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CYCLOPÆDIA:

OR, AN

UNIVERSAL DICTIONARY

OF

ARTS AND SCIENCES.

CONTAINING

An EXPLANATION of the TERMS, and an ACCOUNT OF THE SEVERAL SUBJECTS,

IN THE

LIBERAL AND MECHANICAL ARTS,

AND THE

SCIENCES, HUMAN and DIVINE.

Intended as a COURSE of ANCIENT and MODERN LEARNING.

By E. CHAMBERS, F. R. S.

Floriferis ut apes in ſaltibus omnia libant,
Omnia nos— LUCRET.

WITH THE

SUPPLEMENT,

AND

MODERN IMPROVEMENTS,

Incorporated in one ALPHABET.

By ABRAHAM REES, D. D.

IN FOUR VOLUMES.

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D.

D, The fourth letter in the alphabet, and the third conſonant.

The letter *D* is the fourth in the Hebrew, Chaldee, Samaritan, Syriac, Greek, and Latin alphabets; in the five firſt of which languages it has the ſame name, though ſomewhat differently ſpoken, e. gr. in Hebrew, Samaritan, and Chaldee, *Daleth*; in Syriac *Dolath*; and in Greek *Delta*.

The Arabians have three *D's* in their language, the firſt called *Dal*, which is the eighth of the twenty-eight letters; the ſecond, called *Dhſal*, is only diſtinguiſhed from the former by having a point added over it; though its ſound is much the ſame with that of the *Z*: the third, which is their ſeventeenth letter, is called *Da*, and pronounced like our *D*, though in form it reſembles the Arabic *Ta*, the difference being a point added at the top.

The form of our *D* is the ſame with that of the Latins; as appears from all the ancient medals and inſcriptions. And the Latin *D* is no other than the Greek Δ, rounded a little, by making it quicker, and at two ſtrokes. The Δ of the Greeks, again, is borrowed from the ancient character of the Hebrew *Daleth*; which form it ſtill retains on the Samaritan coins, as is ſhewn by the Jeſuit Souciet, in his Diſſertation on the Samaritan Medals. All the alteration the Greeks have made in it, is the making it ſtoop a little, and taking away a little line. Nor would it be difficult to ſhew, that the Syriac *Dolath*, and the Arabic *Dal*, are both borrowed from the ancient Hebrew, as well as the ד *Daleth* of the modern, or Chaldee Hebrew.

Some indeed will have it, that the Greek Δ, *Delta*, is borrowed from the Egyptians, who made their *D* of three ſtars diſpoſed in a triangle; which was a hieroglyphic that among them denoted God, the ſovereign Being, as if they had had ſome notion of a Trinity: but this ſurmiſe is weakly ſupported.

Grammarians generally rank *D* among the lingual letters, as ſuppoſing the tongue to have the principal ſhare in the pronunciation thereof; though the abbot de Dangeau ſeems to have reaſon in making it a palatal letter. It has one uniform ſound, nearly approaching to that of T, but formed by a ſtronger appulſe of the tongue to the upper part of the mouth.

D is alſo a numeral letter ſignifying *five hundred*, which ariſes hence, that in the Gothic characters the *D* is half the M, or CIↃ, which ſignifies a thouſand. Hence the verſe:

Litera D *velut* A *Quingentos ſignificabit.*

A daſh added at the top of the $\overline{D}$, denotes it to ſtand for *five thouſand.*

D uſed in abbreviation has various ſignifications: thus *D* ſtands for doctor, and M. D. doctor of medicine, D. T. doctor of theology, D. D. doctor of divinity, or *dono dedit*; D. D. D. is uſed for *dat, dicat, dedicat*; and D. D. D. D. for *dignum deo donum dedit.*

Among Roman writers, *D* ſtands for *divus, decimus, devotus, diebus*, and *diutius.*

DM in the Roman epitaphs ſignifies *diis manibus*, but on other occaſions *deo magno*, or *diis magnis*; *DN* denoted *dominus noſter*, a title given by the Romans to their emperors.

D on the French coins is the mark of the city of Lyons.

D, in the chemical alphabet, ſignifies vitriol.

D, in the *Italian Muſic*, intimates, that in thorough baſſes, the treble or deſcant ought to play alone; as T does the tenor, and B the baſs.

DC, in the *Italian Muſic*, an abbreviation of *da capo*, i. e. from the head or beginning: theſe words or letters are commonly met with at the end of rondeaus, or ſuch airs and tunes as end with the firſt ſtrain, and intimate that the ſong is to be begun again, and ended with the firſt part.

DAALDER. See DOLLAR and COIN.

DAB, in *Ichthyology*, a name given by the Engliſh to a ſmall fiſh of the PLEURONECTES kind, called by authors the *paſſer aſper* and *limanda*.

It is a flat fiſh, ſuperior in goodneſs to the common plaiſe, but inferior in ſize, covered with ſmall ſcales, rough at their extremities, and edged as it were with teeth: the eyes are on the right ſide, and are placed very cloſe together. It is generally of an uniform brown colour on the upper ſide, though ſometimes ſhaded with a darker; the lower part of the body is white. The lateral line is incurvated at the beginning, and then proceeds ſtrait to the tail. It is in beſt ſeaſon in February, March, and April; ſpawns in May and June, and becomes flabby during the reſt of ſummer. The *ſmear-dab* reſembles the former; its back is covered with ſmall ſmooth ſcales, of a light brown colour, and ſpotted with yellow; the belly is white, and marked with five large duſky ſpots. It is equally good with the common *dab*. Pennant.

It is caught in the Mediterranean and Engliſh ſeas.

DABUH, a name given by the Arabs to the HYÆNA.

DACE, in *Ichthyology*, the Engliſh name for the fiſh called by authors the *leuciſcus*. According to the new ſyſtem of Artedi, this is a ſpecies of the cyprinus; and it is called by ſome *albicula*.

It is diſtinguiſhed from other fiſhes by its reſembling the chub in ſize, but that it is ſmaller and whiter, and has a ſmaller head in proportion to its body. Its length is ſeldom more than ten inches. It has no teeth in its jaws, but like the reſt of the leather-mouthed fiſhes has them in the throat. It is very common in our rivers, and is a remarkably lively fiſh. They ſpawn in February, and the males at that time are ſpotted and ſcabby, as in the

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rudd, &c. and are in higheſt ſeaſon for the table in April and May; but they are never a very well-taſted fiſh, or much eſteemed.

This fiſh gives the expert angler great diverſion. The *dace* will bite at any fly; but he is more than ordinarily fond of the ſtone-caddis, or May-fly, which is plentiful in the latter end of April, and the whole month of May. In warm weather this fiſh very ſeldom refuſes a fly at the top of the water; but at other times he muſt have the bait ſunk to within about three inches of the bottom. The winter fiſhing for *dace* requires a very different bait: this is a white maggot with a reddiſh head, which is the produce of the eggs of the beetle, and is turned up with the plough in great abundance. A parcel of theſe put in any veſſel, with the earth they were taken in, will keep many months, and are an excellent bait.

Small *dace* may be put into a glaſs jar with freſh water, and there preſerved alive for a long time, if the water be properly changed. They have been obſerved to eat nothing but the animalcula in the water. They will grow very tame by degrees. Phil. Tranſ. N° 487. p. 23. ſeq.

DACOLITHUS, in *Zoology*, a name given by many to a ſmall fiſh, a ſpecies of the loach, and diſtinguiſhed by the name of *cobitis barbatulea aculeata* by Ray and others. It is a very ſmall fiſh, ſeldom exceeding two, or at the utmoſt three inches in length. Its head is broader and flatter than the reſt of the body; its back is of a duſky brown, ſpotted with black, and its belly yellow. It has two beards on each ſide of the upper jaw; and on the coverings of the gills has, on each ſide, two prickles, or a double-pointed ſharp hook, by means of which it moves itſelf about among the ſtones. This fiſh loves ſhallow waters with a ſtony bottom, and ſpawns in May and June. Willughby.

There is another ſpecies of this fiſh, which has ten beards about its mouth, and otherwiſe reſembles this. There is an opinion that they ſwallow little ſtones, and they have hence the German name ſignifying ſtone-ſwallowers, or ſtone-biters.

DACRYODES, in *Medicine*, a term applied to ulcers, which are continually yielding a putrid matter.

The word is formed from δακρυ, *tear*, and ειδος, *form*; denoting the ulcers to weep, or ſhed ſomewhat like tears.

DACRYON. See TEARS.

DACTYL, DACTYLUS, a foot in the Latin and Greek poetry, conſiſting of a long ſyllable, followed by two ſhort ones: as *cāmĭnĕ*.

Some ſay it is derived from δακτυλος, a *finger*, becauſe it is divided into three joints, the firſt of which is longer than the other two.

The *dactyl* is ſaid to have been the invention of Dionyſius or Bacchus, who delivered oracles in this meaſure at Delphos, before Apollo. The Greeks call it ποδιτικος. The *dactyl* and ſpondee are the moſt conſiderable of the poetical feet; as being the meaſures uſed in heroic verſe, by Homer, Virgil, &c. Theſe two are of equal time, but not equal motion. The ſpondee has an even, ſtrong, and ſteady pace, like a trot: the *dactyl* reſembles the nimbler ſtrokes of a gallop.

DACTYLUS was alſo a ſort of dance among the ancient Greeks, chiefly performed, as Heſychius obſerves, by the athletæ.

DACTYLS alſo denote the fruit of the palm-tree, more uſually called *dates*.

DACTYLETHRA, or DACTYLITHRA, *Digitale*, among the *Ancient Phyſicians*, a medicine uſed to provoke vomiting. It was a ſort of topical application, and is deſcribed at large by Oribaſius.

DACTYLI, in *Antiquity*, a name attributed to the firſt prieſts of the goddeſs Cybele; who were particularly called *Dactyli Idæi*, on account of the goddeſs herſelf, who was ſtyled *Cybele Idæa*, becauſe principally honoured on mount Ida in Phrygia. The name *Dactyli* is ſuppoſed to have been given them on this occaſion: that to prevent Saturn from hearing the cries of Jupiter, whom Cybele had committed to their cuſtody, they uſed to ſing verſes of their own invention, which by their unequal meaſures ſeemed to reſemble the foot called *dactylos*.—This is the account of the grammarian Diomedes.

One Sophocles, quoted by Strabo, lib. x. ſpeaks differently. According to him they were called *Dactyli*, from the Greek word δακτυλος, *finger*, becauſe their number was at firſt equal to that of the fingers of the hand, viz. ten; five of them boys, and as many girls. He adds, that it is to them we owe the invention of iron, and the manner of working it, with divers other uſeful things. Others make their numbers more, and others leſs, than ten. Some, again, make them natives of Phrygia, near the foot of mount Ida; and others bring them from other places.

However, all the authors Strabo had ſeen, he ſays, agreed, that they were the firſt who wrought in iron; that they had been miniſters of the mother of the gods, or Cybele; and that they dwelt at the foot of mount Ida: and they probably derived their knowlege of forging metals from the fuſion of minerals at the burning of mount Ida.

It is alſo conjectured by ſome authors, not that the Curetes and Corybantes were the ſame with the *Dactyli Idæi*, but that the Curetes and Corybantes were their poſterity; that a hundred men, born in Crete, were firſt called *Dactyli Idæi*; that each of theſe had nine children, who were the Curetes; and that each of the Curetes had ten children, who were alſo called *Dactyli Idæi*. They were CYCLOPIANS.

Strabo only gives us the names of four of the *Dactyli Idæi*, which are Salaminus, Damnanæus, Hercules, and Acmon.

DACTYLIC, ſomething that has a relation to *dactyls*.

Anciently, there were *dactylic*, as well as ſpondaic flutes, *tibiæ dactylicæ*. The *dactylic* flutes conſiſted of unequal intervals; as the *dactylic* foot does of unequal meaſures.

DACTYLIC *verſes* are hexameter verſes, ending in a *dactyl* inſtead of a ſpondee; as ſpondaic verſes are thoſe which have a ſpondee in the fifth foot inſtead of a *dactyl*.

An inſtance of a *dactylic* verſe we have in Virg. Æn. lib. vi. 33.

Bis patriæ cecidere manus: quin protinus omnia
Perlegerent oculis——

DACTYLIOMANCY, DACTYLIOMANTIA, a ſort of divination performed by means of a ring.

The word is compoſed of the Greek δακτυλιος, *ring*, of δακτυλος, *finger*; and μαντεια, *divination*.

Dactyliomancy conſiſted principally in holding a ring, ſuſpended by a fine thread, over a round table, on the edge whereof were made divers marks with the twenty-four letters of the alphabet. The ring in ſhaking, or vibrating over the table, ſtopped over certain of the letters, which, being joined together, compoſed the anſwer required.

But the operation was preceded and accompanied by ſeveral ſuperſtitious ceremonies; for firſt the ring was to be conſecrated with a great deal of myſtery: the perſon who held it was to be clad in linen garments, to the very ſhoes; his head was to be ſhaved all round; and in his hand he was to hold vervain. And before he proceeded on any thing, the gods were firſt to be appeaſed by a formulary of prayers, &c. Ammianus Marcellinus gives the proceſs at large in his twenty-ninth book.

DACTYLIS, in *Botany*. See *Cock's-foot* GRASS.

DACTYLONOMY, DACTYLONOMIA, from δακτυλος, *finger*, and νομος, *law*, the art of accounting, or numbering, by the fingers.

The rule is this: the left thumb is reckoned 1, the index 2, and ſo on to the right thumb, which is the tenth, and of conſequence is denoted by the cypher 0.

DACTYLUS, in *Ichthyology*, a name uſed by many authors for the ſolen or razor-fiſh, ſuppoſed to be the *dactylus* of Pliny, to which he attributes a quality of being luminous in the dark: but Mr. Reaumur has obſerved, that the common ſolen or razor-fiſh has no ſuch quality; but that the *pholas*, or, as the French call it, the *dail*, has: and therefore it follows either that the *pholas* is the *dactylus* of Pliny, or elſe that this author has attributed to one ſpecies of fiſh what is the peculiar property of another. The ſhell of this creature is not at all luminous, but only its body and juices; and in this it is no way allied to ſome kinds of fiſh, which are known to have the quality of ſhining in the dark, ſince thoſe never ſhine till they are in a ſtate of decay, and in part rotten; whereas theſe have their luminous quality at all times, even when juſt taken out of the ſea. The glow-worm has only a part of its body luminous, but the *pholas* is luminous all over, and is equally ſo in every part: and when the fiſh is taken whole out of the ſhell, and laid in a dark place, every part of its ſurface ſhines with a very bright light. Neither is the light peculiar to the external ſurface of the fiſh, but common to the whole body: for if it be wounded tranſverſely, or longitudinally, the cut parts are equally luminous with the other ſurfaces.

The *pholas* is therefore a true natural phoſphorus, and, like the artificial phoſphorus of urine, it renders every thing luminous that it is rubbed againſt.

Mr. Reaumur obſerved of this fiſh, that when freſh caught it abounds with water, and that this water naturally drops away in the handling it; and, according to Pliny's juſt obſervation, theſe very drops of water are luminous.

The light which this fiſh gives to bodies that touch it, is not of any long continuance, but remains only while they are wet. Mr. Reaumur obſerved, that the light upon his fingers grew fainter and fainter by degrees as they dried; and that on dipping them in water to waſh them,

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them, it brightened up again. This author was thus encouraged to attempt ſome way of keeping the fiſh, ſo as to make it a phoſphorus ready for uſe at pleaſure; but this did not ſucceed to his wiſhes.

In the ſummer months, the fiſh may be kept ſeveral days freſh, and with their luminous property; but as they begin to decay, they gradually loſe it. It ſeems alſo, that there being ſome dead ones among the living, would make them loſe their luminous quality, even in that which is their beſt ſtate. It is well known, that the PHOLAS lives in holes within ſtones, from whence it cannot get out; and Mr. Reaumur cauſing ſome of theſe ſtones to be taken up, in which, on breaking, there appeared to be ſome dead ones, and ſome alive, found that the living fiſh from theſe ſtones had not their luminous property, which ſeemed as it were extinguiſhed by the dead and ſtinking ones. Mem. Acad. des Scienc. ann. 1723.

DACTYLUS *Idæus*, in *Natural Hiſtory*, a name given by many authors to the BELEMNITES; ſuppoſed erroneouſly by many, to be the *lyncurius* of the ancients. For other meanings of the word, ſee DACTYLI.

DADO, in *Architecture*, is by ſome writers uſed for that part in the middle of the pedeſtal of a column between its baſe and cornice. It is of a cubic form, whence it is alſo denominated *dye*.

DADUCHI, in *Antiquity*, prieſts of Ceres.

That goddeſs, having loſt her daughter Proſerpine, ſay mythologiſts, began to make ſearch for her at the beginning of the night. In order to do this in the dark, ſhe lighted a torch, and thus ſet forth on her travels throughout the world: for which reaſon it is, that ſhe is always ſeen repreſented with a lighted torch in her hand.

On this account, and in commemoration of this pretended exploit, it became a cuſtom for the prieſts, at the feaſts and ſacrifices of this goddeſs, to run about in the temple, with torches, after this manner; one of them took a lighted torch from off the altar, and holding it with his hand, ran with it to a certain part of the temple, where he gave it to another, ſaying to him, *Tibi trado:* this ſecond ran after the like manner, to another part of the temple, and gave it to the third, and ſo of the reſt.

From this ceremony the prieſts became denominated *daduchi*, δαδουχοι, q. d. *torch-bearers*; from δας, an unctuous and reſinous wood, as pine, fir, &c. whereof the ancients made torches; and εχω, *I have, I hold.*

The Athenians alſo gave the name *daduchus* to the high-prieſt of Hercules.

DÆDALA, in *Antiquity*, two feſtivals in Bœotia, one of which was obſerved by the Platæans at Alalcomenus, where was the largeſt grove in all Bœotia. Here they aſſembled, and expoſing to the open air pieces of ſodden fleſh, carefully obſerved whither the crows that came to feed upon them took their flight, and then hewed down all thoſe trees on which any of them alighted, and formed them into ſtatues, which by the ancient Greeks were called *dædala*, δαιδαλα.

The other ſolemnity was by far the greateſt and moſt remarkable of the two, being celebrated only once in ſixty years. For the ceremonies obſerved in it, ſee Pott. Archæol. Græc. lib. ii. cap. 20.

DÆDIS, among the Greeks, a ſolemn feſtival that laſted three days, during all which time δαδες, or *torches*, were kept burning, which gave occaſion to the name. Pott. Archæol. Græc. lib. ii. cap. 20.

DÆMON, δαιμων, a name the ancients gave to certain ſpirits, or genii, which they ſay appeared to men, either to do them ſervice, or to hurt them.

The Greek word, δαιμων, is derived (according to Plato, in his Cratylus, p. 398. ed. Serrani, vol. i.) from δαημων, *knowing*, or *intelligent*; but according to others from δαιομαι, *to diſtribute*. See the Scholiaſt on Homer, Il. i. ver. 222. Either of theſe derivations agrees with the office aſcribed to *dæmons* by the ancient heathens, as the ſpirits intruſted with the *inſpection* and *government* of mankind. For, according to the philoſophers, *dæmons* held a middle rank between the celeſtial gods and men on earth, and carried on all intercourſe between them; conveying the addreſſes of men to the gods, and the divine benefits to men. Plutarch. de Defect. Orac. p. 415, et ſeq. Platon. Sympoſ. p. 202. tom. iii. ed. Serrani. Apuleius de Deo Socrat p. 674. 677. ed. Delph. Iamblichus de Myſter. Auguſt. de Civ. Dei.

It was the opinion of many, that the celeſtial divinities did not themſelves interpoſe in human affairs, but committed the entire adminiſtration of the government of this lower world to theſe ſubaltern deities. *Neque enim pro majeſtate deum cœleſtium fuerit, hæc curare.* Apuleius de Deo Socratis, p. 677. *Cuncta cœleſtium voluntate, numine & authoritate, ſed dæmonum obſequio, & operâ, & miniſterio fieri arbitrandum eſt* Id. p. 675. Hence they became the objects of divine worſhip. *If idols are nothing*, ſays Celſus, (apud Origen. cont. Celſ. lib. viii. p. 393.) *what harm can there be to join in the public feſtivals? If they are* dæmons, *then it is certain that they are gods, in whom we are to confide, and to whom we ſhould offer ſacrifices and prayers, to render them propitious.*

Several of the heathen philoſophers held, that there were ſeveral kinds of *dæmons*; that ſome of them were ſpiritual ſubſtances of a more noble origin than the human race, and that others had once been men. Apuleius de Deo Socratis, p. 684. 690. Ammonius apud Plutarch. de Defect. Orac. p. 431. tom. ii. ed. 1624. Plato in Timæo, p. 41, 42. 69. 71. 75.

But thoſe *dæmons* that were the more immediate objects of the eſtabliſhed worſhip amongſt the ancient nations were *human ſpirits*, ſuch as were believed to become *dæmons* or deities after their departure from their bodies. Plutarch teaches (Vit. Romul. p. 36. ed. Paris) *that according to a divine nature and juſtice, the ſouls of virtuous men are advanced to the rank of* dæmons; *and that from* dæmons, *if they are properly purified, they are exalted into gods, not by any political inſtitution, but according to right reaſon.* The ſame author ſays in another place (De Iſ. & Oſir. p. 361.) *that Iſis and Oſiris were, for their virtue, changed from good* dæmons *into gods, as were Hercules and Bacchus afterwards, receiving the united honours both of gods and* dæmons. Heſiod, and other poets, who have recorded the ancient hiſtory or traditions, on which the public faith and worſhip were founded, aſſert, that the men of the golden age, who were ſuppoſed to be very good, became *dæmons* after death, and diſpenſers of good things to mankind.

Though *dæmon* is often uſed in a general ſenſe, as equivalent to a *deity*; and is accordingly applied to *fate* or *fortune*, or whatever elſe was regarded as a god, yet thoſe *dæmons* who were the more immediate objects of divine worſhip amongſt the heathens, were human ſpirits; as is ſhewn in Farmer on Miracles, chap. iii. ſect. 2.

The word *dæmon* is uſed indifferently in a good and in a bad ſenſe. In the former ſenſe it was very commonly uſed amongſt the ancient heathens. *We muſt not*, ſays Menander, *think any* dæmon *to be evil, hurtful to a good life, but every god to be good.* Nevertheleſs, thoſe are certainly miſtaken who affirm, that *dæmon* never ſignifies an evil being till after the times of Chriſt. Pythagoras held *dæmons* who ſent diſeaſes to men and cattle, Diogen. Laert. Vit. Pythagor. p. 514. ed. Amſtel. Zaleucus, in his preface to his Laws (apud Stobæum, Serm. 42.) ſuppoſes that an evil *dæmon* might be preſent with a man, *to influence him to injuſtice.* The *dæmons* of Empedocles were evil ſpirits, and exiles from heaven. Plutarch Περι τυ μη δειν δανειζεσθαι. And in his life of Dion (p. 958.) he ſays, *It was the opinion of the ancients, that evil and miſchievous* dæmons, *out of envy and hatred to good men, oppoſe whatever they do.* Scarce did any opinion more generally prevail in ancient times than this, viz. that as the departed ſouls of good men became good *dæmons*, ſo the departed ſouls of bad men became evil *dæmons.* See Chalcid. in Platon. Tim. cap. 135. p. 330.

It has been generally thought, that by *dæmons* we are to underſtand *devils*, in the Septuagint verſion of the Old Teſtament; but it has been ſhewn, that the word is in that verſion certainly applied to the ghoſts of ſuch dead men as the heathens deified, in Deut. xxxii. 17. Pſ. cvi. 37. What is offered on this head by Mr. Farmer, in his Eſſay on the Dæmoniacs of the New Teſtament, is much confirmed by what occurs in Sir Iſaac Newton's Chronology, p. 160, 161. That *dæmon* often bears the ſame meaning in the New Teſtament, and particulary in Acts xvii. 18. 1 Cor. x. 21. 1 Tim. iv. 1. Rev. ix. 13. is ſhewn at large by Mr. Joſeph Mede (Works, p. 623, et ſeq.) That the word is applied always to human ſpirits in the New Teſtament, Mr. Farmer has attempted to ſhew in the forementioned Eſſay, p. 208, et ſeq. As to the meaning of the word *dæmon* in the fathers of the Chriſtian church, it is uſed by them in the ſame ſenſe as it was by the heathen philoſophers, eſpecially the latter Platoniſts; that is, ſometimes for departed human ſpirits, and at other times for ſuch ſpirits as had never inhabited human bodies. In the fathers indeed the word is more commonly taken in an evil ſenſe, than in the ancient philoſophers. Beſides the two forementioned kinds of *dæmons*, the fathers, as well as the ancient philoſophers, held a third, viz. ſuch as ſprang from the congreſs of ſuperior beings with the daughters of men. In the theology of the fathers, theſe were the worſt kind of *dæmons*. Tertullian's Apology, cap. 22. Lactantius, Div. Inſtitut. lib. ii. cap. 15.

Different orders of *dæmons* had different ſtations and employments aſſigned them by the ancients. Good *dæmons* were conſidered as the authors of good to mankind; evil *dæmons* brought innumerable evils both upon men and beaſts. Amongſt evil *dæmons* there was a great diſtinc-

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tion with reſpect to the offices aſſigned them; ſome compelled men to wickedneſs, others ſtimulated them to madneſs. See DÆMONIAC.

DÆMONIAC, Δαιμονιζομενος, one poſſeſſed by a dæmon. *Dæmoniacs*, or (if we may be allowed the expreſſion) *dæmonized perſons*, were ſuch as were thought to have a dæmon or dæmons *inſpiring* and *actuating* them, ſuſpending the faculties of their minds, and governing the members of their bodies. The dæmons were ſuppoſed to inform the bodies of the poſſeſſed, in the ſame manner that their own ſouls did at all other times. Hence it came to paſs, that every thing ſaid or done by the *dæmoniacs*, was often aſcribed to the indwelling dæmons. Plato (apud Clem. Alex. Strom. i. p. 405. Oxon.) affirms, that *dæmoniacs do not uſe their own dialect or tongue, but that of the dæmons who have entered into them.* And Lucian, when ſtating the common opinion concerning perſons thought to be poſſeſſed, ſays, *The patient is ſilent, the dæmon returns the anſwer to the queſtions that are aſked.* Accordingly we find in the New Teſtament, that what was ſaid and done by the *dæmoniacs* themſelves, is (in conformity to the vulgar language) very often referred to the dæmons by whom they were ſuppoſed to be inſpired and actuated. And *dæmoniacs* having been educated in the common opinion concerning the nature and reality of poſſeſſions, did (as it is natural to ſuppoſe they would) frequently fancy themſelves to be poſſeſſed by dæmons, or that they were dæmons themſelves, and ſpoke and acted in conformity to the apprehended ſentiments and inclinations of thoſe ſpirits. Hence their dread of Chriſt's power, and their treaties and expoſtulations with him. See Farmer's Letters in anſwer to Dr. Worthington, p. 98, and p. 139.

The peculiar ſymptoms of the *dæmoniacs* were certain kinds of inſanity, ſuch as the ancients could not account for by natural cauſes, and ſeemed to argue the ſeizure of the underſtanding by a malevolent dæmon, who inſtigated the unhappy patient to every thing that was extravagant and injurious to himſelf and others. Among the Greeks, the Latins, the Jews, and other eaſtern people, none were thought to be poſſeſſed whoſe underſtandings were not diſturbed. Amongſt the primitive Chriſtians alſo, reputed *dæmoniacs* were all mad, melancholy, or epileptic perſons; and ſuch likewiſe were all the *dæmoniacs* of the New Teſtament; as is ſhewn by Dr. Sykes in his Inquiry, and Farther Inquiry concerning this ſubject, and by Mr. Farmer in his Eſſay upon it, chap. i. ſect. 5, 6. Both theſe writers have alſo taken much pains to ſhew, that the dæmons to whom poſſeſſions were referred by the ancients, were conſidered as human ſpirits. Joſephus ſays in expreſs terms, that dæmons are *the ſpirits of wicked men, who enter the living, and kill thoſe who receive no help.* De Bello Jud. lib. vii. cap. 6. ſect. 3. And Juſtin Martyr affirms (Apol. I. al. ii. p. 65. Pariſ. 1620) *that thoſe perſons who are ſeized and thrown down by the ſouls of the deceaſed, are ſuch as all men agree in calling* dæmoniacs *and mad.*

In the tranſlation of the New Teſtament in vulgar uſe, we frequently read of perſons *having* or *being poſſeſſed by a devil* or *devils*, and of Chriſt's *caſting out devils*. But the Scripture never deſcribes more than one evil ſpirit by the word devil; and never repreſents any perſons as poſſeſſed by the *devil*, or by *devils*, not even in a ſingle inſtance, notwithſtanding the great frequency with which the evangeliſts ſpeak on the ſubject of poſſeſſions. In all the inſtances in which the term devils occurs in the Engliſh tranſlation of the New Teſtament, the original word is *dæmons* (δαιμονες, δαιμονια, δαιμονιζομενοι) and not that from whence comes the Engliſh word *devil* (διαβολος). As poſſeſſing dæmons were in the age of the Goſpel univerſally regarded as human ſpirits, it is very reaſonable to ſuppoſe that the ſacred writers employ the term dæmon in reference to poſſeſſions, in the ſame ſenſe in which all other perſons did; eſpecially as they have given us no notice of their uſing the word in a new or peculiar ſenſe, and have even themſelves certainly uſed it on other occaſions to deſcribe ſuch dead men as the ſuperſtition of the heathens deified, and corrupt Chriſtians have propoſed as objects of worſhip. 1 Cor. x. 20, 21. 1 Tim. iv. 1. Rev. ix. 20.

Whether there ever were any real *dæmoniacs*, is a queſtion that will be conſidered under the article DÆMONIACAL *poſſeſſion*.

In the Romiſh church, there is a particular office for the exorciſm of *dæmoniacs*.

DÆMONIACS are alſo a party or branch of the Anabaptiſts, whoſe diſtinguiſhing tenet it is, that the devils ſhall be ſaved at the end of the world.

DÆMONIACAL *poſſeſſion*. In the ages of ignorance and ſuperſtition, the credulous part of mankind were eaſily perſuaded to believe, that maniacs and epileptics were really poſſeſſed by dæmons: but thoſe who conſulted their reaſon, and gained an inſight into nature, pronounced what commonly paſſed for *dæmoniacal poſſeſſions*, to be mere natural diſorders. The divine Hippocrates wrote his book Περι Ιηρης νουσε, to ſhew that the epilepſy has nothing in it ſupernatural, more than any other diſtemper; and to expoſe the ignorance and impiety of thoſe who aſcribed it to the immediate agency of the gods, and accordingly undertook to cure it by expiations and charms. Amongſt many other conſiderations which he has urged to prove that epileptical diſtempers owe their riſe to natural cauſes, he obſerves, (De Morbo Sacro, p. 307. ed. Foeſii) *that goats are remarkably ſubject to the epilepſy; and, on diſſecting the head, the brain is found to be overcharged with a rheum of a very bad ſmell; a plain proof*, he adds, *that the animal is diſeaſed, not poſſeſſed by a deity.*

Indeed the doctrine of *dæmoniacal poſſeſſions* is ſo manifeſtly repugnant to the perfections of God, and to that fixed order of cauſes and effects which we diſcover in every part of nature, and particularly in the human ſyſtem, that few perhaps in this enlightened age would appear in its defence, were it not for an apprehenſion that it is ſupported by the authority of revelation. Various expreſſions uſed by Chriſt and his apoſtles are thought by ſome to aſſert or imply the reality of poſſeſſions. We are told, that the people brought to Jeſus were ſuch as were *poſſeſſed and vexed with unclean* ſpirits; and that he *caſt out ſpirits with his word.* But perhaps theſe learned writers do not ſufficiently conſider, that the reality of poſſeſſions and diſpoſſeſſions was never taught by Chriſt and his apoſtles as a doctrine; and that they could not, with propriety, interpoſe their authority in eſtabliſhing the reality of poſſeſſions, conſidered as the ſecret cauſe of thoſe diſorders imputed to them: for the miraculous cure of theſe diſorders being a part of that evidence which was deſigned for the conviction of unbelievers, we are to judge of the nature of the miracle in queſtion by reaſon alone, not by an authority which cannot be admitted previous to its performance. Beſides, as poſſeſſion by dæmons was anciently thought to produce ſome maniacal diſorder; and the expulſion or departure of dæmons was thought to effect a removal of the diſorder, or a recovery of the underſtanding; it hence came to paſs that poſſeſſions and diſpoſſeſſions were in common life uſed to expreſs thoſe outward and ſenſible ſymptoms they were thought to produce, or the *diſorder* and *cure* of reputed *dæmoniacs*. It is very common to give to an effect the name of the cauſe to which it is aſcribed. And whenever the ſuppoſed cauſe or author of any thing is put for the thing itſelf, the cauſe or author is not included. When Ceres, for example, ſtands for corn, and Bacchus for wine; corn and wine alone are intended. In like manner *dæmoniacal* poſſeſſion was uſed merely to expreſs madneſs, without taking the cauſe into the account. Joſephus (Bell. Jud. lib. ii. cap. 13. ſect. 4.) ſays, concerning certain demagogues, that *they perſuaded the multitude to be poſſeſſed by dæmons*, when his whole meaning was, "That the people were worked up into *a* "*phrenſy* by the artifices and eloquence of their leaders." Thus, amongſt the moderns, *lunacy*, which at firſt denoted that peculiar kind of phrenſy over which the moon was ſuppoſed to have an influence, is now uſed for phrenſy in general. Nor are the evangeliſts to be blamed for deſcribing the diſorder and cure of *dæmoniacs* in the popular language, that is, by poſſeſſions and diſpoſſeſſions; inaſmuch as they might adopt the popular language on this ſubject (as they certainly have done on other ſubjects, and all other perſons daily do) without deſigning to eſtabliſh the doctrine on which it was originally founded.

Did we not conſider how far prejudice is capable of perverting the underſtanding, it muſt ſeem incredible, that Chriſtians ſhould form their judgment of the ſentiments of the ſacred writers concerning poſſeſſions by their deſcriptions of *dæmoniacs*, rather than by their profeſſed doctrine concerning dæmons. If what all the prophets of God, under both Teſtaments, have taught us concerning the utter inability of dæmons or heathen deities to do either good or harm to mankind; if this doctrine be true, there never was, nor can be, a real *dæmoniac*.

DÆSION, in *Chronology*, the Macedonian name for the Athenian month ANTHESTERION, which was the ſixth of their year, and anſwered to the latter part of our November, and beginning of December. See MONTH.

DAFFODIL, in *Botany*. See NARCISSUS.

DAFFODIL *Lilly*. See AMARYLLIS.

DAFFODIL, *Sea*, *Pancratium*, in *Botany*, a genus of the *hexandria monogynia* claſs. Its characters are theſe: the flowers are incloſed in an oblong ſpatha, or ſheath, and have a funnel-ſhaped cylindrical nectarium of one leaf, ſpreading open at the top, with ſix ſpear-ſhaped petals, which are inſerted on the outſide of the nectarium, and

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six long stamina inserted in the brim of the nectarium, terminated by oblong prostrate summits. They have a three-cornered obtuse germen situated under the flower, supporting a long slender style, crowned by an obtuse stigma. The germen afterwards becomes a roundish three-cornered capsule with three cells, filled with globular seeds. There are nine species. Miller.

DAGON, in *Mythology*, an idol of the Philistines, represented under the figure of a man without thighs, with his body ending in the tail of a fish bending up backward; and covered with scales from the reins to the lower part of the belly. *Dagon* signifies *fish* in Hebrew. Encycl.

DAGYSA, a marine animal with which the sea abounds, not twenty leagues from the coast of Spain, first discovered by Mr. Banks and Dr. Solander, who to this new *genus* of marine animals gave the name of *dagysa*, from the likeness of one *species* of them to a gem. It is of an angular figure, about three inches long, and one thick, with a hollow passing quite through it, and a brown spot on one end, which they conjectured to be its stomach; four of these adhered together by their sides, when they were taken, and were thought at first to be one animal; but on being put in a glass of water they soon separated, and swam about briskly. Several specimens of them were taken, adhering together, sometimes to the length of a yard or more, and shining in the water with very beautiful colours. But the colours of the CARCINIUM *opalinum*, were still more beautiful and vivid.

DAILE, in a ship, the trough wherein the water runs over the decks.

DAILY, in *Astronomy*. See DIURNAL.

DAIRI, or DAIRO, in the *History of Japan*, is the sovereign pontiff of the Japanneſe; or, according to Kæmpfer, the hereditary ecclesiastical monarch of Japan. In effect, the empire of Japan is at present under two sovereigns, viz. an ecclesiastical one, called the *dairo*, and a secular one, who bears the title of *kubo*. The last is the emperor, and the former the oracle of the religion of the country.

DAIRY, or DAIRY-*house*, in *Rural Architecture*, a building where milk, butter, cheese, whey, &c. are made or kept. See MILK, BUTTER, &c.

DAIS. See DEIS.

DAIS, in *Botany*, a genus of the *decandria monogynia* class: the characters of which are, that it has a four-leaved involucrum, the corolla is divided into five parts, and the fruit is a single-seeded berry.

DAISY, in *Botany*, *Bellis*, a genus of the *syngenesia polygamia superflua* class. Its characters are these: it hath a radiated discous flower, composed of many hermaphrodite flowers in the disk, and female flowers, which form the border or rays, included in a common empalement. The hermaphrodite flowers have an oval germen, attended by five short stamina; the germen afterward becomes a single naked seed, placed vertically. There are three species; the first of which is the common *daisy*, which grows naturally in pastures; the second is a native of the Alps; the third is the garden *daisy*, of which there are several varieties. The garden *daisy* flowers in April and May, when they make a pretty variety, being intermixed with plants of the same growth: they should be planted in a shady border, and a loamy soil without dung, in which they may be preserved without varying, provided the roots are transplanted and parted every autumn; which, with keeping them from weeds, is all the culture they require.

The common little *daisy* has the reputation of being a very eminent medicine of the tribe of vulneraries. The roots and leaves are prescribed, fresh gathered, both externally and internally, in bruises and in wounds. They make a sort of cataplasm of the whole plant, bruised, in some parts of the kingdom, which they apply to the part, and give the juice internally at the same time. The ladies have an opinion also, that the roots of this plant have a power of stopping the growth of animals, and with this intent give a decoction of them in milk to the puppies of their favourite breed, to keep them small. The two species of *bellis* used in medicine are, the *bellis major*, called also *leucanthemum vulgare*, in English *ox-eye daisy*; and the *bellis minor*, called also *consolida minima*, or *symphytum minus*, of most repute for physical virtues, being esteemed a good attenuant, resolvent, healer, cooler, and astringent, efficacious against intumescences of the blood, hæmorrhages, &c.

Foreign dispensatory-writers describe a water, syrup, conserve, essence, tincture, extract, and fixed salt, prepared from this plant.

DAISY, *blue*, or *Globe* DAISY, *Globularia*, in *Botany*, a genus of the *tetrandria monogynia* class. Its characters are these: it has a flower composed of many florets, which are included in one common scaly empalement; and each floret is tubulous, and cut into four parts at the top. They have four stamina, terminated by distinct summits; and in the bottom of the tube is situated an oval germen, which becomes an oval seed, sitting in the common empalement. There are six species.

This plant is to be found in the gardens of the curious, and is a vulnerary.

DAISY, *great*, in *Botany*. See CHAMOMILE.

DAISY, *midd'e*. See LEOPARD'*s Bane*.

DAISY, *ox-eye*. See *Corn* MARYGOLD.

DAKER *hen*, in *Zoology*, the English name for the *ortygometra*, a bird of the gallinaceous kind, somewhat resembling the quail, and called by the Italians the king of the quails, *re delle quaglie*. It is larger than the quail, and is common in Ireland, and in some of the northern counties of England. Ray.

DAKIR, in our statutes, is used for the twentieth part of a last of hides.

According to the statute of 51 Hen. III. *De compositione ponderum & mensurarum*, a *last* of hides consists of twenty *dakirs*, and every *dakir* of ten hides. But by 1 Jac. cap. 33. one *last* of hides or skins is twelve dozen. See DICKER.

DALEA, in *Botany*. See PSORALIA.

DALECHAMPIA, so called in honour of Jacobus Dalechamp, a curious botanist, a genus of the *monoecia monadelphia* class. Its characters are these: it hath male and female flowers on the same plant; the male flowers have no petals, but many stamina. The female flowers have a roundish three-cornered germen, which afterward becomes a round three-cornered capsule, having three cells, each containing one roundish seed. We have but one species of this plant in England, which is a native of Jamaica. Miller.

DALMATICA, a garment with large open sleeves, worn at first only by bishops, though since made a distinction of degrees: it is so called, because it came originally from Dalmatia.

DALUS, in *Antiquity*, a certain measure of land: whence comes *dali*. The *dali prati* have been esteemed such narrow slips of pasture, as are left between the plowed furrows in arable land; which, in some parts of England, are called *doles*. The word is applied in Welsh to low meadows by a river side.

DAM, a boundary or confinement, as to *dam* up, or *dam* out: *infra damnum suum*, within the bounds or limits of his own property or jurisdiction. Bract. lib. ii. c. 37.

DAMAGE, is generally taken for any hurt, or hindrance, that a man receives in his estate; but more particularly for a part of what the jurors are to inquire of, in passing verdict for the plaintiff, or defendant, in a civil action, be it personal or real. After verdict given of the principal cause, they are asked their consciences touching costs and *damages*, which contain the hindrances that the plaintiff or demandant hath suffered by means of the wrong done him by the defendant or tenant.

DAMAGE has two significations; the one proper and general, the other strict and relative. *Proper*, as it is in cases where *damages* are founded on the statute of 2 Hen. IV. cap. 1. and 8 Hen. VI. cap. 9. where costs are included within the word *damages*. *Damage* then, in its proper signification, is said *à demendo*, when, by diminution, a thing becomes worse; and in this sense costs of suit are *damages* to the plaintiff, as by them his substance is diminished.

Relative is when the plaintiff declares the wrong done him to the *damage* of such a sum. This is to be taken relatively, for the wrong which passed before the writ brought; and is assessed by reason of the trespass aforesaid; and cannot extend to the COSTS of suit, which are future, and of another nature.

DAMAGE-*cleer*, *Damna Clericorum*, was a fee assessed out of all *damages* exceeding five marks, and recovered in the courts of common pleas, king's bench, and exchequer, which the plaintiff was obliged to pay as a gratuity to the prothonotaries and his clerks, for drawing special writs and pleadings; but is abolished by stat. 17 Car. II. cap. 6.

DAMAGE *feasant*, or *faisant*, is when a stranger's beasts are doing hurt, or spoiling the grass, corn, woods, &c. of another man, without his leave or licence.

In this case, the party whom they *damage* may distrain, and impound them, both by night, and by day; though in other cases, as for rent, services, &c. none may distrain in the night.

DAMASCUS *steel*, a very fine kind of steel, made in some parts of the Levant, and particularly at Damascus, remarkable for its excellent temper; and used chiefly in the making of sword-blades.

Some authors assure us it comes from the kingdom of Golconda in the East Indies; where the method of tempering with alum, which the Europeans have never been able to imitate, was first invented.

DAMASK,

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DAMASK, a ſort of ſilken ſtuff, having ſome parts raiſed above the ground, repreſenting flowers or other figures.

Damaſks ſhould be of dreſſed ſilks, both in warp and woof. It has its name from its being originally brought from Damaſcus, in Syria.

There is alſo a ſtuff in France called the caffart *damaſk*, made in imitation of the true *damaſk*, having the woof of hair, coarſe ſilk, thread, wool, or cotton. Some have the warp of ſilk, and the woof of thread; others are all thread, or all wool.

DAMASK is alſo a kind of wrought linen, made in Flanders, ſo called, becauſe its large flowers reſemble thoſe of *damaſks*. It is chiefly uſed for tables: a table-cloth, and a dozen of napkins, are called a *damaſk-ſervice*.

DAMASKEENING, the art, or act, of adorning iron, ſteel, &c. by making inciſions therein, and filling them up with gold or ſilver wire; chiefly uſed in enriching ſword-blades, guards and gripes, locks of piſtols, &c.

Its name ſhews the place of its origin; or, at leaſt, the place where it has been practiſed in the greateſt perfection, viz. the city of Damaſcus in Syria: though M. Felibien attributes the perfection of the art to his countryman Curſinet, who wrought under the reign of king Henry IV.

Damaſkeening is partly moſaic work, partly engraving, and partly carving; as moſaic work, it conſiſts of pieces inlayed; as engraving, the metal is indented, or cut in *creux*; and as carving, gold and ſilver are wrought therein in *relievo*.

There are two ways of *damaſkeening*: in the firſt, which is the moſt beautiful, the artiſts cut into the metal with a graver, and other tools proper for engraving on ſteel; and afterwards fill up the inciſions, or notches, with a pretty thick ſilver or gold wire. In the other, which is only ſuperficial, they content themſelves to make hatches, or ſtrokes, acroſs the iron, &c. with a cutting-knife, ſuch as is uſed in making of ſmall files. As to the firſt, it is neceſſary the gravings, or inciſions, be made in the dove-tail form; that the gold or ſilver wire, which is thruſt forcibly into them, may adhere the more ſtrongly. As to the ſecond, which is the more uſual, the method is thus: having heated the ſteel till it changes to a violet, or blue colour, they hatch it over and acroſs with the knife; then draw the deſign, or ornament, intended, on this hatching, with a fine braſs point, or bodkin. This done, they take fine gold wire, and conducting or chaſing it according to the figures already deſigned, they ſink it carefully into the hatches of the metal with a copper tool.

DAMASSIN, a kind of damaſk, with gold and ſilver flowers, made in warp and woof, of wrought, and not raw ſilk.

DAMASSONIUM, in *Botany*. See *Star-headed water* PLANTAIN.

DAMASQUITTE, a kind of ſtuff made at Venice, of which there are two ſorts; one with gold, the other with ſilk: the pieces are eighteen ells long.

DAMATER, in *Mythology*, the ſurname of Ceres.

DAMATRIUS, in *Ancient Chronology*, the Bœotian name of the Athenian month *Pyanepſion*, which was the fifth of their year, and correſponded to the latter part of our October, and beginning of November. See PYANEPSION and MONTH.

DAME was formerly a title of honour, and is ſtill uſed in the Engliſh law to denote a lady; but in common acceptation it ſignifies the miſtreſs of a family of the lower rank in the country.

DAME's *Violet*. See VIOLET.

DAMELOPRE, a kind of BILANDER uſed in Holland, for conveying merchandize from one canal to another, and contrived for commodious paſſage under the bridges.

DAMIANISTS, a branch of the ancient Acephalous Severites; who agreed with the Catholics in admitting the fourth council; but diſowned any diſtinction of perſons in the Godhead, and profeſſed one ſingle nature incapable of any difference; and yet they called God, the Father, Son, and Holy Ghoſt. On which account the Severitæ Petritæ, another branch of Acephali, uſed to call them Sabellianiſts, and ſometimes Tetraditæ. Thus much we learn from Nicephorus Calliſtus, lib. xviii. cap. 49. They took their name from *Damianus*, a biſhop of Alexandria, who was originally their leader, in the ſixth century.

DAMIER, in *Conchyliology*, the name given by French naturaliſts to that elegant ſpecies of voluta, the ſpots of which ſtand in a checquered order, and reſemble the marks of a draught or cheſs board, that being the common ſignification of the word *damier*. See VOLUTA.

DAMNATA *terra*, in *Chemiſtry*, the ſame with CAPUT *mortuum*.

DAMPS, in *Natural Hiſtory*, are noxious ſteams, or exhalations, frequently found in cloſe, ſubterraneous places, particularly mines, pits, and wells.

In the German and Saxon languages the word *damp* ſignifies vapour and exhalation.

Damps, with reſpect to their nature and effects, may be diſtinguiſhed into two kinds: the *firſt* is heavier than common air, and therefore chiefly lies at the bottom of pits and mines. It extinguiſhes flame, precipitates the lime of lime-water, and is noxious, and often fatal to animals, and on this account called the *choke-damp*. It is a ſpecies of *fixed* AIR, and has been deſcribed by modern writers under that name. It reſembles thoſe uninflammable vapours, that are produced by the combuſtion of inflammable bodies, as charcoal, and by fermenting and effervеſcing ſubſtances. This *damp* is ſometimes viſible, and appears in form of a fog, as in a cavern near Pyrmont; and it hangs ſo near the ſurface, that a perſon may ſtand upright, without any other inconvenience than an uncommon heat of his lower extremities, but he cannot without danger bend down his head. Many inſtances occur of the fatal effects of this kind of *damp*. Some perſons, digging in a cellar at Paris, were found dead, ſtiff as ſtatues, with open eyes, and in the poſture of digging. Several others were ſucceſſively deſtroyed at Chartres, by going down into a cellar where a baker had been accuſtomed to throw hot embers from his oven; and one, who was inſtantly killed upon being let down into it, was opened; his lungs were found ſpotted with black marks; his inteſtines ſwoln, red, and inflamed; and the muſcles of his legs, thighs, and arms, ſeemed to be ſeparated from each other, and from the adjacent parts. This caſe was ſo ſingular, that it drew the attention of the magiſtrate and phyſician, who found that the embers had not been properly extinguiſhed, and that they had raiſed a malignant vapour from the ſalt-petre, with which the cellars in that neighbourhood abound. A quantity of water was thrown in to extinguiſh the fire, and lay the vapour, and thus the danger was removed. Hiſt. de l'Academie des Scienc. 1701. 1710. and Connor's Diſſert. Med. Phyſ.

Miners try the ſalubrity of the air in pits where they work, by carrying down with them a lighted candle; they ſoon diſcover the effects of the noxious vapour in its diminiſhing, and gradually extinguiſhing the flame; however they remain ſafely for ſeveral hours in pits where a candle cannot burn; but when the *damp* is ſo ſtrong, that not only the flame of the candle, but alſo the redneſs of the burning wick is extinguiſhed, they never venture to remain a minute, knowing that ſuch a degree of *damp* will be ſoon fatal to animal life.

The *ſecond* kind of noxious vapour, though leſs dangerous than the former, is called the *fulminating*, or *fire-damp*; becauſe, when touched by the flame of a candle, it takes fire, and explodes like gunpowder. This is chiefly found in coal-mines, and ſometimes in lead-mines, as in thoſe of Mendip-hills. It is lighter than common air, and therefore floats near the roofs of ſubterraneous places; and miners, when it is accidentally inflamed, or when they deſignedly ſet fire to it, in order to deſtroy it, lie flat on the ground, and thus eſcape injury. This inflammable vapour may probably be produced by the decompoſition of pyritous matters, with which moſt mines, and eſpecially coal-mines, abound.

In ſome of the coal-pits in the neighbourhood of Mendip-hills, fire-*damps* almoſt continually happen, ſo that great numbers have been killed, maimed, and burnt by them. The colliers however continue their work notwithſtanding, only uſing the caution of renewing their air very quick, and uſing no candles in their work but thoſe of a ſingle wick, and of ſixty or ſeventy to the pound; which notwithſtanding will give as good a light there, as others of ten or twelve to the pound in other places. They always have the caution to place even theſe behind them, and never preſent them to the breaſt of the work. When any perſon is burnt by theſe *damps*, they preſently betake themſelves to a good fire, and ſending for a large quantity of cows milk, they bathe the burnt places with this while warm; and afterwards the places will heal by the common cooling ointments, and healing plaſters.

The German miners think themſelves not qualified for their buſineſs, if they are not able to make their weather, as they expreſs it; that is, to cure their *damps*. Theſe are of various kinds in their mines; ſome ſo ſtrong that they ſuffocate the workmen; others leſs violent, and only making them faint, without doing them any further hurt, unleſs they are ſo imprudent as to continue a long time in the place. The common way of curing the *damp* is by letting the air in and out, and cauſing a circulation in it. Phil. Tranſ. abr. vol ii. p. 373. 382.

The pernicious *damps* in mines ſhew abundantly, that nature affords us inflammable air in ſome caſes; and we have found by experiments that art can do the ſame, and that very probably on the ſame principles with the natural. Sir James Lowther having collected the air of ſome

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of these *damps* in bladders, preserved it so well, that, when brought up to London, it would take fire at the flame of a candle, on being let out by the orifice of a piece of tobacco pipe.

It is well known to all that are versed in chemical experiments, that most metals emit a great quantity of sulphureous vapours during the effervescence they undergo in the time of their solutions in their respective menstruums. On this principle many have produced an inflammable air by art, like the natural one. It is observed that iron, while under solution with oil of vitriol, emits a very great quantity of these vapours, which are very subtile, and not easily condensed. This vapour being received into bladders, in the same manner with the natural air of Sir James Lowther, took fire in the same manner, on being let out in a small stream, and answered all the phænomena of the natural kind. See AIR *fixed*, and AIR *inflammable*.

There is a vapour called the *peas-bloom damp*, on account of its smell. It always comes in the summer-time, and hath never been known to be mortal. The miners in the Peak of Derby fancy that it arises there from the multitude of red trefoil flowers, called by them honeysuckles, with which the lime-stone meadows of the Peak much abound; the smell of this gives timely notice to get out of the way.

DAMSEL, DAMOISEL, or DAMOISEAU, an appellation anciently given to all young people of genteel or noble extraction of either sex, e. gr. to the sons and daughters of knights, barons, and even of kings.

Thus, in history, we read of the *damsel* Pepin, *damsel* Louis le Gros, *damsel* Richard, prince of Wales.

Pasquier will have the word a diminutive of *dam*, an ancient name for lord; as in some authors we read *Dam* Dieu for Lord God; *dam* chevalier, &c. Though in its feminine sense he takes it to come from *dame*.—Others derive the word from *domicellus*, or *domnicellus*, a diminutive of *domnus*, *quasi parvus dominus*: accordingly, Du-Cange observes, that it has been sometimes written *domenger*.

They who hold the signory of Commercy, M. de la Roque tells us, anciently held it in the title of *damoiseau*: and M. de Marca assures us, that the nobleſſe of Bern is still divided into three bodies, or classes; the barons, the cavers, and the *damsels*, *domicellos*, called in that country *domengers*.

The kings of Denmark and Sweden have the same title, as appears from Pontanus's Hist. of Denmark, lib. vii. and viii. and Henry of Upsal's Hist. of Suec. lib. iii.

From the sons of kings, the appellation passed to those of great lords and barons; and, at length, to those of gentlemen who were not yet knights.

DAMSEL, at present, is applied to all maids, or girls, not yet married; provided they be not of the lowest class of people.

DAMSEL is sometimes also applied to a kind of utensil put in beds, to warm old men's feet.

It consists of a hot iron inclosed in a hollow cylinder, which is wrapped round with linen cloth, and keeps its warmth a long time. Some call it a *nun*.

DAMSON *tree*, in *Botany*. See CHRYSOPHYLLUM and PRUNUS.

DANAE, or DANACE, Δανα, or Δανακη, in *Antiquity*, a coin current among the barbarians, being somewhat more than the OBOLUS. This they put into the mouths of dead people, to pay for their passage over the river Acheron.

DANAIDES, in the *Ancient Mythology*, the daughters of Danais, or Danaus, eleventh king of Argos, and brother of Ægyptus.

They were fifty in number, and were espoused to the fifty sons of their uncle Ægyptus.

Danaus, fearing the accomplishment of an oracle, which had foretold, that he should be expelled his kingdom by a son-in-law, persuaded his daughters to murder, each of them, her husband, the first night; which they performed, all but Hypermnestra, who spared her husband Lynceus.

In vengeance for this crime of the forty-nine *Danaides*, the poets have condemned them to hell, to be continually employed in filling a cask perforated at bottom.

The *Danaides* are sometimes also called *Belides*, from their father, who was the son of the Egyptian Belius. Hyginus has preserved the names of forty-seven of them.

DANCE, an agreeable motion of the body, adjusted by art, to the measures of a piece of music, either sung or played.

The word is French, *dance*, formed of the German *dantz*, or *tantz*, which signifies the same thing. Bochart derives it from the Arabic *tanza*, and Guichart from the Hebrew דוץ, *douts*, which have all the same signification. Salmasius derives the French *danser*, to *dance*, from the Latin *densare*, *to thicken*; as holding it a practice among the ancient fullers to leap and *dance* as they fulled their cloaths.

Some distinguish the *high dance*, consisting of capers, gambades, &c. from the *low dance*, which is the *terra à terra*, or close to the ground.

In the carrousal of king Louis XIII. there were *dances* of horses. The invention of such *dances* is attributed to the Sybarites.

Dancing has always been in use among all nations, both civilized and barbarous; though held in esteem among some, and in contempt among others. Of itself, no doubt, *dancing* is harmless. There is a time, says the preacher, to *dance*; and sometimes it is even made an act of religion. Thus David *danced* before the ark, to honour God, and express his excess of joy for its return into the city of Sion. The daughters of Shiloh are likewise said to have *danced* in a yearly feast of the Lord. Judges, ch. xxi. And we find many references to this practice in the religious solemnities of the Jews. From them it passed to the Egyptians, and afterwards to the Greeks and Romans, with whom it was a principal part of the worship of their false gods. It afterwards was adopted in many pagan nations; and Christians in popish countries celebrated certain festivals, particularly those of the sacrament, and passion of our Lord, with *dancing*. Socrates learnt to *dance* of Aspasia. And the people of Crete and Sparta went to the attack *dancing*. On the other hand, Cicero reproaches Galbinius, a consular man, with having *danced*. Tiberius expelled the *dancers* out of Rome; and Domitian excluded several members from the senate, for having *danced* Castor and Pollux are said to be the first who taught the art of *dancing*; and that to the Lacedæmonians: though others attribute the invention to Minerva, who, they say, *danced* for joy after the defeat of the giants.

The ancients had three kinds of *dances*, called *bacchic*; the first grave, called *emmelia*, answering to our *low dances* and pavanes. The second gay, called *cordax*, answering to our courants, galliards, gavots, and vaults. The third, called *ficcinis*, was a mixture of gravity and gaiety Neoptolemus, son of Achilles, taught the Cretans a new sort of *dance*, called *Pyrricha*, or the *armed dance*, to be used in going to war: though, according to mythologists, the Curetes first invented this *dance*, to amuse and divert the infant Jupiter, and to drown his cries with the noise and clash of their swords, beating against their bucklers.

Diodorus Siculus, in the fourth of his Bibliotheca, assures us, that Cybele, daughter of Menoes, king of Phrygia, and Dindymenis his wife, invented divers things, and, among others, the flageolot of several pipes, *dancing*, the tabor, and the cymbal. Numa, it is certain, instituted a sort of *dance* for the salii, priests of Mars, who made use of weapons therein. From these *dances* were composed another sort, called *saltatio mimicorum*, or the *buffoons dance*; wherein the *dancers* were dressed in little corslets, with gilt morions, and had bells on their legs, and swords and bucklers in their hands. Lucian has an express treatise, and Julius Pollux a chapter, on this head; Athenæus, Cælius Rhodiginus, and Scaliger, also make mention of this *dance*.

It is not many years ago, since Thoinot Arbeau, a *dancing*-master of Paris, gave an orchesography, wherein all the steps and motions of a *dance* are written, or noted down; as the sounds of a song are scored in music. Though the famous Beauchamp had some pretensions to be the inventor of this secret, and accordingly procured an arret in his favour.

Dancing is usually an effect and indication of joy among most nations: though M. Palleprat assures us, that there are people in South America, who *dance* to shew their sorrow; and it likewise made a part of the funeral solemnities of the ancients.

DANCE *of St. Vitus*. See VITUS.

DANCE, *Country*. See COUNTRY-*Dance*.

DANCER, *Rope*, *Schoenobates*. Groddeck, professor of philosophy at Dantzic, has published a dissertation on *rope-dancers*, De Funambulis; full of learning, and an uncommon knowlege of antiquity. He defines a *rope-dancer*, a person who walks on a thick rope fastened to two opposite posts; which is precisely what is expressed by the Latin word *funambulus*. But our *rope-dancers* do more; for they not only walk, but *dance* and leap upon the rope.

The ancients, it is certain, had their *rope-dancers* as well as we: witness the Greek words, *neurobates*, and *schœnobates*, as well as the Latin *funambulus*, which every where occur. They had likewise the cremnobates and oribates, that is, people who walked on the brinks of precipices. Nay more, Suetonius in Galba, cap. 6. Se-

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neca in his eighty-fifth epiſtle, and Pliny, lib. viii. cap. 2. make mention of elephants that were taught to walk on the rope.

Mr. Groddeck, coming from the hiſtorical to the moral conſideration, maintains, that the profeſſion of a *rope-dancer* is not lawful; that the profeſſors are infamous, and their art of no uſe to ſociety; that they expoſe their bodies to very great dangers; and that they ought not to be tolerated in a well-regulated ſtate. But, coming afterwards to temper the ſeverity of his morals, he allows that there are ſometimes reaſons for admitting them; that the people muſt have ſhews; that one of the ſecrets of government is to furniſh them therewith, &c.

The ancient *rope-dancers* had four ſeveral ways of exerciſing their art; the firſt vaulted, or turned round the rope, like a wheel round its axis, and there hung by the heels, or the neck. The ſecond flew, or ſlid, from above, downwards, reſting on their ſtomachs with the arms and legs extended. The third ran along a rope ſtretched in a right line, or up and down. Laſtly, the fourth not only walked on a rope, but made ſurpriſing leaps and turns thereon.

DANCERS, in *Eccleſiaſtical Hiſtory*, a ſect that ſprung up in Aix-la-Chapelle in 1373, and ſpread through Flanders. Perſons of both ſexes were ſuddenly ſeized with *dancing* fits, and continued them, with extreme violence, till they were quite exhauſted; and at theſe times they pretended to receive wonderful viſions. The French prophets, or convulſioniſts, in later times, and ſome wild methodiſts in our own country, reſembled theſe more ancient religious *dancers*.

DANCETTE', in *Heraldry*, is when the out-line of any bordure, or ordinary, is indented very largely; the largeneſs of the indentures being the only thing that diſtinguiſhes it from indented.

There is alſo a bearing of a bend, called *double dancetté*; thus, he beareth azure, a bend double *dancetté* argent.

DANCHE, or *Denché*, in *Heraldry*, the ſame with indented; or, as others will have it, with *dancetté*.

DANCRETA, in *Botany*, a name given by the people of Guinea to a plant which they uſe in diſorders of the head, boiling it in water, and uſing the decoction in the way of a fomentation. It is a ſpecies of bindweed, and is called by Petiver *convolvulus quinque foliis Guineenſis foliis non ſerratis*, or the five-leaved Guinea bindweed, with leaves not ſerrated. Caſpar Bauhine, in his Prodromus, deſcribes a ſpecies of bindweed growing in Egypt, which exactly agrees with this in all particulars, except that it is finely ſerrated all round the edges of the leaves. Phil. Tranſ. N° 292.

DANDELION, *Dens Leonis*, or *Leontodon*, in *Botany*, the name of a genus of plants of the *ſyngeneſia polygamia æqualis* claſs, the characters of which are theſe: the flower is of the ſemi-floſculous kind, and the petals it is compoſed of are placed on the embryo ſeeds, and ſurrounded by the cup. The embryos finally become ſeeds winged with down, which are affixed to the thalamus, but expand their downy ends into a globular head, and the ſtalks are uſually hollow, and not branched.

Miller gives no characters of this genus; and only obſerves, that they grow naturally in the fields, that they are a troubleſome weed, which ſhould be deſtroyed before the ſeeds ripen, as by reaſon of their down they are wafted by the wind to a great diſtance; and that the roots are gathered by ſome people, and blanched in their gardens, for a ſallad herb.

The common ſpecies of this plant has much the ſame virtues with the common endive, but in a greater degree: the roots eaten in ſpring are eſteemed of great ſervice in obſtructions in the liver and ſpleen. Its more immediate ſenſible operation is to looſen the belly, promote the urinary diſcharge, and render the water high-coloured, without exciting any particular heat.

DANE-*wort*, or *dwarf-elder*. See ELDER and EBULUS.

DANEGELT, or *Dane-geld*, from *Dane* and *gelt*, ſignifying in Dutch, *money*, an annual tax laid on our anceſtors, firſt of 1*s*. afterwards 2*s*. for every hide of land through the realm, for maintaining ſuch a number of forces as were thought ſufficient to clear the Britiſh ſeas of Daniſh pirates, which heretofore greatly annoyed our coaſts.

It was firſt impoſed as a ſtanding yearly tax on the whole nation, under king Ethelred, A. D. 991. That prince, ſays Camden, Britan. 142, much diſtreſſed by the continual invaſions of the Danes, to procure his peace, was compelled to charge his people with heavy taxes, called *danegelt*. At firſt they paid 10,000*l*. then 16,000*l*. then 24,000*l*. after that 36,000*l*. and laſtly, 48,000*l*. *per annum*.

Ethelred, in 1008, made a vigorous effort to free his people from this infamous tribute, by a general tax on all the land of the kingdom, for fitting out a fleet, which might effectually guard againſt the Danes. Lord Lyttleton's Hiſtory, &c. vol. iii. p. 65.

Edward the Confeſſor remitted this tax: William I. and II. aſſumed it occaſionally. In the reign of Henry I. it was accounted among the king's ſtanding revenues; it was levied by king Stephen, and paid in the 1ſt, 2d, 20th, and 21ſt years of Henry II. Soon after the name was loſt. No church or church land paid a penny to the *danegelt*; becauſe, as is ſet forth in an ancient Saxon law, the people of England placed more confidence in the prayers of the church, than in any military defence they could make. Camd. ap. Magn. Brit. p. 68.

DANELAGE. See LAW.

DANGCANGHAC, in *Natural Hiſtory*, the name given by the people of the Philippine iſlands to the heron. The Spaniards call it *gazza*. It is the ſame ſpecies with that ſo common in Europe. See HERON.

DANGERIA, in *Antiquity*, a payment in money made by foreſt tenants, that they might have liberty to plough and ſow in time of PANNAGE.

DANIEL, or *Book of* DANIEL, a canonical book of the Old Teſtament, ſo denominated from its author Daniel, who was a very extraordinary perſon, and was favoured of God, and honoured of men, beyond any who lived in his time. His prophecies concerning the coming of the Meſſiah, and the other great events of after-times, are ſo clear and explicit, that, as St. Jerom tells us, Porphyry objected to them, that thoſe which related to the kings of Syria and Egypt, chap. xi. muſt have been written after the times of Antiochus Epiphanes; whereas this prophecy was tranſlated into Greek a hundred years before his time, and the tranſlation was in the hands of the Egyptians, who had no great kindneſs for the Jews, and their religion. And thoſe prophecies foretelling the ſucceſſes of Alexander, chap. viii. 5. xi. 3. were ſhewn to Alexander by the Jews, in conſequence of which they obtained ſeveral privileges from him. Ant. lib. xi. c. 8. The ſtyle of Daniel is not ſo lofty and figurative as that of the other prophets; it is clear and conciſe, and his narrations and deſcriptions ſimple and natural: in ſhort, he writes more like a hiſtorian than a prophet.

The Jews do not reckon Daniel among the prophets; part of his book, that is, from the fourth verſe of his ſecond chapter, to the end of the ſeventh chapter, was originally written in the Chaldee language; the reaſon of which was, that in that part he treats of the Chaldean or Babyloniſh affairs: all the reſt of the book is in Hebrew. The ſix firſt chapters of the book of Daniel are a hiſtory of the kings of Babylon, and what befel the Jews under their government. In the ſix laſt he is altogether prophetical, foretelling not only what ſhould happen to his own church and nation, but events in which foreign princes and kingdoms were concerned.

DANK, in *Commerce*, a piece of ſilver current in Perſia, and in ſome parts of Arabia, weighing the ſixteenth part of a drachm. It is alſo a weight uſed by the Arabians to weigh jewels and drugs.

DANTELLE', in *Heraldry*, the ſame with *danché*, or rather with *dancetté*, viz. a large open indenture. See DANCETTE'.

DANTZIGERS, or PRUSSIANS, in *Eccleſiaſtical Hiſtory*, a ſect of the refined ANABAPTISTS (ſee FLEMINGIANS), ſo called, on account of their adopting the manners and diſcipline of the Pruſſians.

DAPHNE, Δαφνη, in *Antiquity*, a kind of divination, taken from the crackling of laurel leaves thrown into the fire.

DAPHNE, in *Botany*. See SPURGE-*laurel*.

DAPHNELÆON, in *Medicine*, Δαφνελαιον (from Δαφνη, the *bay-tree*, and ελαιον, *oil*), *laurinum*, or oil of bay. This is prepared of the berries, when full ripe and ready to fall off, by boiling them in water; by which they tranſmit through their huſks a fat ſubſtance, which after compreſſing the berries with the hand, is taken off with ſhells. Some, after they have inſpiſſated oil of unripe olives with cyperus, juncus oderatus, and calamus, caſt therein the tender leaves of the bay, and boil them together; and others add the berries, until it ſmells ſufficiently ſtrong; and ſometimes ſtyrax and myrrh are mixed with them. The mountainous and broad-leaved bay is the fitteſt for the preparation of this oil, which is beſt in its kind when recent, of a green colour, very bitter, and acrimonious.

Laurinum has heating and mollifying virtues, opens the mouths of the veſſels (αναστοματικην), and removes laſſitudes. It is beneficial in all nervous diſorders, pains and diſtillations of the ears; and is inferior to no other remedy in diſtempers of the kidneys, contracted from cold, the parts being anointed with it: but taken inwardly, it excites a nauſea.

DAPHNEPHORIA, Δαφνηφορια, in *Antiquity*, a novennial feſtival, celebrated by the Bœotians in honour of Apollo. For the ceremonies uſed at this ſolemnity, ſee Pott. Archæol.

DAPHNIUS *lapis*, in *Natural Hiſtory*, the name of a ſtone, the veins of which repreſent the grain of the wood of the

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the bay-tree; and which was probably formed of the wood of that tree, impregnated with ſtony matter, in the manner of the other foſſile woods.

DAPHNOMANCY, from δαφνη, *laurel*, and μαντεια, *divination*; a kind of divination practiſed by throwing branches of laurel into the fire: the crackling of them was deemed a favourable omen; the contrary, otherwiſe. The leaves of laurel were alſo chewed, in order to communicate the gift of prophecy.

DAPIFER, the dignity or office of grand maſter, or grand ſewer, of a king's or prince's houſehold.

The word is pure Latin, compounded of *daps*, *dapis*, *a diſh of meat ſerved on the table*, and *fero*, *I bear*: ſo that *dapifer* literally ſignifies a *diſh-carrier*, or an officer who ſerves the meats upon the table.

The title of *dapifer* was given by the emperor of Conſtantinople to the czar of Ruſſia, as a teſtimony of favour. In France, the like office was inſtituted by Charlemagne, under the title of *dapiferat*, and *ſenechauſſee*; to which was affixed the ſuperintendance over all the officers of the houſehold.

In England, the office of *dapifer* was leſs eminent; being found in ſeveral of our ancient charters named one of the laſt of the officers of the houſehold.

The dignity of *dapifer* is ſtill ſubſiſting in Germany. Till the year 1623, the elector Palatine was *dapifer*, or grand ſewer of the empire: ſince that time, the elector of Bavaria has aſſumed the title of *arch-dapifer* of the empire. His office is, at the coronation of an emperor, to carry the firſt diſh of meat to table on horſeback.

The ſeveral functions of a *dapifer* occaſioned the ancients to give him divers names: as, ἐλεϊατρος, and *eleator*, *dipnocletor*, *convocator*, *trapezopæus*, *architriclinus*, *progusta*, *prægustator*, *domeſticus*, *megadomeſticus*, *œconomus*, *majordomus*, *ſeneſchallus*, *ſchalus*, *gaſtaldus*, *aſſeſſor*, *præfectus* or *præpoſitus menſæ*, *princeps coquorum*, & *magirus*.

DAPIFERAT, DAPIFERATUS, the office of DAPIFER.

DAPPLE *bay*, in the *Manege*, is uſed for a horſe which has marks of a dark bay colour. Such are alſo called *bays à mirroir*.

DAPPLE *black*, in the *Manege*, a black horſe, having ſpots or marks blacker and more ſhining than the reſt of his ſkin.

DAPSILES *coronæ*, among the Romans, a kind of crowns or garlands worn by the women, which covered their faces, and ſerved as a veil.

DARANI, in the *Materia Medica*, a word uſed by ſome of the old writers to expreſs the *ſal ammoniac* of thoſe times, which was the ſame with our *ſal gemmæ*.

DARAPTI, in *Logic*, a mode of ſyllogiſm in the third figure, wherein the major and minor are univerſal affirmative propoſitions, and the concluſion a particular affirmative. E. gr.

DA	*Every truly religious man is virtuous.*
RA	*Every truly religious man is hated by the world.*
PTI	*Therefore, ſome virtuous men are hated by the world.*

DARDANARIUS, *Uſurer*, *Monopoliſt*; a name anciently attributed to ſuch as cauſed a ſcarcity, and dearneſs of proviſions, particularly corn, by buying and hoarding it up, to raiſe its value, and ſell it again at an extravagant rate.

The name *Dardanarius* was given from one Dardanus, who is ſaid to have made a practice of ſpoiling and deſtroying the fruits of the earth by a ſort of ſorcery. Hof. Lex. in voc.

The ſame people are alſo called *æruſcatores*, *directarii*, *ſitocapeli*, *annonæ flagellatores*, and *ſeploſiarii*.

DARE. See DACE, and FISHING.

DARIC, in *Antiquity*, a famous piece of gold, firſt coined by Darius the Mede about 538 years before Chriſt; probably during his ſtay at Babylon, out of the vaſt quantity of gold which had been accumulated in the treaſury. From thence it was diſperſed over the Eaſt, and alſo into Greece; ſo that the Perſian *daric*, which was alſo called *ſtater*, was the gold coin beſt known in Athens in ancient times. According to Dr. Bernard, it weighed two grains more than one of our guineas; but as it was very fine, and contained little alloy, it may be reckoned worth about twenty-five ſhillings of our money. Plutarch informs us, that the *darics* were ſtamped on one ſide with an archer cloathed in a long robe, and crowned with a ſpiked crown, holding a bow in his left hand, and an arrow in his right; and on the other ſide with the effigies of Darius. All the other pieces of gold of the ſame weight and value, that were coined by the ſucceeding kings both of the Perſian and Macedonian race, were called *darics*, from Darius, in whoſe reign this coin commenced. Of theſe there were whole *darics* and half *darics*: and they are called in thoſe parts of Scripture written after the Babyloniſh captivity, *adarkonim*; and by the Talmudiſts, *darkonoth*. Greaves ſays that the *daric* is ſtill found in Perſia; but it is certainly very ſcarce, and perhaps of doubtful antiquity. Suidas in Δαρεικος. Bernard de Ponder. &c. p. 171. Prideaux's Conn. vol. i. p. 182, &c.

DARII, in *Logic*, a mode of ſyllogiſms in the firſt figure, wherein the major propoſition is an univerſal affirmative, and the minor and concluſion particular affirmatives. E. gr.

DA	*They who ſpeak well of every body have many friends.*
RI	*Some ſpeak well of every one.*
I	*Therefore ſome have many friends.*

DARK *chamber*. See CAMERA *obſcura*.

DARK *tent*, a portable *camera obſcura*, made not unlike a deſk, and fitted with optic glaſſes, to take proſpects of landſcapes, buildings, fortifications, &c. See CAMERA *obſcura*.

DARNEL. See GRASS.

DARREIN, in *Law*, a corruption of the French *dernier*, *laſt*, and uſed in the like ſenſe: as, *darrein* continuance (ſee CONTINUANCE); *darrein* preſentment (ſee ASSISE *darrein preſentment*).

DARSINI, in the *Materia Medica of the Ancients*, a name given by ſome to cinnamon. It is generally uſed by Avicenna, Serapion, and the reſt of the Arabian phyſicians.

DARSIS, in *Medical Writers*, is uſed for an excoriation of the ſkin. Blancard.

DART, in *Aſtronomy* and *Geometry*. See SAGITTA.

DARTOS, or DARTUS, in *Anatomy*, the inner coat of the ſcrotum, compoſed of a great number of muſcular, or fleſhy fibres; whence ſome conſider it as a cutaneous muſcle. Dr. Hunter ſays no ſuch muſcle can be found, and Albinus takes no notice of it in his tables.

The word is pure Greek, δαρτος, *excoriatus*, *pelle nudatus*, of δερω, *excorio*; probably becauſe it lies cloſe under the ſkin, or from its excoriated appearance.

It is by means hereof that the ſcrotum is contracted, or corrugated, which is eſteemed a ſign of health.

The *dartos* was anciently taken to be a continuation of the *panniculus carnoſus*, but miſtakenly. It has ſeveral veins and arteries. It inveſts the teſticles, and extending itſelf between them, ſeparates them from each other. It is placed between two cellular membranes, which communicate with each other. See SCROTUM.

DARU, in *Botany*, a name given by Avicenna and Serapion to a ſpecies of turpentine-tree, which the latter author calls the lentiſk. This grew up to a very large tree, and bore a much larger and more beautiful fruit than the common turpentine-tree.

DASYMMA, a ſuperficial inequality of the inner part of the eye-lids, accompanied with a redneſs. Blancard derives it from δασυς, *hirſutus*.

DASYPUS, in *Zoology*, belongs to the order of brutes and claſs of *mammalia* in the Linnæan ſyſtem. This genus has many grinding teeth, but no cutting nor canine teeth. The ſeveral varieties are diſtinguiſhed by the number of bands which encompaſs it, and reach from the back to the edges of the belly. Accordingly, Linnæus enumerates the ſingle-banded, the three-banded, the four, ſix, ſeven, and nine-banded *daſypus*. See farther under ARMADILLO.

DASYS, δασυς, denſe, thick, cloſe, rough, in Prorrhet. and Coac. is an epithet for a tongue condenſed, contracted, and exaſperated with heat and dryneſs, as it happens in phrenſies. James's Med. Dict.

DATA, in *Mathematics*, certain things, or quantities, ſuppoſed to be given, or known, in order, from them, to find out other things or quantities, which are unknown, or ſought for. A problem, or queſtion, generally conſiſts of two parts; *data* and *quæſita*.

Euclid has an expreſs treatiſe of *data*; wherein he uſes the word for ſuch ſpaces, lines, and angles, as are given in magnitude; or to which we can aſſign others equal.

From the primary uſe of the word *data* in mathematics, it has been tranſplanted into other arts; as philoſophy, medicine, &c. where it expreſſes any quantity, which, for the ſake of a preſent calculation, is taken for granted to be ſuch, without requiring an immediate proof for its certainty; called alſo the *given* quantity, number, or power. And hence alſo ſuch things as are known, from whence either in natural philoſophy, the animal mechaniſm, or the operation of medicines, we come to the knowlege of others unknown, are now frequently in phyſical writers called *data*.

DATE, an addition, or appendage, in writings; acts, inſtruments, letters, &c. expreſſing the day, and month of the year, when the act, or letter, was paſſed or ſigned; together with the place where the ſame was done.

The word is formed from the Latin *datum*, *given*, the

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participle of *do*, *I give*. The Latins uſually ſay *dabam*, *I gave*.

In writings of importance the *date* ſhould be written in words at length; *dated* or given at London this twenty-ſixth day of March, in the year of our Lord one thouſand ſeven hundred and fifty. In letters, the *date* is uſually in figures; London, March the 26th, 1750.

An *ante-date* is a falſe *date*, prior to the real time when the inſtrument was paſſed, or ſigned.

A *poſt-date*, is that poſterior to the real time, &c.

Our ancient deeds had no *dates*, but only the month and year, to ſigniſy that they were not made in haſte, or in the ſpace of a day, but upon longer and more mature deliberation. The king's grants began with theſe words, *Præſentibus & futuris, &c.* but the grants of private perſons with *Omnibus præſentes literas inſpecturis, &c.*

A deed is good, though it mentions no *date*, or hath a falſe *date*; or even if it hath an impoſſible *date*, as the 30th of February; provided the real day of its being *dated* or given, that is, delivered, can be proved. Blackſt. Com. vol. ii. p. 304.

DATE, *Dactylus*, the fruit of the palm-tree. See PALM-*tree*.

The word is formed of *dacte*, and that of *dactylus*, *finger*; as being round and oblong, reſembling a finger's end.

This fruit is gathered in autumn, before it is ripe; and bears a near reſemblance to our bullace; being of a green colour, and very ſharp and aſtringent. When ripe, it becomes ruddy, having a hard, longiſh ſtone, cloven at bottom, and encompaſſed with a thin white pellicle, or ſkin.

The huſk, or covering of the *date*, called by the ancients *elate*, or *ſpatha*, when the fruit is in its growth, is variable; having as many changes of colour as the fig has.

Some *dates* are black, ſome white, ſome brown; ſome again are round like apples, and very big. Ordinarily they are oblong, fleſhy, yellow, ſomewhat bigger than the thumb's end, and ſome are very agreeable to the taſte. Some are no bigger than a chich-pea, and others as big as a pomgranate. The beſt are thoſe called *royal dates*. There is alſo another ſort called *caryotæ*, which are very good. Some of them have ſtones, and others none.

Dates are principally uſed in medicine: their qualities are, to ſoften the aſperities of the gullet, to ſtrengthen the *fœtus* in the womb, to aſſuage all immoderate fluxes of the belly, and to eaſe diſorders of the reins and bladder. Their bad property is, that they digeſt difficultly, cauſe pains in the head, and produce a thick melancholic blood. Theſe effects ariſe from the principles they contain, which are, a moderate ſhare of oil, and a deal of phlegm, and eſſential ſalt. The oil and phlegm render them moiſtening and nutritious, good againſt acrimonies of the breaſt, to aſſuage coughs, &c. and the phlegm and ſalt render them deterſive and aſtringent, and good againſt diſeaſes of the throat. As for the reſt, they are a heavy food, full of earthy juice, and occaſion obſtructions in the *viſcera*; for which reaſon, people who eat great quantities of *dates* become ſcorbutic, and loſe their teeth betimes.

Our *dates* are brought us from Egypt, Syria, Africa, and the Indies. Among the Egyptians and Africans, they make a principal article of food. They never come to full maturity in Italy, or the moſt ſouthern parts of Spain; and yet there are tolerable *dates* in Provence; which do not keep, but breed worms. The beſt come from Tunis and Perſia.

DATE *plum*. See *Indian Date* PLUM.

DATISCA, in *Botany*. See *Baſtard* HEMP.

DATISI, in *Logic*, a mode of ſyllogiſms in the third figure, wherein the major is an univerſal affirmative, and the minor and concluſion are particular affirmative propoſitions. E. gr.

DA *All God's friends are kings.*
TI *Some of God's friends are poor.*
SI *Therefore, ſome poor are kings.*

DATIVE, in *Grammar*, the third caſe in the declenſion of nouns; expreſſing the ſtate, or relation, of a thing, to whoſe profit or loſs ſome other thing is referred.

It is called *dative*, becauſe uſually governed by a verb implying ſomething to be given to ſome perſon. As, *commodare Socrati, to lend to Socrates*; *utilis reipublicæ, uſeful to the commonwealth*; *perniciouſus eccleſiæ, pernicious to the church*; *viſum eſt Platoni, it ſeemed to Plato*, &c.

In Engliſh, where we have properly no CASES, this relation is expreſſed by the ſign *to*, or *for*.

DATURA, in *Botany*, a name given by many authors to the plant more uſually called *ſtramonium*, or the *thorn-apple*. See THORN-*apple*.

DAVACA *terræ*, a portion of land in Scotland ſo called; *& apud priſcos Scotos*, DAWACH of land, *quod continet quatuor aratra terræ, quorum unum quodque trahitur octo bobus*.

DAUCI *ſemen*, in the *Materia Medica*, the name of a ſeed uſed in many of the officinal preparations. The plant which produces it is a ſort of *myrrhis*, or chervil, called *daucus Creticus*, or candy carrot, by the old authors; but by the moderns, *myrrhis annua ſemine ſtriato, villoſo, imano*.

This ſeed being hairy, has very frequently little animalcules and duſt hanging to it; and this fault grows worſe, the longer it is kept, as the animals continue to eat the ſeed, and their excrements become mixed with it in large quantities. It ought therefore to be choſen new, plump and full, and very clean. See SPIGNEL.

It expels wind, and is good againſt colics, pains of the womb, and in hyſterical complaints.

DAUCUS. See CARROT.

DAUGHTERS, among the *Ancients*, were more frequently expoſed than ſons, as requiring greater charge to educate and ſettle them in the world. See EXPOSING *of Children*.

Thoſe who had no legitimate ſons were obliged, by the Athenian laws, to leave their eſtates to their daughters, who were confined to marry their neareſt relations, otherwiſe to forfeit their inheritance; as we find to have been practiſed likewiſe among the Jews, many of whoſe laws ſeem to have been tranſcribed by Solon.

If an heireſs happened to be married before her father's death, this did not hinder the neareſt relation to claim the inheritance, and even to take the woman from her huſband; which is ſaid to have been a common caſe. Potter, Archæol. Græc. lib. iv. c. 15. tom. ii. p. 441. See SON.

The *ſons* and *daughters* of the king of England are called the *ſons* and *daughters* of England; becauſe all the ſubjects of England have a ſpecial intereſt in them. See PRINCE.

DAVIDISTS, DAVIDICI, or DAVID GEORGIANS, a ſect of heretics, the adherents of David George, a native of Delft, who, in 1525, began to preach a new doctrine; publiſhing himſelf to be the true meſſiah; and that he was ſent thither to fill heaven, which was quite empty for want of people to deſerve it. He is likewiſe ſaid to have denied the exiſtence of angels, good and evil, of heaven and hell, and to have rejected the doctrine of a future judgment. He rejected marriage, with the Adamites; held, with Manes, that the ſoul was not defiled by ſin; and laughed at the ſelf-denial ſo much recommended by Jeſus Chriſt. Such were his principal errors. He made his eſcape from Delft, and retired firſt into Friſeland, and then to Baſil, where he changed his name, aſſuming that of John Bruck, and died in 1556.

He left ſome diſciples behind him, to whom he promiſed, that he would riſe again at the end of three years. Nor was he altogether a falſe prophet herein; for the magiſtrates of that city, being informed, at the three years end, of what he had taught, ordered him to be dug up, and burnt, together with his writings, by the common hangman.

There are ſtill ſome remains of this ridiculous ſect in Holſtein, Frieſland, and other countries; whoſe temper and conduct ſeem to diſcredit the exaggerated account which ſome writers have given of their founder. He was probably a deluded fanatic and myſtic.

DAVIS's *Quadrant*. See BACK-STAFF.

DAVIT, a piece of timber in a ſhip, having a notch at one end; in which, by a ſtrap, hangs a block, called the fiſh-block: the uſe of this is to hale up the fluke of the anchor, and to faſten it at the ſhip's bow or looſ. This *davit* may be ſhifted from one ſide of the ſhip to the other, as occaſion ſerves.

There is a ſmall *davit* in the ſhip's boat, which is ſet over her head with a ſheever, into which is brought the buoy-rope to weigh the anchor: it ſtands in the carlings in the boat's bow.

DAUPHIN, DOLPHIN, in *Aſtronomy*. See DELPHINUS.

DAUPHIN is a title given to the eldeſt ſon of France, and preſumptive heir of the crown; on account of the province of Dauphiné, which in 1343 was given to Philip de Valois, on this condition, by Humbert, *dauphin* of the Viennois.

The *dauphin*, in his letters patent, ſtyles himſelf, "By "the grace of God, eldeſt ſon of France, and *dauphin* of "Viennois."

DAUPHIN was anciently the title, or appellation, of the prince of Viennois in France.

Moſt authors, who have ſought the origin of the name *dauphin*, and *Dauphiné*, ſeem to have given too much looſe to conjecture. Du-Cheſne is of opinion, that it was the grandſon of Guy the Fat who firſt bore the name of *dauphin*. Chorier obſerves, that William, canon of Notre Dame at Grenoble, who has wrote the life of Margaret, daughter of Stephen, earl of Burgundy, married

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ried with Guy, ſon of Guy the Fat, calls the latter ſimply Guy the Old, and the former always count *Dauphin*; and adds, that no record, no monument, ever attributes the title of *dauphin* to Guy the Fat, or any of his predeceſſors: ſo that it muſt neceſſarily have taken its riſe in his ſon, all whoſe ſucceſſors ſo conſtantly aſſumed it, that it became the proper name of the family. He died in 1142, in the flower of his youth; ſo that it muſt be about the year 1120, that the title commenced; and without doubt, adds he, on ſome illuſtrious occaſion. He obſerves farther, that this prince was of a military diſpoſition, and delighted in nothing but war; and again, that it was the cuſtom of the cavaliers to deck their caſks, coats of arms, and the houſing of their horſes, with ſome figure, or device, peculiar to themſelves, whereby they were diſtinguiſhed from all others engaged in the ſame combat or tournament. From all theſe circumſtances he conjectures, that this Guy choſe the *dolphin* for his ſignature; that this was the creſt of his helmet; and that he bore it on his coat in ſome notable tournament, or battle, wherein he diſtinguiſhed himſelf. And this, Chorier makes no doubt, is the real origin of the appellation. Nothing was more common, in thoſe times, than to make proper names become the names of families, or dignities. Witneſs the Ademars, Arthauds, Aynards, Atlemans, Berengers, and infinite others; who all owe their names to ſome one of their anceſtors, from whom it has been tranſmitted throughout the family.

The ſeigneurs, or lords, of Auvergne, have likewiſe borne the appellation of *dauphin*; but the *dauphins* of Auvergne had it not till a good while after thoſe of the Viennois, and even received it from them. The manner was this: Guy VIII. *dauphin* of Viennois, had by his wife Margaret, daughter of Stephen, earl of Burgundy, a ſon and two daughters. The ſon was Guy IX. his ſucceſſor. Beatrix, one of the daughters, was married to the count d'Auvergne, who, according to Blondel, was William V. or rather, as Chorier and others hold, Robert VI. father of William V. This prince loſt the greateſt part of the county Auvergne, which was taken from him by his uncle William, aſſiſted by Louis the Young; and was only left maſter of the little canton whereof Vodable is the capital. He had a ſon whom he called *Dauphin*, on account of Guy, or Guigues, his uncle by the mother's ſide. From his time his ſucceſſors, holding the ſame petty canton of Auvergne, ſtyled themſelves *dauphins* of Auvergne, and bore a *dolphin* for their arms.

DAUPHIN, in *Conchyliology*, the name of a ſpecies of ſhell-fiſh. It is one of the round-mouthed ſnails, or *cochlæ lunares*; and is ornamented with rows of indented eminences, on all the turns of the ſhell.

DAUPHINS, or DELPHINS, in *Literary Hiſtory*, a name given to the commentators on the ancient Latin authors, who were employed by order of Louis XIV. of France, for the benefit of the prince, under the care and direction of M. de Montauſier his governor, Boſſuet and Huet his preceptors. They were thirty-nine in number.

DAWEL-*coronde*, in the language of the Ceyloneſe, drum-cinnamon. This is called in Low Dutch, *trommel caneel*. The reaſon of the name is, that the wood of the tree which affords this ſpecies, when dried, is light and tough, and is uſed to make drums of. The bark is taken off while the tree is growing, and is of a pale colour. It is a very bad kind of cinnamon, and is very rarely ſold as ſuch; but the natives uſe it in medicine.

DAY, a diviſion of time, deduced from the appearance and diſappearance of the ſun.

The *day* is of two kinds; *artificial*, and *natural*.

DAY, *artificial*, which ſeems to be that primarily meant by the word *day*, is the time of light; determined by the ſun's riſing and ſetting.

This is properly defined, the ſtay of the ſun above the horizon: in oppoſition to which, the time of darkneſs, or the ſun's ſtay below the horizon, from ſetting to riſing again, is called *night*.

DAY, *natural*, is the ſpace of time wherein the ſun performs one revolution round the earth; or, more juſtly, the time wherein the earth makes a rotation on its axis; which the Greeks more properly expreſs by νυχθημερον, *nychthemeron*, q. d. *night-day*. This is either *aſtronomical* or *civil*. The *aſtronomical day* begins at noon, when the ſun's center is on the meridian, and is reckoned twenty-four hours to the following noon.

The epocha, or beginning of the *civil day*, is the term from which one *day* begins, and in which the preceding *day* concludes. The fixing of this term is of ſome importance. It is certain, that, for the more commodious diſtinguiſhing of *days*, it ought to be fixed in ſome moment of time wherein the ſun is in ſome diſtinguiſhable part of the heavens. The moſt eligible, therefore, ſhould be the moments wherein the ſun paſſes either the horizon, or the meridian. In effect, as there is no moment can be more accurately determined by obſervation, than that in which the ſun paſſes through the upper meridian; if regard be had to the exactneſs of the meaſure, the noon-tide has the beſt pretenſions; the riſing and ſetting of the ſun being diſturbed by the refractions; beſide that, the horizon is ſeldom clear of clouds. But yet, as the *artificial day* does begin with the ſun's riſe, and ends with the ſetting; and, beſides, the ſun's paſſing the horizon is a thing eaſily obſerved; the riſing or ſetting of the ſun ſhould appear the moſt commodious, though not moſt accurate, epoch or beginning of the *civil day*.

As, then, there are not wanting reaſons for beginning the *natural day*, both from the ſun's paſſing the meridian, and the eaſtern and weſtern ſide of the horizon; it is no wonder, that different nations ſhould begin their *day* differently.

Accordingly, 1ſt, The ancient Babylonians, Perſians, Syrians, and moſt other eaſtern nations, with the preſent inhabitants of the Baleario iſlands, the Greeks, &c. begin their *day* with the ſun's riſing. 2dly, The ancient Athenians and Jews, with the Auſtrians, Bohemians, Marcomanni, Sileſians, modern Italians, and Chineſe, reckon it from the ſun's ſetting. 3dly, The ancient Umbri and Arabians, with the modern aſtronomers, at noon. And, 4thly, The Egyptians and Romans, with the modern Engliſh, French, Dutch, Germans, Spaniards, and Portugueſe, at midnight.

The *day* is divided into hours; and the week, month, &c. into *days*. For the origin of the Engliſh names of the *days* of the week, ſee WEEK.

As to the different length of the *day* in different climates, it has been a matter of ſome controverſy among aſtronomers, whether or no the *natural days* be all equally long throughout the year; and, if not, what is their difference? A profeſſor of mathematics at Seville, in a memoir in the Philoſophical Tranſactions, aſſerts, from a continued ſeries of obſervations for three years, that they are all equal. Mr. Flamſtead, in the ſame Tranſactions, refutes the opinion; and ſhews, that one *day*, when the ſun is in the equinoctial, is ſhorter than when he is in the tropics, by forty ſeconds; and that fourteen tropical *days* are longer than ſo many equinoctial ones, by one ſixth of an hour, or ten minutes. This inequality of the *days*, flows from two ſeveral principles: the one, the eccentricity of the earth's orbit; the other, the obliquity of the ecliptic with regard to the equator, which is the meaſure of time. As theſe two cauſes happen to be combined, the length of the *day* is varied. See EQUATION *of time*.

DAY, in *Law*, is frequently uſed for the *day* of appearance in court, either originally, or upon aſſignation.

We ſay, He had a *day* by the rolls; i. e. he had a *day* of appearance aſſigned him.

If a fact be done in the night, you muſt ſay in law proceedings, *in nocte ejuſdem diei*.

There are ſeveral return *days* in the terms; and if either of them happen upon a Sunday, the day following is taken inſtead of it; for Sunday is *dies non juridicus*: and ſo is Aſcenſion *day* in Eaſter term, St. John the Baptiſt in Trinity term, All Saints and All Souls in Michaelmas term, and the Purification of the Virgin Mary in Hilary term. 2 Inſt. 264.

DAY-*coal*, in *Natural Hiſtory*, a name given by the miners of England, and the common people who live in coal countries, to that ſeam or ſtratum of the coal which lies uppermoſt in the earth. The ſame vein or ſtratum of coal uſually runs a great way through the country, and dips and riſes in the earth in different places; ſo that this upper ſtratum, or *day-coal*, is in the various parts of the ſame ſtratum, ſometimes near the ſurface, and ſometimes at many fathoms deep. The ſubterranean fires found in ſome of our coal countries principally feed on this coal, and are nearer, or farther from the ſurface, as it riſes or ſinks. Phil. Tranſ. N° 130.

DAY-*light*, in *Law*. In reſpect to *day-light*, before ſun-riſing, and after ſun-ſetting, is accounted part of the *day* by common law; as to robberies committed in the *day*-time, when the hundred is liable. 7 Rep. 6.

The law regularly rejects all fractions and diviſions of a *day*, for the uncertainty. 5 Rep. 1. 1 Inſt. 135.

DAY-*lily*, in *Botany*. See LILY.

DAY's *work*, in *Sea Language*, denotes the reckoning or account of the ſhip's courſe, during twenty-four hours, or between noon and noon, according to the rules of trigonometry. See DEAD-*reckoning*.

DAYS *in bank*, are *days* ſet down by ſtatute, or order of the court, when writs ſhall be returned, or when the party ſhall appear on the writ ſerved.

To be diſmiſſed *without day*, *ſine die*, is to be finally diſcharged the court.

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DAYS *of prefixion*, in the *Exchequer*. See REMEMBRANCER.

DAYS *of grace*, in *Commerce*, are a number of days allowed by cuſtom for the payment of a bill of exchange, after the ſame becomes due; i. e. after the time it was accepted for is expired.

In England, three *days of grace* are allowed: ſo that a bill accepted, in order to be paid, e. gr. ten *days* after ſight, is not to be paid till thirteen *days*. Throughout France, they allow ten *days of grace*; as many at Dantzic; eight at Naples; ſix at Venice, Amſterdam, Rotterdam, and Antwerp; four at Francfort; five at Leipſic; twelve at Hamburgh; ſix in Portugal; fourteen in Spain; thirty in Genoa, &c. Note, Sundays and holidays are included in the number of *days of grace*.

DAYS-*man* is uſed in ſome parts of England for an arbitrator or judge: and it has been obſerved that the word *day* ſignifies judgment.

DAYS, *Faſt*. See ABSTINENCE.

DAYS, *Dog*, *Dies caniculares*. See CANICULAR.

DAYS, *Critical*, *Dies critici*. See CRITICAL *days*.

DAYS, *Intercalary*, or *additional*. See INTERCALARY *days*.

D'AYENA, in *Botany*, *monier*. Its characters are theſe: the flowers ariſe from the wings of the ſtalk; they have a five-leaved empalement, and five heart-ſhaped petals. It hath five ſtamina inſerted in a ſhort nectarium; and a five-cornered germen, ſituated at the bottom of the nectarium, which afterward becomes a roundiſh five-cornered capſule having five cells, each having one kidney-ſhaped ſeed. There is but one ſpecies known, a native of Peru; which is named from M. Le Duc D'Ayena, a great lover of botany, and who has a noble garden at St. Germains.

DAZE, in *Natural Hiſtory*, a name given by our miners to a ſort of glittering ſtone, which often occurs in their works; and, as it is an unprofitable ſubſtance, is one of thoſe things which they call weeds. The word *daze* takes in, with them, every ſtone that is hard and glittering; and therefore it comprehends the whole genus of the *telaugia*, or ſtony nodules, which have flakes of talc in their ſubſtance: theſe, according to the colour of the ſtony matter they are bedded in, and their own colour, give the names of *black daze*, *white*, *red*, and *yellow daze* to theſe ſtones.

Theſe *dazes* are generally of the poorer part of the vein. The ſhoad-ſtones are many of them of this nature, and the ends of the veins degenerate again into them. Phil. Tranſ. N° 69.

DEACON, *Diaconus*, a perſon in the loweſt degree of holy orders, whoſe buſineſs is to baptize, read in the church, and aſſiſt at the celebration of the euchariſt.

The word is formed from the Latin *diaconus*; of the Greek διακονος, *miniſter*, *ſervant*.

Deacons were firſt inſtituted, ſeven in number, by the apoſtles, Acts, chap. vi. which number was retained a long time in ſeveral churches. Grotius apprehends that the order of *deacons* in the Chriſtian church correſponded to that of *eleemoſynaries* in the Jewiſh ſynagogue. Their office was, to ſerve in the agapæ, and to diſtribute the bread and wine to the communicants, and diſpenſe the alms. Tertullian informs us, that the deacons preached, and, in the abſence of the biſhop and preſbyters, conferred the ſacrament of baptiſm. De Bapt. p. 602.

By the ancient canons, marriage was not incompatible with the ſtate and miniſtry of a *deacon*; but it is now a long time that the Romiſh church has prohibited their marrying; and the pope only grants them diſpenſations for very important cauſes; and, after this diſpenſation, they loſe the rank and functions of their order, and return to a lay ſtate.

At Rome, under pope Sylveſter, they had only one *deacon*; then ſeven were appointed; then fourteen; and, at laſt, eighteen; who were called *cardinal deacons*, to diſtinguiſh them from thoſe of other churches.

Their office was, to take care of the temporalities of the church, to look to the rents and charities, and provide for the neceſſities of the eccleſiaſtics, and even of the pope. The collecting of the rents, alms, &c. belonged to the *ſubdeacons*; the *deacons* were the depoſitaries and diſtributers. Having thus the management of the revenues of the church in their hands, their authority grew apace, as the riches of the church increaſed. Thoſe of Rome, as being miniſters of the firſt church, preceded all others, and even at length took place of the prieſts themſelves. Doubtleſs, it was the avarice of the prieſts that made them give place to the *deacons*, who had the diſpoſal of the money.

The *deacons* rehearſed certain prayers at the holy office, which were thence denominated *diaconical*.

They took care that the people at church behaved themſelves with due modeſty and reſpect. They were not allowed to teach publicly; at leaſt not in the preſence of a biſhop or prieſt. They only inſtructed the catechumens, and prepared them for baptiſm. The doors of the church were likewiſe in their cuſtody; though, in after-times, that charge was committed to the *ſubdeacons*.

The office of a *deacon*, in the church of England, according to the form of ordination, is to baptize, preach, and aſſiſt in the adminiſtration of the Lord's ſupper; and, in ſhort, to perform all the other offices in the liturgy, which a prieſt can do, except that of conſecrating the elements of the Lord's ſupper, and pronouncing the abſolution. No perſon can be ordained a *deacon* under the age of twenty-three years, unleſs by a faculty or diſpenſation obtained from the archbiſhop of Canterbury: and in order to this, he muſt be provided with a title to a cure, or be a fellow or chaplain in ſome college in Cambridge or Oxford, or a maſter of arts of five years ſtanding, living at his own charge in either of the univerſities, or be admitted by the biſhop who ordains him to ſome benefice or curacy then void. Otherwiſe the ordaining biſhop ſhall maintain him, till he is preferred to ſome eccleſiaſtical living. And by ſtat. 13 and 14 Car. II. c. 4. no perſon is capable of being admitted to any benefice or eccleſiaſtical promotion, till he be ordained a prieſt; nor is a *deacon* capable of a DONATIVE, but is only allowed to uſe his orders as a chaplain to ſome family, a curate to ſome prieſt, or a lecturer without a title.

DEACONESS, *Diaconiſſa*, an office in uſe in the primitive church, though now laid aſide. St. Paul makes mention thereof in his Epiſtle to the Romans: and the younger Pliny, in a letter to Trajan, tells that prince, that he had ordered two *deaconeſſes*, whom he calls *miniſtræ*, to be tortured.

Deaconeſs was a title given to certain devout women, who conſecrated themſelves to the ſervice of the church, and rendered thoſe offices to the women, which men could not decently do: as in baptiſm, for inſtance, which was conferred, by immerſion, on women as well as men.

They were likewiſe to look to the doors on the ſide the women were on, who were ſeparated from the men, according to the cuſtom of thoſe times. They had the care and inſpection of the poor, ſick, &c. And in times of perſecution, when a *deacon* could not be ſent to the women, to exhort and fortify them, a *deaconeſs* was ſent. See Balſamon on the eleventh canon of the council of Laodicea; and the Apoſtolical Conſtitutions, lib. ii. cap. 57. To ſay nothing of the epiſtle of Ignatius to the people of Antioch; where, what is ſaid of *deaconeſſes*, is ſuppoſed to be an interpolation.

The council of Nice ranks *deaconeſſes* among the clergy: though ſome hold, that their ordination was not ſacramental, but a mere eccleſiaſtical ceremony. However, it gave them a pre-eminence above the reſt of their ſex; for which reaſon the council of Laodicea forbad the ordaining of any more for the future. The office of *deaconeſſes* expired in the Weſtern church about the twelfth century, and in the Eaſtern about the thirteenth.

Atto of Verceil, in his eighth letter, gives the reaſon of their being aboliſhed: he obſerves, that in the firſt ages the miniſtry of women was neceſſary, in order to the more eaſy inſtructing of other women, and recovering them from paganiſm; and that they likewiſe ſerved for the more decent adminiſtration of baptiſm to the ſame: but that it was not then neceſſary, becauſe none but children were baptized; and it might now be added, becauſe baptiſm is only conferred by ſprinkling.

The number of *deaconeſſes* does not ſeem to have been fixed: the emperor Heraclius, in his letter to Sergius patriarch of Conſtantinople, orders that in the great church of Conſtantinople there be forty *deaconeſſes*; whereas there were only ſix in that of the Mother of God, in the quarter of the Blachernæ.

DEACONRY, *Diaconate*, the order or miniſtry of a *deacon*, or *deaconeſs*. See DEACON, and DEACONESS.

DEACONRY, *Diaconia*, is alſo a name ſtill reſerved to the chapels and oratories in Rome, under the direction of the ſeveral deacons, in their reſpective regions or quarters.

To the *deaconries* were annexed a ſort of hoſpitals, or boards for the diſtribution of alms, governed by the regionary deacons, called cardinal deacons, of whom there were ſeven, anſwering to the ſeven regions, their chief being called the arch-deacon.

The hoſpital adjoining to the church of the *deaconry*, had an adminiſtrator for the temporal concerns, called the *father of the deaconry*, who was ſometimes a prieſt, and ſometimes a layman.

At preſent there are fourteen of theſe *deaconries* or hoſpitals at Rome, which are reſerved to the cardinals. Du-Cange gives us their names: as the *deaconry* of St. Maria in the Broad-way, the *deaconry* of St. Euſtachio near the Pantheon, &c.

DEAD-

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DEAD-*beat*, in *Horology*, is a general term for a particular conſtruction of pallets; firſt applied by Mr. Graham to clocks, to prevent the retrograde motion of the wheels, and to remedy the imperfections ariſing from the recoil of the common pallets. The principle of this eſcapement is the ſame as the horizontal wheel in watches, and what the French call *echapement à repos*. See PALLET.

DEAD-*lights*, are wooden ports made to faſten in the cabin windows, to prevent the waves from breaking into the ſhip in a high ſea.

DEAD-*men's eyes*, in a ſhip, are a kind of blocks, having many holes in them, but no ſheevers; and through them the lanniers or laniards go, which make faſt the ſhrouds to the chains. Sometimes the main-ſtays of a ſhip are ſet taught in *dead-men's eyes*; but moſt great ſhips uſe double blocks. The crowfeet reeve through the *dead-men's eyes*.

DEAD-*nettle*, ſtinking or yellow. See NETTLE.

DEAD-*nettles*, in *Botany*. See ARCHANGEL.

DEAD-*pledge*. See MORTGAGE.

DEAD-*reckoning*, at ſea, is that eſtimation, judgment, or conjecture, which the ſeamen make of the place where a ſhip is, by keeping an account of her way by the log, by knowing the courſe they have ſteered by the compaſs, and by rectifying all, with allowance for drift, lee-way, &c. according to the ſhip's trim: ſo that this reckoning is without any obſervation of the ſun, moon, or ſtars, and is to be rectified as often as any good obſervation can be had. See LOG.

DEAD-*riſing*, a term in a ſhip for that part of her bottom, through her whole length, where the floor timber is terminated upon the lower futtock.

DEAD-*ropes*, in a ſhip, are ſuch as are not running, i. e. which do not run in any block.

DEAD-*tops*, a diſeaſe incident to young trees; and cured by cutting off the dead parts, cloſe to the next good twig or ſhoot, and claying them over as in grafting.

DEAD-*water*, is the eddy water juſt behind the ſtern of a ſhip. It is ſo called, becauſe it does not paſs away ſo ſwiftly, as the water running by her ſides doth.

If a ſhip have a great eddy following her ſtern, they ſay, ſhe makes much *dead-water*.

DEAD-*wood*, in *Naval Architecture*, a name given by ſhipwrights to certain blocks of timber laid upon the keel, particularly at the extremities afore and abaft, where theſe pieces are placed upon one another to a conſiderable height, becauſe the ſhip is there ſo narrow, as not to admit of the two half-timbers, which are therefore ſcored into the *dead-wood*, where the angle of the floor timbers greatly diminiſhes, as approaching the ſtern and ſtern-poſt. The *dead-wood* afore and abaft is equal in depth to two thirds of the depth of the keel, and as broad as it can be, without exceeding the breadth of the keel.

DEAD-*work*, denotes all that part of a ſhip, which is above water when ſhe is laden.

DEADLY *carrot*. See THAPSIA.

DEADLY *feud*, in our *Law Books*, a profeſſion of irreconcilable enmity till a perſon is revenged by the death of his enemy.

The word *feud* is derived from the German *fehd*, which, as Hottoman obſerves, ſignifies, *modo bellum*, *modo capitales inimicitias*. See FEUD.

Such enmity and revenge was allowed by our ancient laws in the time of the Saxons; viz. If any man was killed, and a pecuniary ſatisfaction were not made to the kindred, it was lawful for them to take up arms, and revenge themſelves on the murderer; which was called *deadly feud*. And this, probably, was the original of an appeal.

DEADLY *nightſhade*, in *Botany*. See NIGHTSHADE.

DEADS, in *Mining*, is uſed to expreſs that part of the ſhelf or faſt ground which contains no ore; but which encloſes the vein or bed of the ore, like a wall on every ſide. The drifts which they ſink for the tin ore in Cornwall, are generally about three feet over, and about ſeven feet high; ſo that a man may conveniently ſtand upright at work, and manage his tools. In caſe the vein itſelf is not broad enough to allow this, as in many places it is not half a foot over, then they pick down the ſtrata that encloſe it, ſo as to make an opening of the ſame breadth. This work they call *breaking up the deads*. Phil. Tranſ. N° 69.

This word is alſo uſed for ſuch parcels of common looſe mould or earth, lying above the ſhelf, as uſually contain the *ſhoad*, which they find when they are training a load.

In the Mendip lead-mines, when a vein of ore breaks off abruptly in an earth, they call it a *deading-bed*; and earth without ore, they call *dead earth*.

DEAFFORESTED, in our *Law Books*, the being diſcharged from being foreſt; or freed and exempted from foreſt-laws. See FOREST.

Johannes Dei gratia, &c. archiepiſcopis, epiſcopis, &c. ſciatis nos omnino deafforeſtaſſe *foreſtam de Brewood de omnibus, quæ ad foreſtam et foreſtarios pertinent. Quare volumus et firmiter præcipimus, quod prædicta foreſta, et homines in illa manentes, et hæredes eorum ſint* deafforeſtati *in perpetuum.*

DEAFNESS, the ſtate of a perſon who wants the ſenſe of hearing: or a diſeaſe of the ear, which prevents its due reception of ſounds.

Deafneſs generally ariſes either from an obſtruction, or a compreſſion, of the auditory nerve; or from ſome collection of matter in the cavities of the inner ear; or elſe from the auditory paſſage being ſtopped up by ſome hardened excrement; or, laſtly, from ſome excreſcence, as a ſwelling of the glands, or ſome foreign body introduced within it.

As to the prognoſtics, thoſe who are born *deaf* are rarely cured; a real *deafneſs* is hard to remedy; a *deafneſs* in acute diſeaſes, with crude urine, foretels a delirium: but when the ſigns of coction are good, it portends a critical hæmorrhage. With regard to the cure, if the obſtruction be in the external cavity of the ear, it is diſcernible by the ſight. If there is occaſion to ſyringe the ear, a decoction of ſage and roſemary flowers will be proper, with equal parts of water and white wine: but great caution is to be uſed. Some pump the head with warm Bath waters: ſome ſay the eggs of ants bruiſed, and put into the ear, with the juice of an onion, cures the moſt inveterate *deafneſs*: others affirm that a ſalivation will ſometimes perform a cure. A critical *deafneſs* will ceaſe of itſelf. Etmuller recommends amber and muſk; and hardneſs of hearing has been often cured by putting a grain or two of muſk into the ear with cotton. Hoffman ſays *deafneſs* ſometimes ariſes from a ſlackneſs of the auditory nerves, which often happens from too great humidity, which if neglected will terminate in perpetual and incurable *deafneſs*: but may be diſperſed if taken in time, by proper cephalics and ſudorifics. Some for this purpoſe recommend equal parts of ſpirit of lavender and Hungary water, which ſhould be dropped warm into the ear. Lindanus adviſes the gall of an eel, mixed with ſpirit of wine; and others the fumes of ſulphur, conveyed into the ear with a pipe or funnel: but regard muſt always be had to the cauſe, if diſcoverable. Heiſter informs us, that medicinal waters drank in the ſummer-time freely, are the beſt means as preſervatives, and for curing diſorders in the ears; and that they often perform more than any other remedy whatever.

Deafneſs ariſing from cold of the head may be cured by keeping the head warm, eſpecially at night; by taking gentle purges, keeping the feet warm, and bathing them frequently in luke-warm water at bed-time.

Thoſe born *deaf* are alſo dumb, as not being able to learn any language, at leaſt in the common way. However, as the eyes, in ſome meaſure, ſerve them for ears, they may underſtand what is ſaid by obſerving the motion of the lips, tongue, &c. of the ſpeaker; and even accuſtom themſelves to move their own, as they ſee other people do; and by this means learn to ſpeak.

Thus it was that Dr. Wallis taught two young gentlemen, born *deaf*, to know what was ſaid to them, and to return pertinent anſwers. Digby gives us another inſtance of the ſame, within his own knowlege. And there was a Swiſs phyſician formerly living at Amſterdam, one Joh. Conrad Amman, who effected the ſame in ſeveral children born *deaf*, with ſurpriſing ſucceſs. He has reduced his ſcheme to a fixed art, or method, which he has publiſhed in his Surdens Loquens, Amſtelod. 1692. and De Loquela, ibid. 1700.

In the Philoſoph. Tranſact. N° 312. we have an account by Mr. Waller, R. S. Sec. of a man and his ſiſter, each about fifty years old, born in the ſame town with Mr. Waller, who had neither of them the leaſt ſenſe of hearing; yet both of them knew, by the motion of the lips only, whatever was ſaid to them, and would anſwer pertinently to the queſtion propoſed. It ſeems they could both hear and ſpeak when children, but loſt their ſenſe afterwards; whence they retained their ſpeech, which, though uncouth, was yet intelligible.

Such another inſtance is that of Mr. Goddy's daughter, miniſter of St. Gervais in Geneva, related by biſhop Burnet. At two years old they perceived ſhe had in great part loſt her hearing; and ever after, though ſhe heard great noiſes, yet ſhe could hear nothing of what was ſaid to her. But by obſerving the motions of the mouths and lips of others, ſhe had acquired ſo many words, that out of theſe ſhe had formed a ſort of jargon, in which ſhe could hold converſation whole days with thoſe that could ſpeak her language. She knew nothing that was ſaid to her, unleſs ſhe ſaw the motion of their mouths that ſpoke to her; ſo that, in the night, they were obliged to light candles to ſpeak to her. One thing will appear the ſtrangeſt part of the whole narra-

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tion: ſhe had a ſiſter, with whom ſhe had practiſed her language more than with any body elſe; and in the night, by laying her hand on her ſiſter's mouth, ſhe could perceive by that what ſhe ſaid, and ſo could diſcourſe with her in the dark. Burn. Let. iv. p. 248.

It is obſervable that *deaf* perſons, and ſeveral others thick of hearing, hear better and more eaſily, if a loud noiſe be raiſed at the time when you ſpeak to them; which is owing, no doubt, to the greater tenſion of the ear-drum, on that occaſion. Dr. Willis mentions a *deaf* woman, who, if a drum were beat in the room, could hear any thing very clearly; ſo that her huſband hired a drummer for a ſervant, that by his means he might hold converſation with his wife. The ſame author mentions another, who, living near a ſteeple, could always hear very well, if there was a ringing of three or four bells; but never elſe.

Dr. Buchner relates an extraordinary method of making *deaf* perſons to hear, by applying thin ſlips of wood, about ſix feet long, an inch broad, and as thick as the back of a knife, at one end to the upper teeth of the ſpeaker, and at the other to the upper teeth of the *deaf* perſon. Many trials were made to aſcertain the fact, and the voice was found perceptible and diſtinct. This method, he obſerves, may be adapted to all perſons afflicted with *deafneſs*, provided the auditory nerves are not injured or deſtroyed at their origin. See Buchner's Eaſy and practicable Method to enable deaf Perſons to hear, tranſlated from the German, 1770.

DEAL, a well-known kind of wood, of great uſe.

A very good method of ſeaſoning planks of *deal* and fir, is to throw them into ſalt-water as ſoon as they are ſawed, and keep them there three or four days, frequently turning them. In this caſe they will be rendered much harder, by drying afterwards in the air and ſun; but neither this nor any other means yet known, will preſerve them from ſhrinking.

Deals called Bulgendorp *deals*, the hundred containing ſix ſcore, pay on importation 3*l.* 8*s.* $8\frac{40}{100}$*d.* and drawback 3*l.* 3*s.* the rate 12*l.* Meabro *deals*, ſix ſcore, pay 1*l.* 2*s.* $10\frac{80}{100}$*d.* and drawback 1*l.* 1*s.* the rate 4*l.* Norway *deals*, ſix ſcore, pay 1*l.* 8*s.* $7\frac{1}{2}$*d.* and drawback 1*l.* 6*s.* 3*d.* the rate 5*l.* Spruce deals, ſix ſcore, pay 4*l.* 5*s.* $10\frac{1}{2}$*d.* and drawback 3*l.* 18*s.* 9*d.* the rate 15*l.* *Deals* from Ruſſia, and all other countries not particularly rated, exceeding twenty feet in length, pay 4*l.* 5*s.* $10\frac{1}{2}$*d.* and drawback 3*l.* 18*s.* 9*d.* the rate 15*l.* *Deals* from Sweden or any other country, of twenty feet in length or under, not otherwiſe rated, the hundred and twenty, pay 1*l.* 8*s.* $7\frac{1}{2}$*d.* and drawback 1*l.* 6*s.* 3*d.* the rate 5*l.*

Rods of *deal* expand laterally, or croſs the grain, in moiſt weather, and contract again in dry; and thence have been found to make an uſeful hygrometer. Phil. Tranſ. N° 480. p. 184. See HYGROMETER.

DEAN, a prime dignitary in moſt cathedral and collegiate churches; being uſually the preſident of the chapter.

He is called *dean*, *decanus*, of the Greek δεκα, *ten*, as being ſuppoſed to preſide over ten canons or prebendaries, at leaſt.

Canoniſts diſtinguiſh betweeen *deans* of cathedral, and thoſe of collegiate churches. The firſt, with their chapter, are regularly ſubject to the juriſdiction of the biſhop. As to *deans* of collegiate churches, they have uſually the contentious juriſdiction in themſelves, that is, they exerciſe juriſdiction over their canons in all civil, or criminal matters; though ſometimes this belongs to them in common with the chapter.

In England, as there are two foundations of cathedral and collegiate churches, the old and the new (the latter being thoſe founded by Henry the Eighth on the ſuppreſſion of the abbots and priors, when their convents were turned into *dean* and chapter); ſo there are two ways of creating the *deans*. Thoſe of the old foundation, as the *deans* of St. Paul's, York, &c. are raiſed to their dignity much like a biſhop; the prince firſt ſending out his conge d'eſlire to the chapter; the chapter then chooſing, the king yielding his royal aſſent, and the biſhop confirming him, and giving his mandate to inſtal him. Thoſe of the new foundation, as the *deans* of Canterbury, Durham, Ely, Norwich, Wincheſter, &c. are donative, and are inſtalled by a ſhorter courſe; only by the king's letters patent, without either election or confirmation. There are ſome cathedral churches, which never had a *dean*; as that of St. David and Landaff, where the biſhop is the head of the chapter, and in his abſence the archdeacon.

Conſtantine, we are told, erected an office of nine hundred and fifty perſons at Conſtantinople, taken out of divers trades and profeſſions, whom he exempted from all impoſitions, and beſtowed them on the cathedral church, to render the offices of burial *gratis* to the deſtitute, particularly to the poor. Theſe he called *decani*, and *lecticarii*, probably becauſe they were divided by tens; each whereof had a bier, or litter, to carry the bodies in. It is ſuppoſed to be theſe, who, under Conſtantius, began to be called *copiatæ*; i. e. clerks deſtined for labour; for they are uſually ranked among the clerks, and even before the chantors. By a law of the year 357, it appears, that there were ſome of theſe *copiatæ* at Rome.

DEAN is alſo a title applied among us to divers perſons that are the chief of ſome peculiar churches, or chapels: as, the *dean* of the King's chapel, who has no juriſdiction; of the ARCHES; of Battel, founded by William I. who hath juriſdiction within the liberty of Battel, is preſentable by the duke of Montagu, and inſtituted and inducted by the biſhop of Chicheſter, but not ſubject to his viſitation; of Bocking, who hath a court and juriſdiction to hold plea of all eccleſiaſtical matters ariſing in ſeveral pariſhes within his peculiar, and is conſtituted by commiſſion from the archbiſhop of Canterbury, like the *dean* of Arches. There are alſo *deputy deans* and *commendatory deans*, who cannot confirm any grants, &c.

DEAN, *Rural*, or *Urban* DEAN, was formerly an eccleſiaſtical perſon, who had a diſtrict of ten churches, or pariſhes, either in the country or city, within which he exerciſed juriſdiction. Theſe *rural deans* were ſometimes called *archipreſbyteri*; and at firſt they were, both in order and authority, above the archdeacons. They were at firſt elected by the clergy, and by their votes depoſed; but afterwards they were appointed, and removed, at the diſcretion of the biſhop; and hence they were called *decani temporarii*, to diſtinguiſh them from the cathedral *deans*, who were called *decani perpetui*. They ſeem to have been deputies of the biſhop, ſtationed round his dioceſe, the better to inſpect the conduct of the parochial clergy, and therefore armed with an inferior degree of judicial and coercive authority.

We meet with *rural deans* as early as the ninth century. Hincmar, in a capitular to his archdeacons, reſerves the right of electing them to himſelf; and only allows it to the archdeacons, in caſe he be abſent, and by proviſion only. Some take the *rural deans* to hold the rank and place of the *chorepiſcopi*. Be this as it will, it is certain, they are very ancient in France, Germany, and England; though, till the end of the ſixteenth century, they were unknown in Italy; becauſe the biſhopricks being there exceeding ſmall, they were not needed. St. Charles Borromeo is ſaid to have firſt introduced them there. Their office is now wholly extinguiſhed in England, the authority which they had being executed by the archdeacons and chancellors of biſhops.

DEAN, in the ancient monaſteries, was a ſuperior eſtabliſhed under the abbot, to eaſe him in taking care of ten monks; whence he was called *decanus*, in imitation of thoſe officers called by the ſame name among the Romans, who had ten ſoldiers under them.

The monaſteries being now leſs populous than they were in ancient times, the abbot, or prior, does not ſtand in ſo much need of being eaſed; ſo that theſe *deans* are, in general, ſet aſide.

DEAN *and Chapter*. Anciently, biſhops did not ordinarily tranſact matters of moment *ſine conſilio preſbyterorum principalium*, who were then called *ſenatores eccleſiæ*, and colleagues of the biſhops; repreſented, in ſome meaſure, by our chapters of cathedrals, wherein the *dean* and ſome of the prebends are, upon the biſhop's ſummons, to aſſiſt him in ordinations, deprivations, condemnations, excommunications, and other weighty concerns of the church. See CHAPTER.

DEARTICULATION, in *Anatomy*. See DIARTHROSIS.

DEATH, *Mors*, is generally conſidered as the ſeparation of the ſoul from the body; in which ſenſe it ſtands oppoſed to life, which conſiſts in the union thereof.

Phyſicians have uſually defined *death* by a total ſtoppage of the circulation of the blood; and a ceſſation of the animal and vital functions conſequent thereon; as reſpiration, ſenſation, &c.

An animal body, by the actions inſeparable from life, undergoes a continual change: in time, its ſmalleſt fibres become rigid; its minute veſſels grow into ſolid fibres no longer pervious to the fluids; its greater veſſels grow hard and narrow; and every thing becomes contracted, cloſed, and bound up; whence the dryneſs, immobility, and extenuation, obſerved in old age. By ſuch means, the offices of the minuter veſſels are deſtroyed, and the humours ſtagnate, harden, and at length coaleſce with the ſolids: thus are the ſubtileſt fluids in the body intercepted and loſt, the concoction weakened, and the reparation prevented; only the coarſer juices continue to run ſlowly through the greater veſſels, to the preſervation of life, after many of the animal functions are deſtroyed. At length, in the proceſs of theſe changes,

death

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death itſelf becomes inevitable, as the neceſſary conſequence of life.

But it is rare, that life is thus long protracted, or that *death* ſucceeds merely from the decays and impairments of old age; diſeaſes in a long and horrid train, uſually precipitate diſſolution.

It is generally taught, that the life of thoſe animals, which we call perfect, conſiſts in a continued flux and reflux of blood, nervous juice, and air, to and from the principal organs; and that a man may be reckoned *dead* when he no longer breathes, and his heart and arteries have left off all circulation and pulſation. Even Lanciſi, the beſt author on this ſubject, ſays, that without a ſmall degree of reſpiration, and ſome little motion and trembling of the heart, there is no life. In conſequence of this ſyſtem, the general practice is, that as ſoon as theſe ſymptoms of life are gone, all hopes and endeavours to maintain the ſmall remains of life are laid aſide. But Dr. Stevenſon does not admit this doctrine, being of opinion, that after the motion of the heart, arteries, and lungs ceaſes, there often remains a ſmall degree of vital principle, deſerving attention. After a full ſtop of all thoſe organic motions on which life is ſaid to depend, the juices frequently retain ſo much of the animal proceſs, as frequently ſerves to keep up warmth for a long time; which, with proper cheriſhing, might perhaps reſtore life entirely. Every age and country affords inſtances of ſurpriſing recoveries after lying long for *dead*. From the number of thoſe preſerved by lucky accidents, we may conclude a far greater number might have been preſerved by timely pains and ſkill. Med. Eſſ. Edinb. vol. v. art. 77.

This ingenious author hopes, from his theory, that one who from all the above mentioned motions ceaſing, may with propriety be called *dead*, may recover, and be properly ſaid to come to life again.

His theory is, that the cauſe of animal heat, or of the inteſtine motion which had been going on proſperouſly, while the progreſſive motion of the fluids in the veſſels continued, is now checked; yet ſtill proceeds in a lower manner, perhaps like the beginning of fermentation or putrefaction. By this degree of the animal proceſs, the maſs of fluids, particularly in the great reſervoir of venous blood, the heart, rarefying, preſſing every way, and being reſiſted by the valves, ſwells ſo as to fill the flaccid right auricle of the heart, which had been ſome time empty; and thus ſtimulating its fibres, which were at reſt, puts them into motion again; as we ſee the heart, after being taken out of the body, by being pricked, or having warm water thrown on it, beats afreſh, though it has been for ſome time motionleſs. The right auricle being thus filled, and ſtimulated into a contraction, fills the ventricle; which being irritated, likewiſe contracts and empties itſelf into the pulmonary artery; whereby the circulation begins where it left off, and life is reſtored, if the organs and juices are in a fit diſpoſition for it, as they perhaps are much oftener than is imagined.

From hence it ſeems, that *death* does not inevitably attend an entire organic reſt of what we call the fluids of the body; nay, that one cannot be called *dead* till the energy of the blood is ſo far gone, that, though aſſiſted by all poſſible means, it can never be again able to fill, and ſtimulate into contraction, the right *ſinus venoſus* and auricle of the heart.

See a remarkable caſe, in ſupport of this opinion, in Med. Eſſ. Edinb. vol. v. art. 55. See DROWNING.

The learned Winſlow has given us a treatiſe upon the uncertainty of the ſigns of *death*.

The law diſtinguiſhes between natural and civil *death*: the former is the actual termination of life; the latter, when a perſon is not actually *dead*, but adjudged ſo by law. Thus, if a perſon for whoſe life an eſtate is granted remains beyond ſea, or is otherwiſe abſent ſeven years, and no proof be made of his being alive, or becomes a profeſſed monk, he ſhall be accounted naturally *dead*. However, the latter diſability, ſince the Reformation, is held to be aboliſhed.

DEATH, *appeal of*. See APPEAL.

DEATH-*watch*, in *Zoology*, the Engliſh name of the *pediculus* of old wood, a ſpecies of the *termes*, belonging to the order of *aptera* and claſs of inſects in the Linnæan ſyſtem. It is nearly of the ſize of the common louſe; and the noiſe, reſembling the beating of a watch, is made by the male or female, when wooing each other. This ticking noiſe the populace have long taken for a preſage of *death*, in the family where it is heard: whence it is alſo called *pediculus fatidicus*, *mortiſaga*, *pulſatorius*, &c.

There are two kinds of *death-watches*: of the firſt we have a good account in the Philoſophical Tranſactions, by Mr. Allen. It is a ſmall beetle, five ſixteenths of an inch long, of a dark brown colour, ſpotted; having pellucid wings under the vaginæ, a large cap, or helmet, on the head, and two antennæ proceeding from beneath the eyes. The part with which it beats, he obſerved, was the extreme edge of the face, which he chooſes to call the upper lip; the mouth being protracted by this bony part, and lying underneath, out of view. Its figure, as it appears in a microſcope, ſee repreſented in *Tab. Nat. Hiſt. fig.* 2.

This account is confirmed by Mr. Derham, with this difference, that, inſtead of ticking with the upper lip, he obſerved the inſect to draw back its mouth, and beat with its forehead. That author had two *death-watches*, a male and female, which he kept alive in a box, ſeveral months; and could bring one of them to beat whenever he pleaſed, by imitating its beating: and by this ticking noiſe he could frequently invite the male to get up upon the other, in the way of coition. When the male found he got up in vain, he would get off again, beat very eagerly, and then up again: whence the ingenious author concludes thoſe pulſations to be the way whereby thoſe inſects woo one another, and find out, and invite each other to copulation.

The ſecond kind of *death-watch* is an inſect in appearance quite different from the firſt. The former only beats ſeven or eight ſtrokes at a time, and quicker: the latter will beat ſome hours together, without intermiſſion; and his ſtrokes are more leiſurely, and like the beat of a watch. This latter is a ſmall greyiſh inſect, much like a louſe when viewed with the naked eye. Its figure, as magnified, is ſeen in *Tab. Nat. Hiſt. fig.* 1. The ticking, as in the other, is a wooing act.

This inſect is at firſt a minute white egg, much ſmaller than the nits of lice; though the inſect is near as big as a louſe. In March it is hatched, and creeps about with its ſhell on. When it firſt leaves its ſhell, it is even ſmaller than its egg; though that be ſcarce diſcernible without a microſcope. In this ſtate it is ſomewhat like the mites in cheeſe: from this ſmall ſtate they grow gradually to their mature or perfect ſize: when they become like the old one, they at firſt run about much more ſwiftly than before. Phil. Tranſ. abr. vol. v. p. 26, &c.

DE BENE ESSE, a Latin phraſe uſed in our law-books. To take, or do, a thing *de bene eſſe*, is to accept, or allow it as well done for the preſent; but when it comes to be more fully examined, or tried, to ſtand or fall, to be allowed or diſallowed, according to the merit, or well-being, of the thing in its own nature; or, as we ſay, *Valeat quantum valere poteſt*.

Thus, in chancery, upon motion to have one of the leſs principal defendants in a cauſe examined as a witneſs, the court (not then thoroughly examining the juſtice of it, or not hearing what may be objected on the other ſide) often orders ſuch a defendant to be examined *de bene eſſe*, i. e. that his depoſitions ſhall be allowed, or ſuppreſſed, at the hearing of the cauſe upon a full debate of the matter, as the court ſhall think fit; but for the preſent they have a well-being, or conditional allowance.

Thus alſo in common law, the judges often take bail *de bene eſſe*, to be allowed or rejected upon the approbation or exception of the plaintiff's attorney.

DEBENTURE, a kind of writing in the nature of a bond, firſt given in 1649, to charge the commonwealth to ſecure the ſoldier-creditor, or his aſſigns, the ſum due, upon auditing the accounts of his arrears.

The word is now alſo uſed in the exchequer, and in the king's houſhold, where *debentures* are uſually given to the ſervants for the payment of their wages, board-wages, and the like.

Debenture is mentioned in the act of oblivion, 12 Car. II. cap. 2. and ſince the late Revolution, has been uſed in many acts of parliament, eſpecially in that which relates to the forfeited eſtates in Ireland, out of which the ſoldiers *debentures* are appointed to be ſatisfied, 11 W. III.

DEBENTURE, in *Commerce*, a term uſed at the cuſtom-houſe, when the exporter of any merchandiſe is entitled to any bounty or drawback, by act of parliament, on the exportation; in which caſe this *debenture* is a peculiar certificate ſigned by the officers of the cuſtoms, which entitles the trader to the receipt of ſuch bounty or drawback.

All merchandiſe that are deſigned to be taken on board for that voyage, being entered and ſhipped, and the ſhip being regularly cleared out, and ſailed out of port on her intended voyage, *debentures* may be made out from the exporter's entries, in order to obtain the drawbacks, allowances, bounties, or premiums; which *debentures* for foreign goods are to be paid within one month after demand: and in making out theſe *debentures*, it muſt be obſerved, that every piece of vellum, parchment, or paper, containing any *debenture* for drawing back cuſtoms

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or duties, muſt, before writing, be ſtamped, and pay a duty of eight pence.

The form of *debentures* vary, according to the merchandiſe exported. In the execution of *debentures* for tobacco, it muſt be particularly obſerved, 1. that *debentures* for the ſame quantity may be made in one or more parchments; 2. that the exporter's oath muſt be printed, ſpecifying whether he acts for himſelf, or by commiſſion; 3. if exported to any other foreign ports than thoſe of Ireland, the word Ireland muſt be added to the oath after Great Britain; 4. that as no tobacco may be conſumed in ſhips of war in Europe, but what has paid full duties, and been manufactured in Great Britain, no drawback is to be allowed for any tobacco exported in men of war; 5. that eight pounds of tobacco *per* hogſhead of 350 pounds or more, allowed for draught at importation, muſt not be deducted on exportation; 6. that *debentures* for tobacco exported to Ireland, muſt not be paid till a certificate be produced, teſtifying the landing thereof; 7. that no perſons may ſwear to the exportation, but ſuch as are permitted to ſwear to *debentures* for other goods. In *debentures* for all other foreign goods, no perſon may be admitted to ſwear to the exportation, but the true exporter, either as a proprietor, or who being employed by commiſſion, is concerned in the direction of the voyage. All kinds of *debentures*, before delivered or paid to the exporters, are entered into a ſeparate book kept for that purpoſe by the collector or comptroller of the cuſtoms. See BOUNTY.

DEBET, among *Merchants*, ſignifies the ſums due to them for goods ſold on credit, for which they have charged their journal or ledger. It is more particularly underſtood of the remainder of debts, part of which has been paid on account.

DEBET, among *Book-keepers*, is uſed to expreſs the left-hand page of the ledger, to which are carried all articles ſupplied or paid, on the ſubject of an account.

DEBET & DETINET, in *Law*, are Latin words uſed in the bringing writs and actions: and an action ſhall always be in the *debet & detinet*, when he who makes a bargain or contract, or lends money to another, or he to whom a bond is made, bringeth the action againſt him who is bounden, or party to the contract and bargain, or unto the lending the money, &c. But if a man ſells to another a horſe, &c. if he brings debt for the horſe, the writ muſt be in the *detinet* only. New. Nat. Br. 265.

DEBET & SOLET, are alſo formal words made uſe of in writs; and ſome writs have theſe words in them, which ought not to be omitted. Likewiſe, according to the diverſity of the caſe, both *debet & ſolet* are uſed, or *debet* alone: as a *quod permittat* may be in the *debet & ſolet*, or in the *debet* only, as the demandant claims. And if a perſon ſues to recover any right, whereof his anceſtor was diſſeiſed, by the tenant or his anceſtor, then he uſeth the word *debet* alone in his writ, becauſe his anceſtor only was diſſeiſed, and the eſtate diſcontinued: but if he ſue for any thing that is now firſt of all denied him, then he uſeth *debet & ſolet*, becauſe his anceſtor before him and he himſelf uſually enjoyed the thing ſued for, until the preſent refuſal of the tenant. Reg. Orig. 140. The writ of *ſecta molendini* is a writ of right in the *debet & ſolet*, &c. F. N. B. 98.

DEBILITY, in a *Medicinal Senſe*, is a relaxation of the ſolids, which often induces weakneſs and fainting.

DEBRUIZED, or DEBRUISED, in *Heraldry*, is when we would intimate the grievous reſtraint of any animal, which is debarred its natural freedom by any of the ordinaries being laid over it.

Thus when a pale, &c. is borne upon a beaſt in an eſcutcheon, the beaſt is ſaid to be *debruiſed* by the pale.

DEBT, a thing due to another, whether it conſiſt of money, goods, or ſervices.

The legal acceptation of *debt* is a ſum of money due by certain and expreſs agreement: as, by a bond for a determinate ſum; a bill or note; a ſpecial bargain; or a rent reſerved on a leaſe, that is fixed and unalterable. The non-payment of theſe is an injury, for which the proper remedy is by action of debt, to compel the performance of the contract, and recover the ſpecific ſum that is due. Actions of *debt* are now ſeldom brought but upon ſpecial contracts under ſeal, in which the ſum due is clearly and preciſely expreſſed. The form of the writ of *debt* is ſometimes in the *debet & detinet*, and ſometimes in the *detinet* only.

By our law, *debts* due to the king are to be ſatisfied in the firſt place in all caſes of executorſhip, and adminiſtratorſhip; and till the king's *debt* be ſatisfied, he may protect the debtor from the arreſt of any other creditor. At the common law, *debt* lies not for rent upon a leaſe for life, though it doth on a leaſe for years; but the remedy is aſſiſe, if the plaintiff have ſeiſin, or by diſtreſs. 3 Rep. 65. But by ſtat. 8 Anne, c. 17. any perſon having rent in arrear, upon any leaſe for life or lives, may bring action of *debt* for ſuch rent, as where rent is due on a leaſe for years. Action of *debt* will lie againſt a leſſee, for rent due after the aſſignment of the leaſe; for the perſonal privity of contract remains, notwithſtanding the privity of eſtate is gone. 3 Rep. 22. But after the death of the leſſee, it is then a real contract, and runs with the land. Cro. Eliz. 555.

We meet with divers kinds of *debts: active debts*, are thoſe whereof a perſon is creditor; *paſſive debts*, thoſe whereof he is debtor. There are alſo *real debts*, *perſonal debts*, and *mixed debts*.

It behoves an executor or adminiſtrator to pay regard to the priority of *debts* in diſcharging them; otherwiſe, on deficiency of aſſets, he muſt anſwer thoſe of a higher nature out of his own eſtate: ſuch are funeral charges, and expence of proving the will; *debts* to the king on record or ſpecialty; *debts*, which by particular ſtatutes are to be preferred to all others, as forfeiture for not burying in woollen, money due on poor's rates, letters to the poſt-office, and ſome others; *debts* of record, as judgments, ſtatutes, and recognizances; *debts* due on ſpecial contracts, as for rent, on bonds, covenants, &c. under ſeal; and laſtly, *debts* on ſimple contracts, as notes and verbal promiſes, and ſervants wages.

DEBT, *Chirographary*, in the *French Law*, is that due by virtue of a note, or writing under one's hand, and not proved in judicature.

DEBT, *Hypothecary*, is that due in virtue of ſome contract, or judgment.

DEBT, *Prædiatory*, is that ariſing from an alienation of lands, &c. the whole purchaſe whereof has not been paid.

DEBT, *Privileged*, is that which muſt be ſatisfied before all others; as, the king's tax, &c.

DEBT, *National*. See FUND.

DEBTEE *Executor*. If a perſon debtor to another makes his creditor or *debtee* his executor, or if ſuch creditor obtain letters of adminiſtration to his debtor, he may retain ſufficient to pay himſelf before any other creditors whoſe debts are of equal degree. Blackſt. Com. vol iii. p. 18.

DEBTOR, a perſon who owes ſomething to another: in oppoſition to creditor, which is he to whom it is owing.

DECACHORDON, in *Antiquity*, a muſical inſtrument of ten ſtrings, called by the Hebrews *haſur*, reſembling our harp, of a triangular figure, with a hollow belly, and ſounding from the lower part.

DECACTIS, in *Natural Hiſtory*, a name given by ſome to a kind of ſtar-fiſh, of the branched, or aſtrophyte kind, whoſe rays are ten in number, where they firſt part from the body, and each ſoon branches out into a number more.

DECADARCHUS, Δεκαδαρχος, among the Greeks, a commander of a party of ten men.

DECADE, a word uſed by ſome old writers for the number ten; and *decades*, for an enumeration by tens: the word is formed from the Latin *decas*, which is derived from a Greek word of the ſame import. The word has been more peculiarly appropriated to the number of books, q. d. *decades*, into which the Roman Hiſtory of Titus Livius is divided. Hence alſo came *decadal* arithmetic, the Decameron of Boccacio, &c.

DECAGON, a plain figure in geometry, having ten ſides and angles.

If all the ſides and angles be equal, it is called a regular *decagon*, and may be inſcribed in a circle.

The ſides of a regular *decagon* are, in power and length, equal to the greateſt ſegment of an hexagon inſcribed in the ſame circle, and cut according to extreme and mean proportion. See EXTREME *and mean proportion*.

A fortification conſiſting of ten baſtions, is ſometimes called a *decagon*.

DECALITRON, among the *Ancients*, a piece of money uſed by the people of Ægina, Corinth, and Syracuſe, in value equal to $16\frac{2}{3}$ oboli of Athens.

DECALOGUE, the Ten Commandments of God, engraven on two tables of ſtone, and given to Moſes.

The word is Greek, compoſed of δεκα, *ten*, and λογος, *word*, q. d. *ten words*. Accordingly, the Jews call them עשרה דבורים, *the ten words*, which appellation is very ancient.

The Samaritans, both in their text and verſion, add after the ſeventeenth verſe of the twentieth chapter of Exodus, and after the twenty-firſt verſe of the fifth chapter of Deuteronomy, an eleventh commandment, to build an altar on mount Gerizzim, &c. But it is apparently an interpolation, to authoriſe their having a temple and an altar on that mountain; and to diſcredit, if poſſible, the temple at Jeruſalem, and the worſhip there performed. It muſt be added, however, that, though all, both Jews and Chriſtians, agree in the number of Ten Command-

ments,

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ments, there is some difference as to the manner of dividing them.

The Talmudists, and Postellus after them, in his treatise De Phœnicum Literis, say, that the *Decalogue*, or Ten Commandments, were engraven quite through the tables which God gave to Moses; but that nevertheless the middle of the ם *Mem* final, and of the ס *Samech*, remained miraculously suspended without adhering to any thing. See the Dissertation on the Samaritan Medals, printed at Paris in 1715. They add, that the *Decalogue* was written in letters of light, i. e. in luminous shining letters.

The *Decalogue* was originally delivered in two tables; one of which contains our duty to God, expressed in the four first commandments; and the second, our duty to our neighbour, enforced in the six last. The church of Rome, for a very obvious reason, hath omitted the second commandment in many of her books; and in order to preserve the number complete, divided the last into two.

DECAMERIS, a term signifying a tenth part; used by Mr. Sauveur, and some other authors, to mark and measure the intervals of sounds.

The word is formed of δεκα, *ten*, and μερις, *part*.

In Mr. Sauveur's system, the *decameris* is the tenth part of the heptameris, which he makes the seventh part of the meris; and this is the forty-third part of the octave: so that the *decameris* is $\frac{1}{301}$ of an octave. See Mem. Acad. Scienc. 1701, and 1707.

DECAMERON, from δεκα, *ten*, and ημερα, *day*; a work containing the actions or conversations of ten days. Boccacio's Decameron consists of one hundred novels related in ten days.

DECAMP. When an army raises its camp, or breaks up from the place where it lay before, they say it is *decamped*.

DECAMYRON, in the *Medicinal Writings of the Ancients*, the name of a malagma or cataplasm, consisting of ten different kinds of aromatics: these were the Indian leaf, mastic, euphorbium, spikenard, adarce, storax, pepper, ointment of nard, opobalsamum, and wax.

DECANDRIA, in *Botany*, the tenth class of plants, with hermaphrodite flowers, and ten stamina, or male parts in each. See *Tab. of Botany, Linnæan System.*

The word is formed of the Greek δεκας, *ten*, and ανηρ, *male*.

Of this class of plants there are five orders; viz. the *monogynia*, containing fifty-three genera; the *digynia*, comprehending twelve genera; the *trigynia*, eleven; the *pentagynia*, fourteen; and the *decagynia*, two genera.

DECANTATION, in *Chemistry*, the act of pouring off a liquor from the fæces, &c. by gently inclining the lip, or *canthus* of the vessel; whence the word is derived. See CANTHUS.

DECANUS, among the Romans, an officer who had ten other officers, or persons, under his charge; whence our English dean.

DECANUS, in *Astrology*, a title given to the god who presided at any birth, ὁ ὡροσκοπος. See ASTROLOGY.

DECAPITE, in *Heraldry*. See DEFFAIT.

DECAPROTI, DECEMPRIMI, among the *Ancients*, were officers who gathered the tributes, or taxes.

The word comes from δεκα, *ten*, and πρωτος, *first*; probably because the ten first, or principal persons of each community, were chosen to make the levies.

The *decaproti* were obliged to pay for the dead; or, to answer to the emperor for the quota of such as died, out of their own estates. Cicero, in his oration for Roscius, calls them *decemprimi*.

DECASMUS, Δεκασμος, in *Antiquity*, the name of an action or process among the Athenians, which was brought against any person who offered a bribe. They thought it not enough to punish the person receiving a bribe, but that the person who offered it ought to be punished likewise. Pott. Archæol. Græc. lib. i. c. 23.

DECASTYLE, in the *Ancient Architecture*, a building with an ordonnance of ten columns in front. The temple of Jupiter Olympius was *decastyle*.

The word is formed of δεκα, and στυλος, *column*.

DECEIT, *Deceptio*, or *Dolus*, in *Law*, is used for any subtile, wily shift, or trick; to which may be referred all manner of craft, subtilty, guile, fraud, sleight, cunning, covin, collusion, and practice used to deceive another by any means.

Deceit is an offence both by common law and by statute. All practices of defrauding, or endeavouring to defraud, another of his right, are punishable by fine and imprisonment, sometimes pillory, &c. and there is a writ called *deceptione* that lies for one who receives injury, or damage, &c.

A writ of *deceit* lies against attornies, for losses sustained by their default; also against bakers, brewers, and other artificers, for not selling good commodities, or refusing to perform a bargain: in all which cases they are by statute liable to penalties in proportion to their offence.

DECEIVED, in the *Manege*, is used when a horse upon a demi-volt of one or two treads, working, for instance, to the right, and not having yet finished above half the demi-volt, is pressed one time or motion forwards with the inner leg, and then is put to a reprise upon the left, in the same cadence with which he began. He thus regains the place where the demi-volt had been begun to the right, and works to the left. A horse may in this manner be *deceived* on any hand. Guillet, Gen. Dict. p. i. in voc.

DECEMBER, the last month of the year; wherein the sun enters the tropic of Capricorn, and makes the winter solstice.

In Romulus's year, *December* was the tenth month; whence the name, viz. from *decem*, *ten*: for the Romans began their year in March.

The month of *December* was under the protection of Vesta: Romulus assigned it thirty days; Numa reduced it to twenty-nine; which Julius Cæsar increased to thirty-one.

Under the reign of Commodus, this month was called, by way of flattery, *Amazonius*, in honour of a courtesan, whom that prince passionately loved, and had got painted like an *Amazon*; but it only kept the name during that emperor's life.

At the latter end of this month they had the *Juveniles ludi*, and the country people kept the feast of the goddess Vacuna in the fields, having then gathered in their fruits, and sown their corn; whence seems to be derived our popular festival called *harvest-home*.

DECEMPEDA, Δεκαπους, *ten-feet rod*; an instrument used by the ancients in measuring.

The *decempeda* was a rule, or rod, divided into ten feet; whence its name, from *decem*, *ten*, and *pes*, *pedis*, *foot*.

The foot was subdivided into twelve inches; and each inch into ten digits.

The *decempeda* was used both in measuring of land, like the chain among us; and by architects, to give the proper dimensions and proportions to the parts of their buildings, which use it still retains. Horace, lib. ii. od. 15. blaming the magnificence and delicacy of the buildings of his time, observes, that it was otherwise in the times of Romulus and Cato; that in the houses of private persons there were not then known any porticoes measured out with the *decempeda*, nor turned to the north to take the cool air.

DECEM-TALES, in *Law*, a writ that issues directed to the sheriff, whereby he is commanded to make a supply of jurymen, when a sufficient number does not appear on a trial at bar.

DECEMVIRI, an order of annual magistrates among the Romans, created with a sovereign power to draw up and make laws for the people; thus called, because their number was ten.

To the *decemviri* was given all the legislative authority ever enjoyed by the kings, and after them by the consuls. One among them had all the ensigns and honours of the function; and the rest had the like in their turn, during the year of their *decemvirate*.

The *decemviri* were those who drew up the laws of the Twelve Tables, called thence *leges decemvirales*, which for a considerable time were the whole of the Roman law.

In the year 302, the consuls Appius Claudius Crassinius, and T. Genucius Augurinus, being obliged to abdicate, the first *decemviri* were created; in the year following, ten new ones were appointed to succeed them; and in the year 304, another set were to have been chosen, but that the people rose, made them lay down, and resumed the consuls. The excessive debauchery of Appius Claudius Crassinius, one of the consuls, who was first obliged to abdicate, and who had been chosen first *decemvir* three times, was the principal cause of all this. Cicero De Finib. lib. i. Livy, lib. iii. Halicarnasseus, lib. x. and Florus, lib. i. c. 24. relate the history.

The *decemviral* administration, however, it is to be observed, had not its first rise at the time when the authority of the consuls was devolved into the hands of the *decemviri*: for, during the interregnum that ensued after the death of Romulus, the management of affairs, which the senate then took upon them, is called by Halicarnasseus, lib. ii. *decemviral*, because the senators, divided into tens, commanded each in their turn: that is, one of each ten, for five days successively, having the fasces, lictors, &c. like the kings.

There were also military *decemviri*; and on divers emergencies, *decemviri* were created to manage and regulate certain affairs, after the same manner as boards of commissioners

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miſſioners are appointed among us. Thus we find *decemviri* for conducting colonies; *decemviri* to prepare and preſide at feaſts in honour of the gods; *decemviri* to take care of the ſacrifices; and *decemviri* to keep the Sibyls books.

Sometimes, in lieu of *decemviri*, they only created *ſeptemviri*, or *triumviri*, or *duumviri*, &c.

DECENNALIA, in *Antiquity*, feaſts which the Roman emperors held every tenth year of their reign, with ſacrifices, games, largeſſes to the people, &c.

Auguſtus was the author of this cuſtom, which was afterwards imitated by his ſucceſſors.

At the ſame time they likewiſe offered VOWS for the emperor, and the perpetuity of his empire, called *vota decennalia*.

From the time of Antoninus Pius, we find theſe ceremonies marked on medals. PRIMI DECENNALES. SECUNDI DECENNALES. VOTA SOL. DECEN. II. VOTA SVSCEP. DECENN. III.

Theſe vows muſt have been made at the beginning of every tenth year; for on a medal of Pertinax, who ſcarce reigned four months, we find VOTA DECENN. & VOTIS DECENNALIBUS.

Struvius is of opinion, that theſe vows took place of thoſe which the cenſor uſed to make in the times of the republic, for the proſperity and preſervation thereof. In effect, they were not only made in behalf of the prince, but alſo of the ſtate, as may be obſerved from Dion. lib. viii. and Pliny the younger, lib. x. ep. 101.

Auguſtus's aim in eſtabliſhing the *decennalia*, was to preſerve the empire, and the ſovereign power, without offence or reſtraint to the people. For, during the celebration of this feaſt, that prince uſed to ſurrender up all his authority into the hands of the people, who, filled with joy, and charmed with the goodneſs of Auguſtus, immediately delivered it to him back again.

DECENNARY, *Decennaria*, the limits or compaſs of ten *friburghs*. See DECINERS, and TITHING.

DECEPTIONE, in *Law*, a writ which properly lies for one that receives harm or damage, by him that does any thing deceitfully in the name of another.

This writ is either *original* or *judicial*. Old. Nat. Br. fol. 50. Fitz. Nat. Br. fol. 95. See Reg. of Writs, fol. 112. and Reg. Judicial.

DECIDUOUS, in the general, expreſſes a thing apt and ready to fall.

In ſome plants, the perianthium or calyx is *deciduous* with the flower, that is, falls off from the plant with it; in others, not.

In ſome, the leaves are *deciduous*, or fall off in autumn; in others, they remain all the winter.

DECIES *tantum*, a writ that lies againſt a juror, who hath taken money for giving his verdict.

It is ſo called from its effect, which is to recover ten times as much as he took.

It alſo lies againſt embracers that procure ſuch an inqueſt. See EMBRACEOR.

DECIL, *Decilis*, in *Aſtronomy*, an aſpect or poſition of two planets, when they are diſtant from each other a tenth part of the zodiac, i. e. thirty-ſix degrees. This is one of the new aſpects invented by Kepler.

DECIMAL *arithmetic*, the art of computing by *decimal* fractions, firſt invented by Johannes Regiomontanus, about the year 1464, and uſed by him in the conſtruction of his tables of ſines; who thus introduced *decimal* parts in the room of SEXAGESIMALS. They were alſo uſed by Ramus, in his Arithmetic, written in 1550; and before his time by our countryman Bucklæus, and about the ſame time by Record. But the firſt perſon who wrote an expreſs treatiſe on *decimals*, was Stevinus, about the year 1582.

DECIMAL *fractions*, are thoſe whoſe denominator is 1, with one or more cyphers; as, 10, 100, 1000, 10000, &c. Thus, $\frac{5}{10}$, $\frac{6}{100}$, $\frac{7}{1000}$, &c. are *decimal fractions*.

In the writing of *decimal fractions* we uſually omit the denominator, as only conſiſting of unity with cyphers annexed; and in lieu thereof, a point, or comma, called the *ſeparatrix*, is prefixed to the numerator. Thus, $\frac{5}{10}$ is written ,5; $\frac{46}{100}$, ,46. So ,125 expreſſes a hundred and twenty-five parts of any thing ſuppoſed to be divided into a thouſand parts.

As cyphers on the right hand of integers do increaſe their value *decimally*; as 2, 20, 200, &c. ſo, when ſet on the left hand of *decimal fractions*, they decreaſe the value *decimally*; as, 5, 05, 005, &c. when ſet on the left hand of integers, or on the right hand of *decimals*, they ſignify nothing, but only to fill up places; thus, ,5000 denotes only five tenths, and 0005. is only five units.

To reduce any vulgar fraction, as ſuppoſe $\frac{5}{8}$, to a *decimal fraction* of the ſame value; add cyphers at pleaſure to the numerator, and divide by the denominator: as thus,

8)5000(
.625

And therefore $\frac{625}{1000}$, or ,625, is a *decimal* of the ſame value with the former fraction $\frac{5}{8}$.

Some vulgar fractions can never be reduced into *decimals* without defect; as $\frac{1}{3}$, &c. in thoſe caſes, the greater number of places the *decimals* are continued to, the more is the defect diminiſhed, in a tenfold proportion. Thus, $\frac{1}{3}$ expreſſed in *decimals* is ,333333 *ad infinitum*.

Such *decimals* are very properly called circulating *decimals*, becauſe of the continual return of the ſame figures; and they may be called indeterminate or infinite *decimals*, by way of diſtinction from thoſe where the reduction leaves no remainder, and which are therefore called finite or determinate *decimals*. See REPETENDS.

By the rule above given, the parts of any integer may be eaſily reduced into *decimals*. Thus, 5*s*. is $\frac{5}{20}$, or ,25 of a pound ſterling; 6*d*. is $\frac{6}{240}$, or $\frac{1}{40}$, i. e. ,025 of a pound; and 5*s*. 6*d*. is ,25+,025=,275*l*. Or the *decimal* of a mixed number may be readily obtained by reducing the number of the loweſt ſpecies to the *decimal* of the next above; add to this the number of that ſpecies, if there be any, and reduce the ſum to the next higher ſpecies, adding to the number found the number of that ſpecies given in the queſtion; and thus proceed till you arrive at the propoſed integer: 4*s*. 7*d*. 3*f*. are equal to ,2322916*l*. for 3*f*. is $\frac{3}{4}$, or ,75*d*. to which add 7*d*. and 7,75 is equal to $\frac{7,75}{12}$, or ,645833 &c. *s*. to which add 4*s*. and 4,645833 &c. is equal to $\frac{4,645833}{20}$, or ,23229166 &c. *l*. The ſame proceſs may be eaſily applied to the *decimal* parts of any other integer, as weights, meaſures, and time.

The common operations in *decimals* are performed as in the vulgar rules, regard being had only to the particular notation, to diſtinguiſh the integral from the fractional part of a ſum.

In Addition and Subtraction of DECIMALS; the points being all placed under each other, the figures are to be added, and ſubtracted, as in common arithmetic; and when the operation is done, ſo many figures of the ſum, or the remainder, are to be noted for *decimals*, as there are places of *decimals* in the greateſt given numbers. An example will make this clear.

Addition of *Decimals*.

,43791	59 ,271
,792	15 ,040
,6124	3 ,791
,053	12 ,009
,10	7 ,5
,2	
2,19531	97 ,611

Subtraction.

From	67 ,9
Take	29 ,8754
Rem.	38 ,0246
From	25 ,1462
Take	13 ,07
Rem.	12 ,0762

For Multiplication of DECIMALS, obſerve to cut off juſt ſo many *decimal* parts from the product as there are *decimals* in both factors. The work is the ſame as in integers. Thus,

Multiplication of *Decimals*.

,1472	,365	3,650
,175	,122	621
7360	730	3 650
10304	730	73 00
1472	365	2190 0
,0257600	,044530	2266,650

Note. In the firſt and ſecond examples, the products only amount to ſix and five places; for which reaſon cyphers are prefixed, to make up the number of *decimal* places in the two factors reſpectively.

Hence, to multiply a *decimal* by unit with any number of cyphers, is only to remove the ſeparatrix ſo many places to the right as there are cyphers annexed.

In Diviſion of DECIMALS, proceed in all reſpects as in dividing of integers; and, when the operation is done, mark as many places in the quotient for *decimals*, as, with the number of *decimals* in the diviſor, are equal to the *decimal* places of the dividend.

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,22),8030(3,65 66 143 132 110 110 ..0	22)8,030(,365 6 6 1 43 1 32 . 1 10 1 10 . . 0
22),8030(,0365 66 143 132 110 110 ...	73,2)83,219(1,13 73 2 100 1 73 2 26 99 21 96 5 03

Hence, to divide a *decimal* by unit with any number of cyphers, is only to remove the ſeparatrix ſo many places to the left as there are cyphers annexed.

But there are certain caſes in diviſion of *decimals*, which require ſome farther management: as, firſt, where the diviſor is a *decimal fraction*, and the dividend is an integer; add, or annex, as many or rather more cyphers to the dividend, than there are places in the diviſor: thus, ,365)22,0000(60,2. For there being three places of *decimals* in the diviſor, and four in the dividend, there will be but one in the quotient. Secondly, Where the diviſor is a mixed number, and the dividend a whole number, add at leaſt as many cyphers to the dividend, as there are places in the diviſor: thus, 3,65)22,0000(6,02. Thirdly, Wherever the diviſor is bigger than the dividend, annex cyphers to the latter: thus,

36,5)22,0000(,602.

For the Valuation of DECIMALS; multiply the given *decimal* by the number of parts contained in the propoſed integer, proceeding from the higher to the lower if there be a remainder, and you will have the value required at the left of the ſeparatrix. Thus, ,785 *l.* is equal to 15 *s.* 8 *d.* 1,6 *f.*

,785 20	,78 of a yard = 2 feet, 4,08 inches.
s. 15,700 12	,78 3
d. 8,400 4	*f.* 2,34 12
f. 1,600	*in.* 4,08

DECIMAL *ſcales*, in the general, denote any ſcales divided *decimally*; but particularly certain ſcales of money, weights, and meaſures, made from tables ſo called, to expedite *decimal* arithmetic, by ſhewing by inſpection the *decimal fraction* of any part of money, weight, or meaſure. See SCALE.

DECIMATION, a puniſhment which the Romans uſed to inflict on the ſoldiers who had quitted their poſt, raiſed a mutiny in the camp, behaved themſelves cowardly in the fight, or otherwiſe failed in their duty; for which every tenth man was put to death as an example to the reſt.

The manner of *decimating* was thus: the general aſſembled the whole camp; then the tribune brought to him thoſe that were guilty, and impeached, and reproached them with their cowardly actions, and baſeneſs, in the preſence of the whole army; then putting their names into an urn, or a helmet, as many were drawn out as made the tenth part of the whole number, and theſe were put to the ſword, and the others ſaved.

This was called *decimare*, a word of the ancient Roman militia, who, to puniſh whole legions, when they had failed in their duty, ſometimes alſo made every tenth ſoldier draw lots, and put him to death for an example to the others.

As the Romans had their *decimatio*, they had alſo the *viceſimatio*, and even *centeſimatio*, when only the twentieth or hundredth man ſuffered by lot.

This practice has been occaſionally recurred to in modern times: as, particularly, in France, for the puniſhment of the garriſon of Treves in 1675, who capitulated and ſurrendered that place in oppoſition to the remonſtrance of the Marſhal de Crequi, who commanded there.

DECIMÆ. See TYTHES.

DECIMIS *ſolvendis pro poſſeſſionibus alienigenarum*, a writ, yet extant in the regiſter, which lay againſt thoſe that had farmed the priors aliens lands of the king, for the rector of the pariſh, to recover his tithe of them. Reg. of Writs, fol. 179.

DECINERS, DECENNIERS, or DOZINERS, derived from the French *dizeine*, i. e. *decas*, *ten*; in the ancient monuments of our law, are ſuch as were wont to have the overſight and check of the friburghs, for maintenance of the king's peace; the limits of whoſe juriſdiction were called *decenna*, and *dozein*.

They ſeem to have had very large authority in the Saxon times; taking cognizance of cauſes within their circuit, and redreſſing wrongs by way of judgment. Thus Briton, "We will that all thoſe who are fourteen years old "ſhall make oath, that they will be ſufficient and loyal "to us; and neither be felons, nor aſſenting to felons: "and we will, that all profeſs themſelves of this or that "*dozein*, and make or offer ſurety of their behaviour by "thoſe or thoſe *doziners*, except religious perſons, clerks, "knights eldeſt ſons, and women."

A *dozein* now ſeems to be no other than a leet: for in leets only this oath is adminiſtered by the ſteward, and taken by ſuch as are twelve years old and upwards.

DECIPHERING, or DECYPHERING, the art, or act, of finding the alphabet of a *cipher*, or of explaining a letter written in CIPHER.

Every language has peculiar rules of *deciphering*; which depend, not only on the form of its characters, but likewiſe on the place, order, combination, frequency, and number of the letters. The general theory of this art may be comprized in the following propoſitions: one word is to be compared with another, in order to obſerve both their reſemblance and their difference: no word can be without a vowel: a word of one letter is always a vowel, or a conſonant with an apoſtrophe: the vowels recur much more frequently than the conſonants: double vowels may be pronounced at the beginning of a word, but not double conſonants; and double characters in this place are always vowels: ſhort words of two or three letters have two or three vowels, or one or two conſonants; and in words of this kind the vowels are moſt eaſily diſcovered: when double conſonants are preceded by a ſingle letter, that letter is a vowel: one vowel is often joined with another in words abounding with diphthongs: the conſonant, that always precedes or follows double conſonants, is one of the liquids *l*, *m*, *n*, *r*: the conſonant *q* is always followed by the vowel *u*, though *u* may be joined with other letters. When two different characters occur, the latter of which is often joined with various letters, and the former never found either by itſelf, or followed by any other letter, thoſe two are *qu*; which letters are almoſt always followed by a vowel: one vowel and one conſonant recur more frequently than others. The particular theory of *deciphering* depends on the peculiar ſtructure of different languages to which it is applied. The curious, who deſire farther information on this ſubject, may conſult the Art of *Deciphering* deduced from principles, and explained by examples in the German, Dutch, Latin, Engliſh, French, Italian, and Greek languages, by David Arnold Conradus, in the twelfth volume of the Gentleman's Mag. for 1742. See alſo M. s'Graveſande Introd. ad Philoſophiam, cap. xxxv. Leyden, 1737.

B. Porta publiſhed a treatiſe on this ſubject; and a collection of letters written in cipher, and *deciphered* by Dr. Wallis, are now in the Library of Oxford.

DECK *of a ſhip*, from *decker*, Dan. *to cover*; a kind of planked floor, connecting the ſides, and ſerving as different platforms to ſupport the artillery, to lodge the men, and to preſerve the cargo in merchant-veſſels.

A ſhip is ſaid to have two or three *decks*, when it contains two or three ſtories. Ships of the firſt and ſecond rates are furniſhed with three whole *decks*, reaching from the ſtem to the ſtern, beſides a fore-caſtle and a quarter-*deck*, which extends from the ſtern to the main-maſt. There is alſo another *deck* above the hinder part of the quarter-*deck*, called the poop, and ſerving as a roof for the captain's cabin or couch. Inferior ſhips of the line of battle have two *decks* and a half; and frigates, ſloops, &c. have one gun-*deck* and a half, with a ſpare *deck* below to lodge the crew. The frame of the lower *deck* is ſtronger than that of the others, becauſe ſhips are broader at the lower *deck* than at the next above it, and it alſo bears the heavieſt cannon.

The *decks* are formed and ſuſtained by the BEAMS, the CLAMPS, the WATER-WAYS, the CARLINGS, the LEDGES, the KNEES, and two rows of ſmall pillars, called STANCHIONS.

DECK, *Fluſh*, is one that lies even in a right line, fore and aft, from ſtem to ſtern.

The ſeamen ſay, *a deck lies cambring*, when it doth not lie level, but higher in the middle than at either end. A

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cambered *deck* is by no means proper for a man of war. Alſo, if the ſhip's keel be bent in the middle upwards (which may happen from her lying a-ground on a place, where neither her aft nor fore-part touch it, and from many other reaſons taken from her make), they ſay, *ſhe is camber-keeled.*

DECK, *Half*, is a ſpace under the quarter-*deck* of a ſhip of war, between the foremoſt bulk-head of the ſteerage, and the fore-part of the quarter-*deck*. In the Northumberland colliers, the ſteerage is called the *half-deck*, and is uſually the habitation of the ſhip's crew.

DECK, a *Rope*, is that made of cordages interwoven, and ſtretched over a veſſel that has no *deck*, through which it is eaſy to annoy the enemy who comes to board her, and has leaped thereon. Theſe are little uſed but in merchant-veſſels, to defend them from the corſairs.

DECLAMATION, a diſcourſe or ſpeech made in public, in the tone and manner of an oration.

Among the Greeks, *declamation* was the art of ſpeaking indifferently on all ſubjects, and on all ſides of a queſtion; of making a thing appear juſt that was unjuſt; and of triumphing over the beſt and ſoundeſt reaſons.

Such ſort of *declamations*, M. de St. Evremond obſerves, were fit only to corrupt the mind, by accuſtoming men to cultivate their imagination rather than to form their judgment, and to ſeek for veriſimilitudes to impoſe upon, rather than ſolid reaſons to convince, the underſtanding.

It is ſaid that a certain orator, named Plotius Gallus, firſt introduced the uſe of *declamations* at Rome. In this way Cicero formed himſelf for eloquence. The term frequently occurs both in Horace and Juvenal.

Among us, *declamation* is reſtrained to certain exerciſes, which ſcholars perform, to teach them to ſpeak in public.

We ſay, a *declamation* againſt Hannibal, againſt Pyrrhus, the *declamation* of Quintilian, &c.

In the colleges of the Jeſuits, *declamations* are little theatrical or dramatic performances, conſiſting of a few ſcenes not divided into acts, rehearſed by the ſtudents by way of exerciſe, and to form them for ſpeaking in public. Such *declamations* are the moſt uſeful exerciſes performed in the colleges.

DECLARATION, in the *Cuſtom-Houſe and Commerce of France*, contains a particular account or invoice of what is contained in the bales or caſes, brought to the officer for entrance inward or outward.

DECLARATION, in *Law*, the act of ſhewing in writing the cauſe of complaint of the demandant, or plaintiff, againſt the defendant, where he is ſuppoſed to have received ſome wrong.

This ought to be plain and certain, both becauſe it impeacheth the defendant, and alſo compels him to anſwer thereto. It muſt alſo ſet forth the plaintiff's and defendant's names, the nature and cauſe of the action, &c. and the damage received. See COUNT.

DECLARATION *of fidelity*, is uſed for a confeſſion, which the Quakers, who ſcruple taking the oaths of ſupremacy, &c. are obliged to make and ſubſcribe in lieu thereof.

Its tenor is a ſolemn promiſe to be true and faithful to king George; with a deteſtation and horror of that damnable poſition, that princes excommunicated by the pope, or any other power, may be depoſed or murdered; and a *declaration*, that no foreign prince, or power, has any right, juriſdiction, or authority, in this kingdom.

There is alſo a *declaration* againſt tranſubſtantiation made and ſubſcribed by thoſe who qualify for offices; 25 Car. II. c. 2. and a *declaration* againſt popery to be made and ſubſcribed by the members of both houſes of parliament, by diſſenters qualified according to the toleration act, &c. &c. in which they renounce tranſubſtantiation, the invocation of ſaints and of the Virgin Mary, and the ſacrifice of the maſs, and every kind of evaſion and mental reſervation, as well as diſpenſation or abſolution. 30 Car. II. ſtat. 2. c. 1.

DECLARATIONS, *Clerk of the*. See CLERK.

DECLARATORY *part of a Law*, is that by which the rights to be obſerved, and the wrongs to be avoided, are clearly defined and laid down. This depends not ſo much on the law of revelation or of nature, as on the wiſdom and will of the legiſlator.

DECLARATORY *part of a Statute*, is that which relates to obſolete or diſputable cuſtoms; in which caſe the parliament has thought proper, *in perpetuum rei teſtimonium*, and for avoiding all doubts and difficulties, to *declare* what the common law is and ever hath been.

DECLENSION, in *Grammar*, the inflexion of a noun, according to its diverſe caſes. See CASE, NOMINATIVE, &c.

Mr. Harris obſerves, that the Peripatetics likened the noun in its primary and original form, to a perpendicular line; and the variations from the nominative were conſidered as if that line *fell* from its perpendicular to an oblique poſition: and hence theſe variations were called πτωσεις, *caſus*, *caſes* or *fallings*. Grammarians were thus led to call the method of enumerating the various caſes of a noun, κλισις, *declinatio*, *a declenſion*; becauſe it was a ſort of progreſſive deſcent from the noun's upright form, through its various declining forms. Hermes, p. 277, 278.

The *declenſion* of nouns is a different thing in the modern languages, which have not properly any caſes, from what it is in the ancient Greek and Latin, which have.

Declenſion, in languages wherein the nouns admit of changes, whether in the beginning, middle, or end, is properly the expreſſing or reciting all thoſe changes in a certain order, and by certain degrees, called *caſes*.

In languages wherein the nouns do not admit of changes in the ſame number, *declenſion* is the expreſſing of the different ſtates or habitudes a noun is in, and the different relations it has: which difference of relations is marked by particles called *articles*; as, *a*, *the*, *of*, *to*, *from*, &c.

DECLENSION *of a diſeaſe*, is when it is paſt its height, and the ſymptoms abate.

DECLINATION, in *Aſtronomy*, the diſtance of the ſun, a ſtar, planet, or other point of the ſphere of the world, from the equator, either northward or ſouthward. It is the ſame with LATITUDE in geography.

Declination is either *real* or *apparent*, according as the real or apparent place of the point is conſidered.

The *declination* is an arch of a great circle, as GS (*Tab. Aſtronomy, fig.* 4.), intercepted between a given point, as S, and the equator AQ, and perpendicular to the ſame. Conſequently, the circle, by whoſe arch the *declination* GS is meaſured, paſſes through the poles of the world.

The *declination* of a ſtar, &c. is found by firſt obſerving the altitude of the pole, as PR (*fig.* 5.). This ſubtracted from 90° gives the height of the equator AH. Then, the meridian altitude of the ſtar HD being obſerved, if it be greater than the altitude of the equator AH, the latter ſubtracted from the former leaves the *declination* northward AD: or, if the altitude of the ſtar HT be leſs than that of the equator HA, the former ſubtracted from the latter leaves the *declination* ſouthward TA.

E. gr. Tycho at Uraniſbourg obſerved the meridian altitude of the Cauda Leonis:

	HD	50°	59′	0″
Altitude of equat.	HA	34	5	20
Declinat. therefore,	AD	16	53	40

If the ſtar be in the quadrant ZR, then the leaſt altitude MR ſubtracted from the altitude of the pole PR leaves the diſtance from the pole PM; which ſubtracted again from the quadrant PQ, leaves the *declination* MQ. E. gr. M. Couplet obſerved PM 2° 18′ 50″, which ſubtracted from 90° leaves MQ 87° 41′ 10″. And by this method are conſtructed the tables of *declination* of the fixed ſtars given us by Ricciolus and Dechales.

In the conſtruction of tables of *declination* of the ſun, planets, and ſtars, regard ſhould be had to REFRACTION, ABERRATION, NUTATION, and PARALLAX.

By comparing the ancient obſervations with the modern, it appears, that the *declination* of the fixed ſtars is variable; and that differently, in different ſtars. For in ſome it increaſes, and in others decreaſes, and that in different quantities.

It has been greatly diſputed among the later mathematicians, whether or no the *declination* and the obliquity of the ecliptic be variable. See ECLIPTIC, and OBLIQUITY.

A TABLE

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A TABLE SHEWING THE SUN's PLACE AND DECLINATION.

January.

Days.	Sun's Pl.			Sun's Dec.	
	S.	°	′	°	′
1	♑	11	5	S. 23	1
2		12	6	22	56
3		13	8	22	50
4		14	9	22	44
5		15	10	22	37
6		16	11	22	30
7		17	12	22	22
8		18	13	22	14
9		19	14	22	6
10		20	16	21	57
11		21	17	21	48
12		22	18	21	38
13		23	19	21	28
14		24	20	21	17
15		25	21	21	6
16		26	22	20	55
17		27	24	20	43
18		28	25	20	31
19		29	26	20	18
20	♒	0	27	20	5
21		1	28	19	52
22		2	29	19	39
23		3	30	19	24
24		4	31	19	11
25		5	32	18	55
26		6	33	18	40
27		7	34	18	25
28		8	35	18	9
29		9	35	17	53
30		10	36	17	37
31		11	37	17	20

February.

Days.	Sun's Pl.			Sun's Dec.	
	S.	°	′	°	′
1	♒	12	38	S. 17	3
2		13	39	16	45
3		14	40	16	28
4		15	41	16	10
5		16	41	15	52
6		17	42	15	33
7		18	43	15	15
8		19	43	14	56
9		20	44	14	36
10		21	45	14	17
11		22	45	13	57
12		23	46	13	37
13		24	46	13	17
14		25	47	12	57
15		26	47	12	37
16		27	48	12	16
17		28	48	11	55
18		29	48	11	34
19	♓	0	49	11	12
20		1	49	10	51
21		2	50	10	29
22		3	50	10	7
23		4	50	9	45
24		5	51	9	23
25		6	51	9	1
26		7	51	9	38
27		8	51	8	16
28		9	51	8	53

N. signifies North Decl. and S. South Decl.

March.

Days.	Sun's Pl.			Sun's Dec.	
	S.	°	′	°	′
1	♓	10	52	S. 7	30
2		11	52	7	7
3		12	52	6	45
4		13	52	6	21
5		14	52	5	58
6		15	52	5	35
7		16	51	5	12
8		17	51	4	49
9		18	51	4	25
10		19	51	4	2
11		20	51	3	38
12		21	50	3	15
13		22	50	2	51
14		23	50	2	27
15		24	49	2	4
16		25	49	1	40
17		26	49	1	16
18		27	48	0	53
19		28	48	0	29
20		29	47	0	5
21	♈	0	47	N. 0	19
22		1	46	0	42
23		2	46	1	6
24		3	45	1	30
25		4	44	1	53
26		5	43	2	16
27		6	43	2	40
28		7	42	3	4
29		8	41	3	27
30		9	40	3	50
31		10	39	4	13

April.

Days.	Sun's Pl.			Sun's Dec.	
	S.	°	′	°	′
1	♈	11	38	N. 4	37
2		12	37	5	0
3		13	36	5	23
4		14	35	5	45
5		15	34	6	8
6		16	33	6	31
7		17	31	6	53
8		18	30	7	16
9		19	29	7	38
10		20	28	8	1
11		21	27	8	23
12		22	25	8	44
13		23	24	9	6
14		24	23	9	28
15		25	21	9	49
16		26	20	10	11
17		27	18	10	32
18		28	17	10	53
19		29	15	11	14
20	♉	0	14	11	34
21		1	12	11	55
22		2	11	12	15
23		3	9	12	35
24		4	7	12	55
25		5	6	13	15
26		6	4	13	34
27		7	2	13	54
28		8	0	14	12
29		8	59	14	31
30		9	57	14	50

May.

Days.	Sun's Pl.			Sun's Dec.	
	S.	°	′	°	′
1	♉	10	55	N. 15	8
2		11	53	15	26
3		12	51	15	43
4		13	49	16	1
5		14	47	16	18
6		15	45	16	35
7		16	43	16	52
8		17	41	17	8
9		18	39	17	24
10		19	36	17	40
11		20	34	17	55
12		21	32	18	11
13		22	30	18	26
14		23	28	18	40
15		24	25	18	55
16		25	23	19	9
17		26	21	19	22
18		27	19	19	36
19		28	16	19	49
20		29	14	20	1
21	♊	0	11	20	14
22		1	9	20	26
23		2	7	20	37
24		3	4	20	49
25		4	2	21	0
26		4	59	21	10
27		5	57	21	20
28		6	54	21	30
29		7	52	21	40
30		8	49	21	49
31		9	47	21	58

June.

Days.	Sun's Pl.			Sun's Dec.	
	S.	°	′	°	′
1	♊	10	44	N. 22	6
2		11	41	22	14
3		12	39	22	21
4		13	36	22	28
5		14	34	22	35
6		15	31	22	42
7		16	28	22	47
8		17	26	22	53
9		18	23	22	58
10		19	20	23	3
11		20	18	23	8
12		21	15	23	12
13		22	12	23	15
14		23	9	23	18
15		24	7	23	21
16		25	4	23	23
17		26	1	23	25
18		26	58	23	26
19		27	56	23	28
20		28	53	23	29
21		29	50	23	29
22	♋	0	47	23	29
23		1	45	23	28
24		2	42	23	27
25		3	39	23	26
26		4	36	23	24
27		5	33	23	22
28		6	31	23	19
29		7	28	23	16
30		8	25	23	13

July.

Days.	Sun's Pl.			Sun's Dec.	
	S.	°	′	°	′
1	♋	9	22	N. 23	9
2		10	19	23	5
3		11	16	23	0
4		12	14	22	55
5		13	11	22	50
6		14	8	22	44
7		15	5	22	38
8		16	1	22	31
9		16	59	22	24
10		17	56	22	17
11		18	54	22	9
12		19	51	22	1
13		20	49	21	52
14		21	46	21	43
15		22	43	21	34
16		23	40	21	24
17		24	38	21	14
18		25	35	21	4
19		26	32	20	53
20		27	29	20	42
21		28	27	20	30
22		29	24	20	19
23	♌	0	21	20	7
24		1	19	19	54
25		2	16	19	41
26		3	13	19	28
27		4	11	19	15
28		5	8	19	1
29		6	6	18	47
30		7	3	18	33
31		8	0	18	18

Auguſt.

Days.	Sun's Pl.			Sun's Dec.	
	S.	°	′	°	′
1	♌	8	58	N. 18	3
2		9	55	17	48
3		10	53	17	32
4		11	50	17	16
5		12	48	17	0
6		13	45	16	44
7		14	43	16	27
8		15	41	16	10
9		16	38	15	53
10		17	36	15	35
11		18	33	15	18
12		19	31	15	0
13		20	29	14	41
14		21	26	14	23
15		22	24	14	4
16		23	22	13	45
17		24	20	13	26
18		25	17	13	7
19		26	15	12	47
20		27	13	12	28
21		28	11	12	8
22		29	9	11	47
23	♍	0	7	11	27
24		1	5	11	7
25		2	3	10	46
26		3	1	10	25
27		3	59	10	4
28		4	57	9	43
29		5	55	9	22
30		6	53	9	0
31		7	51	8	38

September.

Days.	Sun's Pl.			Sun's Dec.	
	S.	°	′	°	′
1	♍	8	49	N. 8	17
2		9	47	7	55
3		10	46	7	32
4		11	44	7	10
5		12	42	6	48
6		13	40	6	26
7		14	39	6	3
8		15	37	5	41
9		16	35	5	18
10		17	34	4	55
11		18	32	4	32
12		19	31	4	9
13		20	29	3	47
14		21	28	3	23
15		22	26	3	0
16		23	25	2	37
17		24	24	2	14
18		25	22	1	51
19		26	21	1	27
20		27	20	1	4
21		28	19	0	40
22		29	17	0	17
23	♎	0	16	S. 0	7
24		1	15	0	30
25		2	14	0	53
26		3	13	1	17
27		4	12	1	40
28		5	11	2	4
29		6	10	2	27
30		7	9	2	51

October.

Days.	Sun's Pl.			Sun's Dec.	
	S.	°	′	°	′
1	♎	8	8	S. 3	14
2		9	7	3	37
3		10	7	4	1
4		11	6	4	24
5		12	5	4	47
6		13	4	5	10
7		14	4	5	33
8		15	3	5	56
9		16	3	6	20
10		17	2	6	42
11		18	1	7	5
12		19	1	7	28
13		20	0	7	50
14		21	0	8	13
15		22	0	8	35
16		23	0	8	57
17		23	59	9	19
18		24	59	9	41
19		25	59	10	3
20		26	58	10	25
21		27	58	10	46
22		28	58	11	8
23		29	58	11	29
24	♏	0	58	11	50
25		1	58	12	11
26		2	58	12	31
27		3	58	12	52
28		4	58	13	12
29		5	58	13	32
30		6	58	13	52
31		7	58	14	11

November.

Days.	Sun's Pl.			Sun's Dec.	
	S.	°	′	°	′
1	♏	8	58	S. 14	31
2		9	58	14	50
3		10	59	15	9
4		11	59	15	28
5		12	59	15	46
6		13	59	16	4
7		15	0	16	22
8		16	0	16	39
9		17	0	16	57
10		18	1	17	14
11		19	1	17	30
12		20	2	17	47
13		21	2	18	3
14		22	3	18	19
15		23	4	18	34
16		24	4	18	49
17		25	5	19	4
18		26	5	19	19
19		27	6	19	33
20		28	7	19	47
21		29	7	20	0
22	♐	0	8	20	13
23		1	9	20	26
24		2	10	20	38
25		3	11	20	50
26		4	11	21	1
27		5	12	21	12
28		6	13	21	23
29		7	14	21	33
30		8	15	21	43

December.

Days.	Sun's Pl.			Sun's Dec.	
	S.	°	′	°	′
1	♐	9	16	S. 21	53
2		10	17	22	2
3		11	18	22	11
4		12	19	22	19
5		13	20	22	27
6		14	22	22	34
7		15	23	22	41
8		16	24	22	47
9		17	25	22	53
10		18	26	22	59
11		19	27	23	4
12		20	28	23	8
13		21	29	23	12
14		22	30	23	16
15		23	31	23	19
16		24	32	23	22
17		25	33	23	25
18		26	34	23	21
19		27	35	23	28
20		28	36	23	29
21		29	37	23	29
22	♑	0	38	23	29
23		1	39	23	28
24		2	40	23	27
25		3	42	23	26
26		4	43	23	24
27		5	44	23	21
28		6	45	23	19
29		7	46	23	15
30		8	48	23	11
31		9	49	23	7

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This table was calculated by Mr. Ferguſon for the noon of every day of the ſecond year after leap-year, on the meridian of Greenwich; which is a mean between thoſe of leap-year itſelf and the firſt and third years after. See a table of *declination*, &c. annually publiſhed in the *Nautical* ALMANACK.

DECLINATION, *Circle of*, is a great circle of the ſphere paſſing through the poles of the world; and on which the *declination* of a ſtar is meaſured: ſuch is PDGK, paſſing through the poles P and K, *fig.* 4.

DECLINATION, *Parallax of*, is an arch of the circle of *declination*, whereby the parallax of the altitude increaſes or diminiſhes the *declination* of a ſtar.

DECLINATION, *Refraction of the*, an arch of the circle of *declination*, whereby the *declination* of a ſtar is increaſed or diminiſhed by means of the refraction.

DECLINATION *of the needle*, or *compaſs*, is its VARIATION from the true meridian.

DECLINATION *of a vertical plane*, or *wall*, in *Dialling*, is an arch of the horizon, comprehended either between the plane, and the prime vertical circle, if you account it from eaſt to weſt; or between the meridian and the plane, if you account it from north to ſouth.

There are many ways given by authors for finding the *declination* of planes: the moſt practicable way is by a *declinator*.

DECLINATOR, or DECLINATORY, an inſtrument in dialling, whereby the declination, inclination, and reclination of planes is determined.

Its ſtructure is as follows: on a ſquare wooden board ABCD (*Tab. Dialling*, *fig.* 1.) deſcribe a ſemicircle AED, and divide the two quadrants thereof AE and ED into 90 degrees each, beginning from E, as in the figure. Then, having fixed a pin in the center F, fit a wooden ruler HI upon the ſame, moveable thereon, with a box and needle K, as ſhewn under COMPASS.

Now, to apply this, in taking the *declination* of a plane: apply the ſide AD of the inſtrument to the plane propoſed, as MN (*fig.* 2.); and move the ruler FG, with the compaſs G, this way and that, about the center F, till the needle reſt upon the line of the magnetical meridian of the place. Now, if the ruler in this ſituation cut the quadrant in E, the plane is either northern or ſouthern: but if it cut between D and E, the plane declines to the weſt; or, if between A and E, to the eaſt by the quantity of the angle GFE.

The ſame inſtrument will alſo ſerve to take the inclinations and reclinations of planes. To this end, inſtead of the ruler and needle, a thread with a plumbet is fitted on a pin in the center F: then the ſide BC of the *declinator* ABCD, being applied to the propoſed plane, as IL (*fig.* 3.), if the plumb-line FG cut the ſemicircle AED in the point E, the plane is horizontal: or if it cut the quadrant ED in any point at G, then will EFG be the angle of inclination: laſtly, if applying the ſide AB to the plane, the plumbet cut E, the plane is vertical. Hence, if the quantity of the angle of inclination be compared with the elevation of the pole, and equator, it is eaſily known whether the plane be inclined, or reclined. See INCLINATION, and RECLINATION.

DECLINATORY *Plea*, in *Law*. See *Benefit of* CLERGY.

DECLINERS, or DECLINING *dials*, are thoſe which cut either the plane of the prime vertical circle, or the plane of the horizon, obliquely.

If we conceive the plane of the prime vertical circle to revolve a little upon a right line drawn from zenith to nadir, the plane will become declining; nor will it be any longer cut at right angles by the meridian, but by ſome vertical circle paſſing through the intermediate points. After the like manner a horizontal plane will be brought to decline, if revolving on the meridian line, one part of it be raiſed a little towards the zenith, and the other depreſſed towards the nadir.

The uſe of declining vertical dials is very frequent, becauſe the walls of houſes whereon dials are commonly drawn, do generally decline from the cardinal points. Incliners and recliners, and eſpecially deinclineis, are very rare. See DIAL.

DECLIVIS, in *Anatomy*, a muſcle of the abdomen, called alſo *obliquus deſcendens*. See OBLIQUUS *deſcendens*.

DECLIVITY. See ACCLIVITY.

DECOCTION, the act of boiling any ſubſtance in water, to extract the virtues out of the ſame for ſome medicinal purpoſe; or the water itſelf, in which the ſubſtance has been boiled.

Decoction is moſtly employed about balſamics, detergents, and cathartics; for it is not ſo proper for cephalics, &c. as it exhales the more volatile parts, in which the virtues of all thoſe ingredients conſiſt. The harder bodies, as woods, dried roots, &c. require moſt boiling; but herbs and ſeeds need only be ſcalded. All thoſe *decoctions* which are reſtringent, and moſt of the cathartics, may for the greater elegance be clariſied: but all ſuch as are emollient, and intended to conſiſt of the ſoft and mucilaginous parts of ſimples, are by no means to be ſo managed.

M. Boulduc aſſures us from his own experience, that the infuſions of vegetable purgatives act better, and produce better effects, than their *decoctions*; which he attributes to this, that the pureſt and moſt active principles of thoſe bodies are diſſipated and evaporated by a boiling heat. Memoires de l'Academie Royale des Sciences, an. 1710. And M. Baumè, in his Elements of Pharmacy, obſerves, that the infuſion of Peruvian bark made without heat contains more of its principles than the *decoction*: becauſe heat ſeparates and precipitates a conſiderable quantity of reſinous ſubſtance, of which the bark conſiſts: and it is obſerved in general, that *decoction* ought not to be employed but when abſolutely neceſſary, or when the ſame principles and the ſame quantity of theſe principles cannot be obtained by an infuſion without heat.

DECOLLATION, *beheading*, a term frequently uſed in the phraſe, *decollation* of St. John Baptiſt, which denotes a painting, wherein is repreſented the Baptiſt's head, ſtruck off from his trunk; or, the feaſt held in honour of that martyr.

DECOMPOSITE *Leaf*, in *Botany*. See LEAF.

DECOMPOSITION, in *Chemiſtry* and *Pharmacy*, the ſame with analyſis or reſolution; viz. the reduction of a body into its principles, or component parts.

DECOMPOSITION is ſometimes taken for any ſort of reſolution, or ſeparation of parts; but, in propriety, *decompoſition* is a chemical proceſs, in order to a ſeparation of the heterogeneities, or impurities, from any matter.

Tradition, founded on repeated experiments, is a much ſurer way of arriving at the knowlege of the properties of a plant, than any chemical analyſis, or *decompoſition* of its principles. See MEDICINE.

DECOMPOSITION is uſed by Boyle, Newton, and other Engliſh authors, to ſignify the compoſition or junction of two or more bodies, which were previouſly compounded of other parts.

DECORATION, in *Architecture*, any thing that adorns and enriches a building, church, triumphal arch, or the like, either without-ſide, or within.

The orders of architecture contribute greatly to the *decoration*; but then the ſeveral parts of thoſe orders muſt have their juſt proportions, characters, and ornaments; otherwiſe the fineſt order will bring confuſion rather than richneſs.

Decorations in churches are paintings, vaſes, feſtoons, &c. occaſionally applied to the walls; but that with ſo much ſkill, as not to take off any thing from the form of the architecture: as is much practiſed in Italy, at the ſolemn feaſts.

DECORATION is more properly applied to the ſcenes of theatres, which muſt be frequently changed, conformably to the ſubject.

The ancients had two kinds of *decorations* for their theatres: the firſt, called *verſatiles*, having three ſides, or faces, which were turned ſucceſſively to the ſpectators; the other, called *ductiles*, ſhewing a new *decoration* by drawing, or ſliding another before it.

This latter ſort is ſtill uſed, and apparently with much greater ſucceſs than among the ancients, who were obliged to draw a curtain whenever they made a change in the *decoration*; whereas on our ſtage the change is made in a moment, and almoſt without being perceived.

DECORTICATION, the act of peeling, or unhuſking roots, ſeeds, fruits, branches, &c. or of freeing them from their barks, rinds, huſks, or ſhells.

DECORUM, *Decor*, in *Architecture*, denotes the ſuitableneſs of a building, and of the ſeveral parts and ornaments thereof, to the place and occaſion.

Vitruvius is very ſevere in this point; and gives expreſs rules for appropriating, or ſuiting the ſeveral orders to their natural characters: ſo, e. gr. as that a Corinthian column may not be ſet at the entrance of a priſon, or gatehouſe; nor a Tuſcan, in the portico of a temple; as ſome have done among us, in breach of *decorum*. Even in the diſpoſition of the offices of our ordinary houſes, we find grievous offences againſt *decorum*; the kitchen being often where the parlour ſhould be, and that in the firſt and beſt ſtory, which ſhould have been condemned to the loweſt, and worſt.

DECOUPLE', in *Heraldry*, the ſame as uncoupled, i. e. parted, or ſevered.

Thus, a chevron *decouplé* is a chevron wanting ſo much towards the point, that the two ends ſtand at a diſtance from each other.

DECOURS, } in *Heraldry*. See DECREMENT.
DECRESSANT, }

DECOY, a place made fit for catching of wild fowl.

Hence alſo a *decoy-duck* is one that flies abroad, and lights

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lights into company of wild ones, and, being become acquainted with them, by her allurement draws them into the *decoy* place, where they become a prey. See FOWL.

The *decoy* is usually made where there is a large pond, surrounded with wood, and behind it a marshy and uncultivated country, where the wild-fowl may securely sleep during the day-time. The *decoy* consists of several pipes, as they are called, which lead up a narrow ditch, that closes at last with a funnel-net. Over these pipes, which become narrower from the first entrance, is fixed a continued arch of netting, suspended on hoops. There is usually a pipe or ditch for almost every wind that can blow, as the wild-fowl are determined by this circumstance which pipe to chuse; and the *decoy*-man always keeps on the leeward side of the ducks to prevent his effluvia from reaching their sagacious nostrils. Skreens made of reeds are placed at certain distances along each pipe, in such a manner, that it is impossible for the wild-fowl to see the *decoy*-man, before they have passed towards the end of the pipe where the net is fixed. In the evening, when the wild-fowl begin to feed, the *decoy* rises, and the noise of their wings, in their flight, may be heard at a great distance. The rising of the *decoy* is in Somersetshire called *rodding*. The *decoy*-ducks are fed with hemp-seed, which is thrown in small quantities over the skreens, to bring them forwards into the pipes, and to allure the wild-fowl to follow. They are so trained as to lead the way, after hearing the whistle of the *decoy*-man, and enticed by the hemp-seed, and to dive under water, whilst the wild-fowl fly on, and are taken in the net. When they are in such a sleepy state as not to follow the *decoy*-ducks, a small dog is made to pass between the skreens, approaching gradually nearer and nearer to the purse-net; which draws the attention of the wild-fowl, and makes them to advance forward; at length the *decoy*-man appears behind a skreen, and drives them into the net.

The general season for catching wild-fowl in *decoys* is from the latter end of October till February. The act of 10 Geo. II. cap. 32. forbids taking them from June 1 to Oct. 1. under a penalty of five shillings for every bird destroyed within that time. The Lincolnshire *decoys*, which principally supply the London markets, are rented from 5*l.* to 20*l.* a year. Pennant's Zoology, vol. ii. p. 594. 8vo. 1776.

DECOY, in *Sea Language*, denotes a stratagem employed by a small ship of war to betray a vessel of inferior force into a pursuit, till she comes within gun-shot. The stem and sides are painted so as to disguise the ship, and the emblems and ornaments of the nation to which the strangers belong, are assumed. When the adversary is allured to chase, the *decoy* is continued by spreading a great sail, as if she endeavoured to escape; but her course is retarded by an artful alteration of her trim. The *decoy* is also performed for eluding the chace of a ship of superior force in a dark night, by throwing out a lighted cask of pitch, which will burn for a considerable time, and misguide the enemy. When the cask is thrown out, the course of the escaping ship is changed.

DECREE, DECRETUM, an order, or resolve, made by a superior power, for the regulation of an inferior.

The commerce between soul and body, F. Malebranche observes, has no other vinculum, or connexion, but the efficacy of the divine *decrees*. Second causes only execute the *decrees* of Providence.

The doctrine of the Calvinists has been charged with implying that God concurs to sin by a positive *decree*; in that, if crimes were not ordained by an antecedent *decree*, God could not foresee the events.

DECREES of councils are the laws made by them to regulate the doctrine and policy of the church.

DECREE was originally used by the lawyers for any thing ordained by the prince, upon cognizance of a cause.

But the canonists now restrain the word *decree* to the ordinances of popes, which form the first part of the CANON-*law*; as the name canon is to what is ordained by councils.

DECREES in chancery are the determinations or sentences of the lord chancellor, upon full hearing, and weighing the merits of the cause. See CHANCERY.

DECREMENT, or DECRESSANT, in *Heraldry*, denotes the wane, or decrease of the moon, when she is receding from the full towards the new.

In this state she is called, in blazon, a *moon-decressant*, or *en decours*; since to call it a crescent, would be improper, as that term denotes an increase. The moon looking to the left side of the escutcheon, is always supposed to be *decressant*: when she faces the right she is crescent, or in her growth.

DECREMENT, *equal, of life*. See COMPLEMENT *of life*.

DECREPITATION, in *Chemistry*, the operation of drying and calcining salts over the fire, continued till such time as they cease to crackle.

DECREPITATION is also applied to the noise or crackling of the salts during the operation.

The design of this operation is to free the salt of its superfluous moisture: but the salt is hereby rendered so porous, and apt to imbibe moisture, that unless it be kept very close afterwards, it soon moistens again.

DECREPITUDE, in *Medicine*, the consequence of the infirmities of old age; which by degrees leads to death. See DEATH.

DECTA, in *Botany*, a name used by some authors for the garden-beet.

DECRETAL, a rescript, or letter of a pope, whereby some point or question in the ecclesiastical law is solved, or determined.

The *decretals*, *literæ decretales*, compose the second part of the CANON-*law*.

All the *decretals* attributed to the popes before Siricius, in 318, are evidently suppositious. They are supposed by some the spurious offspring of Isidore, archbishop of Seville, by reason the collection thereof bears the name of Isidore Peccator, or Mercator. They were first published by Riculph bishop of Mentz, in the ninth century.

Pope Gregory IX. in the thirteenth century, procured a compilation to be made of all the *decretals* or pontifical constitutions of his predecessors, in five books, by Frier Raimond, a Dominican, his chaplain; which is the only collection authorized by the holy see to be read in schools.

DECUBITUS, in *Medicine*, the manner of lying or reposing in bed.

Every physician knows that the principal indications of the strength or weakness of the motive faculty are taken from the *decubiture*; and indeed we may with very good reason judge of the state of that faculty, by the *decubiture* itself; in the consideration of which too many circumstances enter for us to particularize.

DECUMANNI *Dentes*, a term used by the Latin writers on heraldry to express that sort of line in arms, which we call dansette, or dancetté. See DANCETTE.

It is a kind of indented line, but is very large, and has very few teeth, commonly no more than three. It is supposed to have been in its origin no other than the letter M, with its two lengs extended from one side of the field to the other.

DECURRENT *leaf*, in *Botany*. See LEAF.

DECUPLE, in *Arithmetic*, a term of relation, or proportion, implying a thing to be ten times as much as another.

DECURIO, the chief, or commander of a *decury*, both in the Roman army, and in the college, or assembly of the people. See DECURY.

DECURIO *municipalis* was a name given to the senators of the Roman colonies.

They were called *decuriones*, because their court, or company, always consisted of ten persons. See DECURY.

By means hereof, the cities of Italy, at least such as had colonies, had a share, under Augustus, in the election of the Roman magistrates; the *decuriones*, or senators, of those cities, having suffrages therein, which they sent, sealed up, to Rome, a little before the election.

DECURIO was also a name given to certain priests, intended, as it should seem, for some particular sacrifices, or other religious ceremonies; or for the sacrifices of private families and houses, as Struvius conjectures, who thence derives their name.

Be the origin of the name what it will, we have an inscription in Gruter, which confirms what we have said of their function: ANCHIALVS. CVB. AED. Q. TER. IN. AEDE. DECVRIO. ADLECTVS. EX. CONSENSV. DECVRIONVM. FAMILIAE. VOLVNTATE. Which proves that there was a *decurio* in the house of a private person, Q. Terentius.

DECURSIO, in Roman *Antiquity*. See CAMPICURSIO.

DECURY, ten persons ranged under one chief, or leader, called the *decurio*.

The Roman cavalry was divided into *decuries*.

Romulus divided the whole Roman people into three tribes; over each of which he appointed a tribune: each tribe he subdivided into ten centuries, with centurions at their heads; and each century he subdivided farther into ten *decuries*, over each of which a *decurio* commanded.

DECUSSATION, in *Geometry*, *Optics*, and *Anatomy*, the points wherein two lines, rays, or nerves, cross, or intersect each other: or the action itself of crossing.

The optic nerves of both eyes are commonly supposed to *decussate* before they reach the brain; to which *decussation* many authors attribute it, that we see single with two eyes; though others deny this *decussation*.

The rays of light *decussate* in the crystalline, before they reach the retina.

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There are divers muſcles, membranes, &c. that *decuſſate*; their fibres running over each other at greater or leſſer angles, and by that means giving both ſtrength, and conveniency of motion, in different ways.

DECUSSIS, a Roman coin, which had different values. At firſt it was worth ten *as*, under Fabius ſixteen, and under Auguſtus twelve.

DECUSSORIUM, a ſurgeon's inſtrument, wherewith the *dura mater* is preſſed down in trepanning, to ſecure it from damage in the operation.

DEDI, in *Conveyances*, imports a warranty given to the feoffee, and his heirs. See WARRANTY.

DEDICATION, the act of conſecrating a temple, altar, ſtatue, place, &c. to the honour of ſome deity. See TEMPLE, ALTAR, CHURCH, &c.

The uſe of *dedications* is very ancient, both among the worſhippers of the true God, and among the heathens: the Hebrews call it חנכה, *hhanuchah*, *initiation*; which the Greek tranſlators render εγκαινια, and εγκαινισμος, *renewing*.

In the Scripture we meet with *dedications* of the tabernacle, of altars, of the firſt and ſecond temple, and even of the houſes of private perſons; Numb. vii. 10, 11. 84. 88. Deut. xx. 5. 1 Kings viii. 63. 2 Chron. vii. 5. 9. Ezra vi. 16, 17. 1 Eſdr. vii. 7. Pſalm xxx. 1 Heb. ix. 18. There are alſo *dedications* of veſſels, and garments of the prieſts and Levites, and even of the men themſelves.

Under the Chriſtian diſpenſation, we call the like ceremonies *conſecrations*, *benedictions*, *ordinations*, &c. and not *dedications*, which is only applied to places, as to a church; and is properly the conſecration thereof, performed by a biſhop, with a number of ceremonies preſcribed by the church. See CONSECRATION.

The Chriſtians, finding themſelves at liberty under Conſtantine, in lieu of their ruinous churches, built new ones in every place; and *dedicated* them with a great deal of ſolemnity. The *dedication* was uſually performed in a ſynod; at leaſt they aſſembled a number of biſhops, to aſſiſt at the ſervice. We have the deſcription of thoſe of the churches at Jeruſalem and Tyre, in Euſebius, and many others in later writers.

In the Sacramentary of Gelaſius, the *dedication* of the baptiſtery is delivered ſeparately from that of the church, which was performed with leſs ceremony than at preſent.

The *Feaſt of the Dedication*, or, rather, the feaſt-day of the ſaint and patron of a church, called, in our law-books, &c. *dedicatio*, was celebrated not only by the inhabitants of the place, but by thoſe of all the neighbouring villages, who uſually reſorted thither; and ſuch aſſemblies were authorized by the king.—*Ad dedicationes, ad ſynodos, &c. venientes ſit ſumma pax.*

The cuſtom is ſtill retained, in divers places, under the name of *feaſts*, *wakes*, or *vigils*.

The Jews celebrated the anniverſary of the *dedication* of their temple every year, for eight days; this was firſt enjoined by Judas Maccabæus, and the whole ſynagogue, in the year of the Syro-Macedonian æra 148, i. e. 165 years before Chriſt, on occaſion of the victory obtained by the Maccabees over the Greeks. It begun every year on the twenty-fifth day of Ciſleu, and was continued to the eighth day, during all which time they illuminated their houſes, by ſetting up candles at every man's door, whence it was called the feaſt of lights. This feſtival Chriſt honoured with his preſence at Jeruſalem. John x. 22. Leo of Modena ſays, that they begun with one lamp, and added to the number, according to the day of the feaſt; ſo that on the laſt day they had eight lamps in their houſes.

The heathens had alſo *dedications* of temples, altars, and images, of their gods, &c. Nebuchadnezzar had a ſolemn *dedication* of his ſtatue, Daniel iii. 2. Pilate *dedicated* gilt bucklers, at Jeruſalem, to Tiberius; Philo de Legat. Petronius would have *dedicated* a ſtatue to the emperor in the ſame city, ibid. p. 791. Tacitus, Hiſt. lib. iv. cap. 53. mentions the *dedication* of the Capitol, upon rebuilding it by Veſpaſian, &c.

Theſe *dedications* were performed with ſacrifices proper to the deity they were offered to; but they were never practiſed without public permiſſion. Among the Greeks, it does not appear who gave that permiſſion; but among the Romans, it was always the magiſtrate.

The heathens had ſimilar anniverſaries with the Jews, as that of the *dedication* of the temple of Parthenope, mentioned by Lycophron.

The heathen temples were *dedicated* with many ceremonies, the principal of which were the following. The pontiffs and people encompaſſed the temple with garlands and feſtoons of flowers; the veſtal virgins, holding branches of olive-trees in their hands, ſprinkled the outſide of the temple with the luſtral water; then the perſon who conſecrated, being the prætor, cenſor, &c. drew near the gate with a pontiff at his ſide, who directed him in pronouncing the words of conſecration: after which they ſacrificed a beaſt in the court of the temple, and anointed the ſtatue of the deity to whom it was *dedicated* with oil, and laid it on a pillow rubbed with oil. An inſcription was afterwards made on ſome part of the temple, according to the name of the perſon who performed the office, and the year of *dedication*, which they annually obſerved by a ſacrifice, or ſome other ſolemnity.

DEDICATION, in *Literature*, is an addreſs prefixed to a book, ſoliciting patronage, or teſtifying reſpect for the perſon to whom it is made. The *dedication* of the fourth part of Mr. Edwards's Hiſtory of Birds, is curious: *To* GOD! *the* ONE *eternal! the incomprehenſible! the omnipreſent! omniſcient and Almighty Creator of all things that exiſt! from orbs immeaſurably great, to the minuteſt points of matter, this* ATOM *is dedicated and devoted, with all poſſible gratitude, humiliation, and worſhip, and the higheſt adoration both of body and mind, by his moſt reſigned, low, and humble creature*, G. E.

DEDIMUS *proteſtatem*, in *Law*, a writ whereby commiſſion is given to one, or more, private perſons, to aſſiſt for the expedition of ſome act belonging to a judge.

The civilians call it *delegatio*: it is granted moſt commonly upon ſuggeſtion, that the party, who is to do ſomething before a judge, or in a court, is ſo weak that he cannot travel.

Its uſe is various: as, to take a perſonal anſwer to a bill in chancery; to examine witneſſes, or to levy a fine, &c.

DEDUCTION, in *Commerce*, a ſubtracting, or retrenching, a little ſum paid, from a greater remaining to pay.

DEDUCTION, in *Logic* and *Science*, denotes a proceſs or chain of reaſoning, whereby from principles ſuppoſed and allowed, we arrive at the truth of any propoſition. See REASONING.

DEDUCTOR, in *Antiquity*, a client, who, beſides the ordinary ceremony of ſaluting his patron every morning, was likewiſe obliged to attend him on public occaſions. Pitiſc. Lex. Antiq. in voc.

DEDUTTIONE, in the *Italian Muſic*, the name which Guido Aretine gave to the riſe of the voice, in pronouncing the ſyllables *ut, re, mi, fa, ſol, la: quia per has deducitur vox.* On the contrary, when the voice deſcended by *la, ſol, fa, mi, re, ut*, he called it *Reduttione, quia per has reducitur vox.*

DEDUCTIVE *evidence*, in *Ethics*, is derived either from the invariable properties or relations of general ideas, or from the actual, though perhaps variable, connexions ſubſiſting among things. The former is called *demonſtrative*, and the latter *moral*. Theſe differ from one another with reſpect to their ſubject; with reſpect to their nature, as the one admits of degrees and contrariety of proofs, which the other does not, and as the former is ſimple, ariſing from a coherent ſeries of proofs mutually and eſſentially connected, and the latter is generally complicated, being compoſed of a number of independent proofs. Campbell's Hiſt. Rhet. vol. i. book i. chap. 5.

DEED, *Factum*, in *Law*, ſo called, κατ' εξοχην, by way of eminence, becauſe it is the moſt ſolemn and authentic act which a man can poſſibly perform, with reſpect to his property, is an inſtrument written on paper, or parchment, the validity of which conſiſts in the following particulars: proper parties to contract with one another, and a proper ſubject matter to be contracted for; a good and ſufficient conſideration; writing on paper or parchment duly ſtamped; ſufficient and legal words properly diſpoſed; reading, if deſired, before the execution; ſealing; and by ſtat. 29 Car. II. cap. 3. in many caſes ſigning alſo; and DELIVERY; and which comprehends a contract, or bargain, between party and party.

If a *deed* wants any of the forementioned requiſites, it is void *ab initio*; and it may be alſo avoided by matter *ex poſt facto*; as by raſure, interlining, or alteration in any material part, without a memorandum made at the time of execution and atteſtation; by breaking off or defacing the ſeal; by delivering it up to be cancelled; by the diſagreement of ſuch whoſe concurrence is neceſſary; and by the judgment and decree of a court of judicature.

Of theſe there are two ſorts; *deeds indented*, and *deeds poll*; which denominations ariſe from the form and faſhion thereof; the one being cut in and out in the top, or ſide, called *indented*; *inſtar dentium*, in acute angles, but at preſent in a waving line; and the other *plain*, or *polled*.

A *deed indented*, or an indenture, conſiſts of two parts, or more (for there are *tripartite*, *quadripartite*, *ſeptempartite*, &c. *deeds*); wherein it is expreſſed, that the parties thereto have to every part thereof interchangeably ſet their ſeveral ſeals. The cauſe of their indenting is, that whereas the ſeveral parties have each of them one, the indenture may make it appear, that they belong to one

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and the ſame contract by their tallying. See INDENTURE.

A *deed poll*, or *polled*, anciently called *charta decima parte*, or *charta ſimplex*, is a plain *deed*, without indenting; uſed when the vendor, for example, only ſeals, and there is no need for the vendee's ſealing a counter-part, becauſe the nature of the contract is ſuch, that it requires no covenant from the vendee.

DEED, *date of a*. See DATE.

DEEMSTERS, or DEMSTERS. All controverſies in the iſle of Man are decided, without proceſs, writings, or any charges, by certain judges, choſen yearly from among themſelves, called *deemſters*. This inſtitution they are ſuppoſed to owe to the ancient Druids.

The word is formed from the Saxon *dema*, *judge*, or *umpire*.

There are two *deemſters* for each diviſion of the iſland: in ancient court-rolls they are called *juſticiarii domini regis*. They ſit as judges in all courts, either for life, or property; and with the advice of the twenty-four keys, declare what is law in uncommon emergencies.

DEEP-*ſea line*, or DIP-*ſea line*, in the *Sea-Language*, a ſmall line uſed for ſounding, when a ſhip is in very *deep* water at ſea.

At the end of this line is a piece of lead, called the *deep-ſea lead*, at the bottom of which is a coat of white tallow, to bring up ſtones, gravel, ſhells, or the like, from the bottom; in order to learn the differences of the ground; which being entered, from time to time, in the ſeamen's books, by comparing of obſervations, enable them to gueſs, by their ſoundings, &c. what coaſts they are on, though they cannot ſee land.

DEEP-*waiſted*, in *Naval Architecture*, denotes the ſtructure of a ſhip's deck, when the quarter-deck and fore-caſtle are elevated from four to ſix feet above the level of the upper-deck, ſo as to leave a vacant ſpace, called the WAIST, on the middle of the upper-deck.

DEER, *Cervus*, in *Natural Hiſtory*, the name of a genus of animals, the characters of which are, that the horns fall off every year, that they are ſolid and branched, and that the animal has eight cutting teeth in the lower-jaw, and none in the upper.

The word *cervus*, uſed alone, is underſtood by authors to mean the ſtag, or *red deer*, the others being all diſtinguiſhed by their ſeveral adjectives; the common *fallow-deer* being called *cervus platyceros*, or the broad horned *deer*. Ray.

In the Linnæan ſyſtem, the ſeveral ſpecies of *deer* are claſſed under the genus *cervus*, in the order of *pecora*. The *red deer* is called *cervus elaphus*; the *fallow-deer*, *cervus dama*; the *roe-deer*, *cervus capreolus*; and the *rein-deer*, *tarandus*.

The *common deer* is more preſerved in England than in any other part of the world, and carries its diſtinction from the *red deer*, in its ſize, and in the falcated figure of its horns. See STAG.

They are ſaid to have been introduced here by king James I. out of Norway, who firſt brought them into Scotland, and from thence into his chaces of Enfield and Epping. They are ſcarcely known in France, but are ſometimes found in the north of Europe. In Spain they are extremely large: they are met with in Greece, the Holy Land, and China; but in every country, except our own, are in a ſtate of nature, unconfined by man.

We keep ſeveral ſpecies of theſe, however, and may perhaps increaſe them in ſome ſort to many more, as they are a very ſalacious animal, and will be apt to mingle one ſpecies with another. The principal kinds we know at preſent, are, 1. The *Spaniſh deer*, which is almoſt as large as the *red deer*, but has a very ſlender neck, and is of a deep duſky colour; the tail in this ſpecies alſo is longer than in ours, and is black all over, not white next the body. 2. The *mottled deer*, which are beautifully variegated with black, white, and tawney. 3. The *Virginia deer*, which are larger and ſtronger than ours, and have thicker necks, and are of a grey or aſh-colour, rather than tawney, and remarkable for the largeneſs of their penis and ſcrotum. 4. A ſpecies which have their hinder hoofs marked with white on the outſide; the ears and tails of theſe are long, their horns branched, and their forehead a little depreſſed or hollow between the eyes. Theſe will eat bread, fruits, and any thing that is offered them, and are often beautifully variegated; many of them have black variegations, and a black liſt down their back, with a ſeries of white ſpots on each ſide; others are ſo beautifully marked with white ſpots and other variegations, as to equal the zebra in beauty: theſe they call *menaled deer*. Ray.

The method of hunting *deer* in the iſland of Ceylon is very particular. The huntſmen go out in the night, and only two uſually go together; the one of theſe carries upon his head an earthen veſſel, in which there is ſome fire burning and flaming: the ingredients are generally ſmall ſticks cut into pieces, and common roſin; of this the other man carries a ſupply about him to repleniſh the pot when it becomes low. The perſon who has the fire upon his head carries in one hand a ſtaff, on which there are fixed eight bells, and the larger theſe are the better. This man goes firſt into the woods, and the other follows cloſe behind with a ſpear in his hand. As ſoon as the *deer* hears the noiſe of the bells, he turns towards the place whence the ſound comes, and ſeeing the fire he eagerly runs up to it, and ſtands gazing at a ſmall diſtance; the ſecond man has then nothing to do but to kill him with the ſpear, for he ſees neither of them.

Not only *deer* but elks, and even hares are thus taken; for they gaze at the fire, and never ſee the men. The profits of this ſort of hunting are very large, without any danger; for though there are great numbers of tygers, elephants, and wild boars in theſe woods, the huntſmen are in no danger of them while the fire burns, for they all run away from it. Phil. Tranſ. N° 278. p. 1094.

As the *fallow-deer* lives entirely on vegetables and water, its ſalts are not highly exalted; nor is it much inclined to an alkaline putrefaction, on account of its aliment. But the habitual exerciſe of the animal in ſome degree exalts and volatilizes the ſalts. The veniſon of a *deer* killed when cool, differs very much from that of one killed when heated with exerciſe: the fibres of the firſt are harder, the fleſh more tough, and conſequently leſs eaſily diſſolvable in the ſtomach. The ſecond is more tender, more eaſily diſſolvable, but has a greater tendency to an alkaline putrefaction; which, however, may in a great degree be prevented, by ſuffering the *deer* to bleed plentifully when killed, as the Jews were directed to do, with reſpect to all ſorts of beaſts and fowls. Lev. xvii. 13.

Upon the whole, however, veniſon is eſteemed with juſtice an excellent aliment. The recent blood of a *fallow-deer* drank immediately from the vein, is ſaid to remove dizzineſs from the head: the gall is ſaid to be deterſive, to cure dimneſs of ſight, and take away films of the eyes: the liver is recommended againſt a diarrhœa; the horns are uſed exactly with the ſame intentions as thoſe of the ſtag; and the fat or ſuet agrees exactly with that of the ſame animal. James.

DEER, *African*. See COU-DOU.

DEER, *mooſe*. See MOOSE-*deer*.

DEER, *rein*, in *Zoology*, an animal very common in all the northern nations, and called by ſome authors *tarandus* and *machlis*. It is of the ſhape of a ſtag, but its body is thicker, and its whole make much more robuſt and ſtrong. The breaſt is thick, covered with very long hairs. The legs very hairy, and the hoofs moveable; for the creature expands and opens them in going; it is an extremely ſwift, as well as ſtrong animal; its horns are very long, and finely branched, and particularly run out immediately from the forehead into two fingered branches; in the middle there is a little branch, like the joints in the ſtalks of ſome plants; and thence again they are divided into broad fingered ſegments. They differ from the horns of the elk in their length, and from thoſe of the ſtag or red *deer* in their breadth, and from both, in the multitude of branches, and in their colour, which is white. The lower branches, which fall very near the forehead, are ſaid to be uſed by the creature to break the ice, when the waters are frozen over, that he may get drink. It feeds on ſhrubs and plants, and on the moſs, which it finds on the earth, and upon the barks of trees. It is of prodigious uſe, as a beaſt of carriage, to the Laplanders, and almoſt all the other nations far north. Scheffer alleges, from Tornæus, that the *rein-deer*, though a cloven-footed animal, and plainly of the *deer*-kind, does not chew the cud. This, however, is wholly diſbelieved by the more accurate naturaliſts. Ray.

Its horns and hoofs are of uſe in ſpaſmodic affections.

DEER, *roe*, *Capreolus*, in *Zoology*, a ſpecies of *deer*, diſtinguiſhed by Pliny under the name of *caprea*.

Its Latin names are extremely improper, ſince it has not the leaſt reſemblance or analogy to the goat-kind in any reſpect. It is properly of the *deer* kind, but differs from all the other ſpecies in the ſmallneſs of its ſize, and ſhortneſs of its horns. The horns in this ſpecies are not palmated or compreſſed, as in moſt of the *deers*, but are rounded, and ſerve very aptly for the making knife-hafts, and other ſuch things. Ray.

Theſe animals do not keep in herds like other *deer*, but only in families; they bring two fawns at a time, which are tender, and difficult to be reared, and which the female is obliged to conceal from the buck while they are very young. The fleſh is reckoned delicate food.

This ſpecies no longer exiſts in any part of Great Britain, except

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except in the Scottiſh Highlands. In France they are more frequent; they are alſo found in Italy, Sweden, and Norway, and alſo in Siberia. Pennant's Britiſh Zoology, vol. i. p. 49, &c.

DEER-*field*, a park, or place, where *deer* are kept.

DEER-*hays*, engines, or great nets, made of cords, to catch *deer*. Anno 19 Hen. VII. cap. 11.

DEER-*ſtealers*, in *Law*. There are ſeveral ſtatutes for the puniſhment of *deer-ſtealers*; as 3 Jac. I. cap. 13—13 Car. II. cap. 10—3 and 4 W. and M. cap. 10—5 Geo. I. cap. 15 and 28—9 Geo. I. cap. 22—10 Geo. II. cap. 32. See BLACK *Act*.

DEER's-*weed*, in *Botany*, &c. See DYER's *Weed*.

DE ESSENDO *quietum de tolonio*, a writ that lies for thoſe who are by privilege freed from the payment of toll. See Nat. Br. fol. 226.

DE EXPENSIS *militum*, a writ commanding the ſheriff to levy four ſhillings per day, to defray the expences of a knight of the ſhire attending in parliament. See KNIGHT.

There is a like writ *de expenſis civium & burgenſium*, to levy two ſhillings per day for every citizen and burgeſs in parliament. 23 Hen. VI. cap. 11. See BURGESS.

DE FACTO, ſomething actually in fact, or exiſting: in contradiſtinction to *de jure*, where a thing is only ſo in juſtice, or equity, but not in fact.

After the Revolution, the retainers to the abdicated king inſiſted much on the difference between a king *de jure*, and *de facto*, or a prince in actual but not legal poſſeſſion of the crown, and another who had the right, but not the poſſeſſion. The nonjurors ſtill hold the pretender for king *de jure*; and only allow king George for king *de facto*.

DEFALCATION, from the French *defalquer*, *to diminiſh*, denotes the deduction or ſubtraction of a ſmall ſum, in matters of account, from a large one.

DEFAMATION, in *Law*, is when a perſon ſpeaks ſcandalous words of another, or of a magiſtrate, &c. whereby they are injured in their reputation; for which the party offending ſhall be puniſhed, according to the nature and quality of his offence: ſometimes by action on the caſe at common law, ſometimes by ſtatute, and ſometimes by eccleſiaſtical law. But *defamation* is properly puniſhed by the ſpiritual courts; in which courts it ought to have three incidents: firſt, it is to concern matters ſpiritual, and determinable in the eccleſiaſtical courts; as for calling a man heretic, ſchiſmatic, adulterer, fornicator, &c. Secondly, that it be a matter ſpiritual only; for if the *defamation* concern any thing determinable at the common law, the eccleſiaſtical judges ſhall not have conuſance thereof. And thirdly, though ſuch *defamation* be merely ſpiritual, yet he that is defamed cannot ſue for damages in the eccleſiaſtical courts, but the ſuit ought to be only for puniſhment of the fault by way of penance. Terms de Ley, 224, 225.

DEFAMATORY, a term chiefly uſed in the phraſe *defamatory* libel, ſignifying a writing intended to ſcandalize, or diſcredit a perſon, &c.

By the Roman law, and the ancient ordonnances of France, the authors of *defamatory* libels were puniſhed with death. See Balduin. Comment. ad Leges de Libellis famoſis.

But the hiſtorian tells us, that cardinal Ximenes was inſenſible to all *defamatory* libels: he found it but reaſonable to leave inferiors the liberty of venting their grief by writings, which only live while the perſon is offended at them, and loſe all their ſpirit and malignity when deſpiſed, or diſregarded.

DEFAULT, in *Law*, non-appearance, or an omiſſion of what a perſon ought to do, particularly before a court of juſtice, at a day aſſigned; for which judgment may be given againſt the *defaulter*.

Jurors making default in their appearance for trying of cauſes ſhall loſe and forfeit iſſues, unleſs they have a reaſonable excuſe proved by witneſſes.

DEFEASANCE, in *Law*, (from the French *defaire*, *to defeat*) ſignifies a condition relating to a deed, which being performed the deed is defeated, and rendered void, as if it had never been made. The difference between a common condition and a *defeaſance* is, that the condition is annexed to, or inſerted in, the deed; and a *defeaſance* is a deed by itſelf, concluded and agreed on between the parties, and having relation to another deed. To make a good *defeaſance* it muſt be, 1. by deed; for there cannot be a *defeaſance* of a deed without a deed; and a writing under hand doth not imply it to be a deed. 2. It muſt recite the deed it relates to, or at leaſt the moſt material part thereof. 3. It is to be made between the ſame perſons who were parties to the firſt deed. 4. It muſt be made at the time, or after, the firſt deed, and not before. 5. It ought to be made of a thing *defeaſible*. 1 Inſt. 236. 3 Lev. 234.

DEFECATE, or DEFÆCATE, a term applied to ſome body that is purged and cleared of fæces, or impurities.

Diſtillations, and other chemical operations, are intended to ſeparate the moſt pure and ſubtile parts from the fæces, or lees. See CLARIFICATION.

DEFECTION, the act of abandoning, or relinquiſhing, of a party, or an intereſt, a perſon had been engaged in.

The word is formed of the Latin *deficio*, *to fail of*.

DEFECTIVE, or DEFICIENT, *Nouns*, in *Grammar*, are ſuch as want either a whole number, or a particular caſe, or are totally indeclinable.

The term *defective* is alſo applied to a verb that has not all its moods and tenſes.

DEFECTIVE *third*, in *Muſic*. See DIMINISHED *third*, and DEFICIENT.

DEFENCE, in *Sieges*, is uſed for any thing that ſerves to preſerve or ſcreen the ſoldiers, or the place. See FORTIFICATION.

The parapets, flanks, caſemates, ravelins, and outworks, that cover the place, are called the *defences*, or covers, of the place: and when the cannon has beat down, or ruined, theſe works, ſo that the men cannot fight under covert, the *defences* of the city are ſaid to be demoliſhed.

DEFENCE, *line of*, is that which flanks a baſtion, being drawn from the flank oppoſite thereto.

The line of *defence* ſhould not exceed a muſket-ſhot, i. e. 120 fathoms, or 720 feet, or 60 Rhinland perches: indeed Melder allows 65; Scheiter 70; the counts De Pagan, and Vauban, 75.

Line of DEFENCE *greater*; or *ſichant*, is a right line, as EC (*Tab. Fortif. fig.* 1.) drawn from the point, or vertex, of the baſtion C, to the concourſe E of the oppoſite flank LE, with the curtin EA.

Line of DEFENCE *leſſer*, called alſo *raſant*, and *flanquant*, is the face of the baſtion continued to the curtin; as CI.

DEFENCE, in *Old Law-Books*, is ſometimes uſed for prohibition.

Thus, in Rot. Parl. 21 Edw. III. cries and *defence* were made throughout England, i. e. proclamation and prohibition. *Salmones ponantur in* defenſo. Stat. Weſt. 2. cap. 47. Salmons are by that act prohibited to be taken at certain times. *Uſurarios* defendit *rex Eduardus*, *ne remanerent in regno*. LL. Edu. Confeſſ. cap. 37. In the ſtatutes of Edward I. we have one, intituled, *Statutum de* defenſione *portandi arma*, &c. and it is *defended* by law, to diſtrain on the high-way.

This ſenſe of the word was probably borrowed from the French, in which language it is ſo applied.

DEFENCE, in its true legal ſenſe, denotes an oppoſing or denial of the truth or validity of the complaint, anſwering to the *conteſtatio litis* of the civilians. It is a general aſſertion, which the defendant makes immediately after the COUNT OR DECLARATION, that the plaintiff hath no ground of action; which aſſertion is afterwards extended and maintained in his plea.

DEFENCE-*month* is more uſually called *Fence-month*. See FENCE-*month*.

DEFENCES, in *Heraldry*, are the weapons of any beaſt; as, the horns of a ſtag, the tuſks of a wild boar, &c.

DEFEND, *Defendere*, in our *Ancient Laws* and *Statutes*, ſignifies to prohibit or forbid. See DEFENCE. 5 Rich. II. cap. 7. In which ſenſe alſo Chaucer uſes it, in the following paſſage:

Where can you ſay in any manner, age,
That ever God defended marriage.

See alſo Milton's Parad. Loſt, book ii. line 86.

DEFENDANT, a term in *Law*, ſignifying him who is ſued in an action perſonal; as tenant is he who is ſued in an action real.

DEFENDEMUS, in *Law*, a term uſed in feoffments and donations; having this force, that it binds the donor and his heirs to *defend* the donee, if any man go about to lay any incumbrance on the thing given, other than is contained in the deed of donation. See WARRANTY.

DEFENDER *of the Faith*, (*Fidei Defenſor*) is a peculiar title belonging to the king of England; as *Catholicus* to the king of Spain; and *Chriſtianiſſimus* to the king of France, &c. Theſe titles were given by the popes of Rome; and that of *fidei defenſor* was firſt conferred by Leo X. on king Henry VIII. for writing againſt Martin Luther; and the bull for it bears date *quinto idus Octob.* 1521. It was afterwards confirmed by Clement VII. Lord Herbert's Hiſt. Henry VIII. 105. But the pope, on Henry's ſuppreſſing the houſes of religion, at the time of the Reformation, not only deprived him of his title, but depoſed him from his crown alſo: though in the thirty-fifth year of his reign, his title, &c. was confirmed by parliament; and hath continued to be uſed by all ſucceeding kings to this day. Lex Conſtitutionis, 47, 48. Chamberlayne ſays, the title belonged to the kings of England before that time; and for proof hereof appeals to ſeveral charters granted to the univerſity of Oxford.

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So that pope Leo's bull was only a renovation of an ancient right. Pref. ſtat. lib. i. cap. 2.

DEFENDERE *unica manu*, to wage law, by denying the accuſation upon oath. *Et ſi forte forisfactor ille factum negaverit, & foreſtarius ſolus ſit ſine teſte, ille debet ſe* defendere unica manu *ad unicam vocem rationabili die data in curia abbatis, & ſi unicum teſtem vel plures habuerit, debet ſe defendere ſexta manu, &c.* Charta facta inter W. de Bray, mil. & Abb. & Convent. de Oſeney, fine dat. See MANUS.

DEFENDERS were anciently notable dignitaries, both in church and ſtate; whoſe buſineſs was, to look to the preſervation of the public weal, and to protect the poor and helpleſs, and to maintain the intereſts and cauſes of churches, and religious houſes.

The council of Chalcedon, can. 2. calls the *defender* of a church, ἔκδικος. Codin. De Officiis Aulæ Conſt. makes mention of *defenders* of the palace; ſo does Bollandus, Act. S. Januar. tom. i. p. 501. There was alſo a *defender* of the kingdom, *defenſor regni*; *defenders* of cities, *defenſores civitatum*; *defenders* of the people, *defenſores plebis*; of the poor, fatherleſs, widows, &c.

About the year 420, each patriarchal church began to have its *defender*; which cuſtom was afterwards introduced into other churches, and continued to later days under other names; as thoſe of *advocate*, and *advouee*. See ADVOCATE, and ADVOUEE.

In the year 407, we find the council of Carthage aſking the emperor for *defenders*, of the number of *ſcholaſtici*, i. e. advocates who were in office; and that it might be allowed them to enter, and to ſearch the cabinets and papers of the judges, and other civil magiſtrates, whenever it ſhould be found neceſſary for the intereſt of the church.

DEFENDING, in *Fortification*, is ordinarily ſynonymous with flanking.

Thus, we ſay, the flank *defends* the curtin, and the oppoſite face of the baſtion; this demilune flanks, or *defends*, the horn, or crown work. The ancient fortifications are eaſily taken; there being nothing to *defend*, that is, to flank them.

When they ſay, the flank *defends* the curtin, they mean, not only that it is aſide of the curtin, but, alſo, that it prevents the approaches: that is, ſuch as are poſted on the flank of a baſtion, can ſee any that comes to attack the curtin; and can ſhoot them, or prevent their approaching it.

Inner DEFENDING-*Angle* is the angle CIE (*Tab. Fortification, fig.* 1.) made by the leſſer line of *defence* with the curtin.

Outer DEFENDING-*Angle* is the angle COF, formed by the two leſſer lines of *defence* CO, and FO.

The lines, or ſides, of the rampart, or wall, are *defended* by muſquets, or carbines; as more eaſy, cheap, and commodious, than cannons.

DEFENSITIVE, in *Medicine* and *Chirurgery*, denotes a bandage, plaſter, or the like; uſed in the cure of a wound, to moderate the violence of the pain, the flux of blood, and the acceſs, or impreſſion, of the external air.

The cauterization performed, the wound is covered with lint, and the eye with a *defenſitive*, and a triangular compreſs. For the firſt dreſſing of the entorſe, M. Dionis uſed a little *defenſitive* made of the white of an egg, oleum roſatum, and alum-powder.

DEFENSO, that part of any open field or place, that was allotted for corn and hay, and upon which there was no common or feeding, was anciently ſaid to be *in defenſo*: ſo of any meadow ground, that was laid in for hay only. It was likewiſe the ſame of a wood, where part was encloſed and fenced up, to ſecure the growth of the underwood from the injury of cattle.

DEFENSOR. See ADVOCATE.

DEFERENT, DEFERENS, in *Anatomy*, is applied to certain veſſels of the body, appointed for the conveyance of humours from one place to another.

Vaſa DEFERENTIA are two white ſolid flatted tubes, one lying on the right ſide, and the other on the left; from the epididymis, of which they are continuations; each of them runs up in the cellular vagina of the ſpermatic veſſels, as high as the openings in the abdominal muſcles, the blood-veſſels lying forward, and the *vas deferens* behind them. Theſe veſſels convey the ſeed as faſt as it is ſecreted and prepared in the teſticles, &c. into the *veſiculæ ſeminales*; there to be depoſited till an emiſſion is required. See *Tab. Anat. (Splanch.) fig.* 1. *lit. t t. fig.* 8. *lit. n n. fig.* 15. *lit. a a.*

The paſſage of the *vaſa deferentia* into the *veſiculæ ſeminales* is very particular. Theſe canals are incurvated behind the bladder, and their contracted extremities unite at that place. They unite in an angle, and run between the contiguous extremities of the *veſiculæ*; and this union is ſo cloſe, that the adhering portions ſeem only to form one middle ſeptum, between two ſmall tubes; each of which is formed partly by the extremity of one *vas deferens*, and partly by that of the neighbouring *veſicula*.

Some call them the *ejaculatory veſſels*. They are white, nervous, and round; ſituate partly in the ſcrotum, and partly in the abdomen.

DEFERENT, or DEFERENS, in the *Ancient Aſtronomy*, a circle invented to account for the eccentricity, perigee, and apogee, of the planets.

As the planets are found differently diſtant from the earth, at different times; it was ſuppoſed, that their proper motion was performed in a circle, or ellipſis, which is not concentric with the earth; and this eccentric circle, or ellipſis, they called the *deferent:* becauſe, paſſing through the center of the planet, it ſeemed to ſupport or ſuſtain it in its orbit.

The *deferents* are ſuppoſed differently inclined to the ecliptic, but none more than eight degrees, excepting that of the ſun, which is in the plane of the equator itſelf, and is cut differently by the *deferents* of the other planets in two places, called *nodes*.

In the Ptolemiac ſyſtem, the ſame *deferent* is alſo called the *deferent of the epicycle*; becauſe it traverſes the center of the epicycle, and ſeems to ſuſtain it.

DEFAIT, or DECAPITE', a term uſed, by the French heralds, to denote a beaſt whoſe head is cut off ſmooth: in which it differs from eraſed; where the head is, as it were, torn off, and the neck left ragged.

DEFICIENT *interval*, in *Muſic*, is uſed for an interval leſs than the true by a comma. See INTERVAL.

DEFICIENT *numbers*, are ſuch whoſe parts, added together, make leſs than the integer, whoſe parts they are. See NUMBER.

Such, e. gr. is 8; whoſe quota parts are 1, 2, and 4; which, together, only make 7. See ABUNDANT *Number*.

DEFICIENT *hyperbola* is a curve of that denomination, having only one aſymptote, and two hyperbolic legs running out infinitely towards the ſide of the aſymptote, but contrary ways. See CURVE.

DEFILE, in *Fortification*, a narrow paſs, or way, through which a company of horſe, or foot, can paſs only in file, by making a ſmall front; ſo that the enemy may take an opportunity to ſtop their march, and to charge them with ſo much the more advantage, becauſe the front and rear cannot reciprocally come to the relief of one another.

The word is formed from the French *defile, to unthread*, or *unſtring*.

The term *defile* is alſo applied to narrow paſſages, guarded on each ſide by mountains, &c.

To DEFILE, to go off file by file. See FILE.

The army began to *defile* on the left, and was forced to *defile* at each end of the field, on account of the moraſſes, and the woods.

DEFINITE, in *Grammar*, is applied to an ARTICLE that has a preciſe, determinate ſignification.

Such are, the article *the* in Engliſh, *le* and *la* in French, &c. which fix and aſcertain the noun they belong to, to ſome particular; as, *the* king, *le* roy: whereas, in the quality *of* king, *de* roy, the articles *of*, and *de*, mark nothing preciſe; and are therefore called *indefinite*.

DEFINITION, in *Logic*, an enumeration of the chief ſimple ideas, whereof a compound idea conſiſts; in order to aſcertain, or explain, its nature and character.

The ſchoolmen give very imperfect notions of *definition*. Some define it the firſt notion, or conception, that ariſes of a thing, whereby it is diſtinguiſhed from every other, and from which all the other things, that we conceive of it, are deduced: but the uſual *definition* of it is, *oratio explicans quid res eſt*, a diſcourſe explaining what a thing is: that is, as ſome further explain it, a diſcourſe ſetting forth thoſe attributes which circumſcribe and determine the nature of a thing. For to explain, is only to propoſe the parts ſeparately, and expreſly, which were before propoſed conjunctly and implicitly; ſo that every explication has regard to ſome whole. Hence, according to the diverſe kinds of parts in any thing, viz. phyſical parts, metaphyſical parts, &c. ariſe ſo many different kinds of *definitions* of the ſame thing: thus, man is either *defined* an animal, conſiſting of ſoul and body; or, a reaſonable animal, &c.

Definitions are of two kinds; the one *nominal*, or, *of the name:* the other *real*, or, *of the thing*.

DEFINITION *of the name*, or *nominal* DEFINITION, is that which explains the ſenſe or ſignification appropriated to a word: or, as Wolfius more accurately conſiders it, it is an enumeration of certain marks, or characters, ſufficient

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ficient to diſtinguiſh the thing *defined* from any other thing; ſo as to leave it out of doubt, what the ſubject is that is intended, or denoted by the name. This is what is meant by *definition* in mathematics.

Such is the *definition* of a ſquare, when it is ſaid to be a quadrilateral, equilateral, rectangular figure.

By *definition of the name*, is either meant a declaration of the ideas and characters appropriated to the word in the common uſage of the language; or the peculiar ideas, &c. which the ſpeaker thinks fit to denote by that word, i. e. the ſpecial ſenſe wherein he propoſes to uſe it, in his future diſcourſe. For it may be obſerved, that the ſignificancy of any word depends entirely on our will; and we may affix what idea we pleaſe to a ſound, which itſelf ſignifies nothing at all.

The *definition* of the name, therefore, in the ſecond ſenſe, is merely arbitrary, and ought never to be called in queſtion; only it is to be minded, that we keep inviolably to the ſame ſignification. Hence, a *definition* comes to ſtand, or to be made uſe of, as an undoubted, or ſelf-evident maxim; as it frequently does, and particularly among geometricians, who, above all other people, make uſe of ſuch *definitions*.

Not that we mean, that after having *defined* a thing ſo and ſo, there is nothing in our idea affixed to the *defined* term, but muſt be granted to the thing itſelf: thus, if any one ſhould *define* heat to be a quality in certain bodies, like that which we feel upon the application of fire, or hot bodies; no man could find fault with the *definition*, as far as it expreſſes what he means by the word heat; but this does not hinder us from denying, that there is any thing in the body that warms us, like what we feel in ourſelves.

DEFINITION *of the thing*, or *real* DEFINITION, is properly an enumeration of the principal attributes of a thing, in order to convey or explain its nature.

Thus, a circle is *defined* a figure, whoſe circumference is every where equidiſtant from its center.

Wolfius *defines* a *real definition* to be a diſtinct notion explaining the geneſis of a thing; that is, the manner wherein the thing is made, or done: ſuch is that of a circle, whereby it is ſaid to be formed by the motion of a right line round a fixed point. On which footing, what was before inſtanced as a *real definition* of a circle, amounts to no more than a nominal one.

This notion of a *real definition* is very ſtrict and juſt; and affords a ſufficient diſtinction between a *real* and a *nominal* one. But though it has the advantages of analogy, diſtinctneſs, and conveniency, on its ſide; yet, being only itſelf a *nominal definition*, i. e. a *definition* of the term *real definition*, we muſt conſider it in that light, that is, an idea fixed arbitrarily to that word, and which the author always denotes by that word in the courſe of his book. But, in effect, it is not the uſual ſenſe, or acceptation of the term; which is much leſs convenient and diſtinct. And it is to that uſual acceptation we are here chiefly to have regard.

Definitions are alſo divided into *accurate* and *inaccurate*; the firſt make what we ſtrictly call a *definition*; the ſecond, we diſtinguiſh under the name of *deſcription*.

Of the parts enumerated in a *definition*, ſome are common to other things beſide the thing *defined*; others are peculiar thereto: the firſt are called the *genus*, or *kind*; and the ſecond, the *difference*.—Thus, in the former *definition* of a circle, by a figure whoſe circumference is every where equidiſtant from its center; the word *figure* is the *kind*, as being a name common to all other figures, as well as the circle: the reſt are the *difference*, which ſpecify, or diſtinguiſh this figure from every other figure.

And hence ariſes that rule of F. de Colonia, for the making of a *definition*. "Take, ſays he, ſomething that "is common to the thing *defined* with other things, and "add to it ſomething that is proper, or peculiar to the "thing; i. e. join the genus and ſpecific difference, and "you will have a *definition*." Thus, e. gr. rhetoric is *defined* the art of ſpeaking well; for that it is an art, is common to it with ſeveral other things; but that it is the art of ſpeaking well, is peculiar to it alone.

There are five common rules of a good *definition*. 1. That it be clear, and more eaſy and obvious than the thing *defined*. 2. That it be univerſal, or adequate to the thing *defined*; that is, it muſt agree to all the ſpecies or individuals included under the ſame idea. 3. That it be proper or peculiar to the thing *defined*. The two ordinary defects of *definitions* are, not to agree either to the whole thing, or the ſole thing defined: *neque omni, neque ſoli*: than which nothing is more common, even among the beſt and juſteſt authors. 4. That it be ſhort. And 5. That neither the thing defined, nor a mere ſynonymous name, make any part of the *definition*.

Lord Bacon obſerves of Ariſtotle's *definitions* in the general, that they are very much like that, whereby man ſhould be *defined* an animal that tills the ground. Nor was his maſter Plato leſs exceptionable. The joke put upon him on that account is famous: Plato, it ſeems, had *defined* man, *animal bipes & implume, a two-footed animal without feathers*. Upon which, Diogenes the Cynic, a great derider of the Academics, threw a cock ſtripped of his feathers, and quite naked, into the middle of Plato's ſchool; crying, "Here is Plato's man."

Our *definitions* of ſubſtances, it muſt be added, are very defective: and as for individuals, we have no *definitions* at all. The ideas of ſubſtances are compounded of the various ſimple ideas jointly impreſſed when they preſent themſelves; and all we can do to *define* them, is only to enumerate thoſe ſeveral ſenſible ideas, as colour, denſity, malleability, weight, &c. Thus, gold is *defined* by ſuch a peculiar colour, gravity, &c. Yet ſuch *definitions* may raiſe an idea clear enough of that ſubſtance in the mind of one who has ſeparately received, by his ſenſes, all the ſimple ideas that are in the compoſition of the complex idea *defined*; though the intimate nature and eſſence of ſubſtance is unknown, and conſequently cannot be *defined*.

It follows, that it is only the modes, or attributes, that can be explained by what we properly call a *definition*.

DEFINITION, in *Rhetoric*, is one of the common places, and is defined by Tully, a ſhort comprehenſive explanation of a thing.

The *definitions* of the orator, it muſt be obſerved, differ much from thoſe of the logician and philoſopher: theſe latter *define* a thing cloſely and dryly by genus and difference; e. gr. man is a reaſonable animal, &c.

The orators take a larger compaſs, and *define* things more ornamentally from the places of rhetoric, thus: man is a curious work of an Almighty Creator, framed after his own image, endued with reaſon, and born for immortality. But this rhetorical *definition*, in ſtrictneſs, comes nearer to the nature of a deſcription, than an accurate *definition*.

DEFINITIVE is applied to ſomewhat that terminates or decides a queſtion, or proceſs. Thus we ſay

The houſe of lords have paſſed a *definitive* ſentence in ſuch a cauſe: the church has given a *definitive* judgment on ſuch an article of faith.

The word ſtands in oppoſition to *proviſional*, and INTERLOCUTORY.

DEFINITIVE *pronoun*, in *Grammar*. See DEMONSTRATIVE.

DEFINITOR, a term uſed in ſeveral religious orders, for an aſſeſſor, or counſellor of a general, or ſuperior, in certain monaſteries.

In moſt orders of religious, the *definitor* takes place after the ſuperior of the convent he lives in, when in the convent itſelf; but out of the convent, the *definitor's* place is before his own ſuperior.

Definitors are alſo ſubject, in the convent they reſide in, to the immediate ſuperior of the convent, as to things relating to the monaſtic diſcipline, but in nothing elſe.

DEFLAGRATION, in *Chemiſtry*, the kindling, or ſetting fire to a ſalt, a mineral, or other matter, either alone, or mixed for that purpoſe, with a ſulphureous one, in order to purify it. As is done in the preparing of Æthiops mineral by fire, or ſal prunellæ, &c.

The word is formed of the Latin *de*, and *flagrare*, *to burn*.

This ſhort proceſs has been often recommended to the world as of great uſe in trying the ſtrength of brandies, and other vinous ſpirits, and has been greatly improved in this reſpect by Mr. Geoffroy.

The common way of trying ſpirits by *deflagration*, is to meaſure out any quantity of it, then to heat it, and ſet it on fire; if after it will no longer burn, the remainder is half as much as the quantity meaſured out for the trial was, then the ſpirit tried is found to conſiſt of half water, and half totally inflammable ſpirit; that is, it is exactly what we underſtand by the term perfect proof, and according as the remainder is more or leſs than half the original quantity, it is ſo much below or ſo much above proof, or the due ſtrength of brandy.

This method is much more certain than that by the crown of bubbles, which ariſes upon ſhaking the ſpirit in a vial.

M. Geoffroy's method is thus: take a cylindric veſſel two inches high, and as much in diameter, conſiſting of thin plate ſilver, that metal being much leſs liable to ruſt than copper; this veſſel muſt be fitted with a little rectangular gage exactly graduated into lines, half lines, &c. then the veſſel being ſet level upon a copper caſe made to contain it, a quantity of the brandy to be examined is poured in, to the height of ſixteen lines. This height is to be exactly hit by pouring in more than enough at firſt, and then with a ſmall tube ſucking out what is ſuperfluous; then the veſſel being heated a little, ſo as juſt to make the liquor

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liquor fume, it is to be ſet on fire, and left to go out of itſelf. At the inſtant when the flame expires the gage is plunged perpendicularly into the veſſel, and the lines and quarters exactly noted, which the liquor wants of its former height: this difference gives the preciſe quantity of pure ſpirit, or alcohol, originally contained in the liquor. Mem. Acad. Paris. 1718.

DEFLECTION, the turning any thing aſide from its former courſe, by ſome adventitious or external cauſe:

The word is often applied to the tendency of a ſhip from her true courſe, by reaſon of currents, &c. which divert her, and turn her out of her right way.

DEFLECTION *of the rays of light*, is a property which Dr. Hook obſerved in 1674-5, and read an account of before the Royal Society, March 18, the ſame year. He ſays, he found it different both from reflexion, and refraction; and that it was made towards the ſurface of the opacous body perpendicularly.

This is the ſame property which Sir Iſaac Newton calls INFLECTION. It is called by others DIFFRACTION.

DEFLORATION, or DEFLOWERING, the act of violating, or taking away a woman's virginity.

Death, or marriage, are decreed by the civil law in caſe of *defloration*. Many anatomiſts make the hymen a real proof of virginity, perſuaded that where it is not found, the girl muſt have been *deflowered*. See HYMEN.

The ancients had ſo much reſpect for virgins, that they would not put them to death, till they had firſt procured them to be *deflowered*. On the contrary, the natives of the coaſt of Malabar hold virginity in ſo little eſtimation, that they pay ſtrangers to come and *deflower* their brides. Among the Scots, it was a privilege of the lords of the manor, that they ſhould have the firſt night's lodging with their tenants wives. King Malcolm III. allowed the tenants to redeem this ſervice at a certain rate, called *Marcheta*, conſiſting of a certain number of cows. Buchanan ſays, it was redeemed with half a mark of ſilver. The ſame cuſtom had place alſo in Wales, Flanders, Frieſland, and ſome parts of Germany. See BOROUGH-ENGLISH.

By the cuſtom of Anjou and Maine, a maid, after twenty-five years of age, may ſuffer herſelf to be *deflowered*, without being diſinherited for it by her father.

Du-Cange quotes an arret of the nineteenth of March, 1409, obtained by the inhabitants of Abbeville, againſt the biſhop of Amiens, for taking money to diſpenſe with an injunction he had made, not to ſuffer them to conſummate their marriage the three firſt nights; the injunction being founded on a canon of the fourth council of Carthage, which decrees the ſame, out of reverence of the matrimonial benediction.

DEFLUVIUM, is uſed to expreſs a diſtemper in trees, whereby they loſe their bark; it is thought to be cauſed by a ſharp humour, that diſſolves the glue whereby the bark is faſtened to the wood, and ſometimes by too much drought.

DEFLUXION, or FLUXION, a falling, or flowing of ſome humour to any part of the body; as of rheum on the trachea, and œſophagus, in a catarrh.

The word is formed from the Latin *defluo*, *I flow down*, the humours falling upon ſome part, where they are gathered together.

Defluxions on the lungs are of dangerous conſequence. See CATARRH, and PHTHISIS.

Defluxions on the eyes produce a weakneſs of ſight, and frequently blindneſs. See EYE.

DEFORCEMENT, in *Law*, a with-holding lands, or tenements, by force, from the right owner.

DEFORCEMENT, in the law of Scotland, is uſed for the reſiſting, or offering violence to the officers of the law, while they are actually employed in the exerciſe of their functions, by putting its orders and ſentences in execution; whether they be officers of the ſupreme courts of juſtice, as heralds, purſuivants, meſſengers, macers; or of inferior courts, as mayors.

The puniſhment of this crime is confiſcation of moveables, joined with ſome arbitrary puniſhment; as fine, impriſonment, baniſhment, or corporal pains, according to the degrees of violence, and other circumſtances which aggravate the crime: beſides, the party aggrieved may have an action of damages, to be highly taxed out of the firſt and readieſt of the offender's eſcheat, or other eſtate. See Bayne's Criminal Law.

Deforcing of officers of the cuſtom-houſe, is provided againſt by the ſame ſtatutes as in England.

DEFORCEOR, or DEFORCIANT, one that caſts out another from his lands, or tenements, by mere *force*.

Deforcer differs from *diſſeiſer*, in that a man may diſſeiſe without *force:* and that a man may *deforce* another who never was in poſſeſſion; as where ſeveral perſons have a right to lands, as common heirs, and one entering firſt keeps out the reſt. See DISSEISOR.

Deforcer alſo differs from *intruder*, in that a man becomes *intruder* by a wrongful entry only into lands void of a poſſeſſor; whereas a *deforcer* holds out the rightful heir. See INTRUSION.

DEFORMITY is immediately oppoſed to BEAUTY, and denotes the want of that uniformity, ſymmetry, and variety, neceſſary to conſtitute beauty. Accordingly, Dr. Hutcheſon defines it by the abſence of beauty, or a deficiency in the beauty expected in any ſpecies. *Deformity* and beauty may be conſidered either as natural or moral. Theſe are both referred by the above mentioned ingenious writer to an internal SENSE, and our perceptions of them, as he ſuppoſes, ariſe from an original, arbitrary ſtructure of our own minds, by which certain objects, when obſerved, are rendered the occaſions of certain ſenſations and affections.

That many objects give no pleaſure to our ſenſe, is obvious. Many are certainly void of beauty; but then, ſays this author, there is no form which ſeems neceſſarily diſagreeable of itſelf, when we dread no other evil from it, and compare it with nothing better of the kind. Many objects are naturally diſpleaſing, and diſtaſteful to our external ſenſes, as well as others pleaſing, and agreeable; as ſmells, taſtes, and ſome ſeparate ſounds: but with regard to our ſenſe of beauty, no compoſition of objects which give not unpleaſant ſimple ideas, ſeems poſitively unpleaſant, or painful of itſelf, had we never obſerved any thing better of the ſame kind.

Had there been a ſpecies of the form which we now denominate ugly, or *deformed*, and had we never ſeen or expected greater beauty, we ſhould have received no diſguſt from it; though the pleaſure would not have been ſo great in this form as in thoſe we now admire. Our ſenſe of beauty ſeems deſigned to give us poſitive pleaſure; but not poſitive pain, or diſguſt, any farther than what ariſes from diſappointment.

There are, indeed, many faces which, at firſt view, are apt to raiſe diſlike. But this is generally not from any poſitive *deformity*, but either from want of expected beauty, or from the carrying ſome natural indications of morally bad diſpoſitions, which we all acquire a faculty of diſcerning in countenances, airs, and geſtures. That this is not occaſioned by any form poſitively diſguſting, appears hence, that if upon long acquaintance we are ſure of finding ſweetneſs of temper, humanity, and chearfulneſs, though the bodily form continues, it ſhall give us no diſguſt. There are horrors raiſed by ſome objects, which are only the effect of fear for ourſelves, or compaſſion towards others, when either reaſon, or ſome fooliſh aſſociation of ideas, makes us apprehend danger, and not the effect of any thing in the form itſelf. For we find, that moſt of thoſe objects, which excite horror at firſt, when experience, or reaſon, has removed the fear, may become the occaſion of pleaſure.

The caſual conjunction of ideas gives us diſguſt, where there is nothing diſagreeable in the form itſelf. And this, in effect, is the cauſe of moſt of our fantaſtic averſions to the figures of diverſe animals, &c. Thus ſerpents of all kinds, and many inſects, really beautiful enough, are beheld with averſion by many people, who have got ſome accidental ideas of miſchief aſſociated to them. A ſimilar reaſoning is applied to our perception of moral beauty and *deformity*. Inquiry into the original of our Ideas of Beauty and Virtue, paſſim.

But it is more juſt to diſtinguiſh between the ſentiments of delight or diſguſt, excited in us by beautiful or *deformed* objects, which are effects of ſome *cauſes*, and the natural and real qualities of the perceived objects by which they are produced. There are objects, ſays an excellent writer, which have a natural aptitude to pleaſe or offend, or between which and the contemplating mind there is a neceſſary congruity or incongruity; and though the actual perception of the underſtanding, and conſequent feeling of the heart, in contemplating the actions and affections of moral agents may exiſt in very different degrees, on account of the incidental obſtructions, ariſing from bodily indiſpoſition, mental prejudices and biaſſes, and the aſſociation of ideas; yet, to every rational mind properly diſpoſed, morally good actions muſt for ever be acceptable, and can never of themſelves offend; and morally evil actions muſt for ever be diſagreeable, and can never of themſelves pleaſe. What is right in actions and characters is beautiful and amiable, and gives pleaſure; what is wrong is *deformed* and odious, and excites diſguſt: right and pleaſure, wrong and pain, are as diſtinct as cauſe and effect. It is no leſs abſurd to maintain, that the perception of virtue is nothing diſtinct from the reception of the pleaſure reſulting from it, than to infer, with ſome metaphyſicians, that ſolidity, extenſion, and figure, are only particular modes of ſenſation, becauſe attended, whenever they are perceived, with ſome ſenſations of ſight or touch. Thus does this

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author ſhew, that moral beauty and *deformity* are real qualities of certain actions; in which conſiſts their aptitude to pleaſe or diſguſt. With reſpect to natural beauty, he obſerves, that uniformity amidſt variety pleaſes, becauſe of the *natures* of variety and uniformity, which are ſuch, that whenever united, they are adapted to pleaſe every free, unbiaſſed mind that diſcerns them. He accounts for the pleaſure they afford, without referring them to an arbitrary, internal ſenſe, by the following circumſtances that attend them. They are more eaſily comprehended by the mind: order and ſymmetry give things their ſtability and ſtrength, and ſubſerviency to any valuable purpoſe; regularity and order evidence art and deſign. Diſorder and confuſion, whence *deformity* ariſes, denote only the negation of regularity and order; or any arrangement and diſpoſition of things, which are not according to a law, rule, or plan, and prove not deſign. Theſe are not poſitively diſpleaſing; except where we previouſly expected order, or where impotence or want of ſkill appear, and the contriver has either failed of his deſign, or executed it ill. See on this ſubject Dr. Price's Review of the principal Queſtions and Difficulties in Morals, ch. ii. paſſim. See an admirable Eſſay on bodily *Deformity*, by Mr. Hay, in the Fugitive Pieces, vol. i. p. 93, &c.

DEFOSSION, *Defoſſio*, the puniſhment of burying alive, inflicted, among the Romans, on Veſtal virgins guilty of incontinency. It is alſo a cuſtom among the Hungarians to inflict this puniſhment on women convicted of adultery. Heretics alſo were puniſhed in this manner. See BURIAL.

DEFTARDAR, or DEFTERDAR, the treaſurer of the revenues of the Turkiſh empire. See TREASURER.

The word is compounded, firſt, of *defter*, a Turkiſh name for a book, regiſter, memoir, &c. which Meniſki derives from the Greek Διφθερα, the ſkin or parchment anciently wrote on. The ſecond word, whereof *deftardar* is compounded, is *dar*, a Turkiſh and Perſian word, ſignifying *keeping*, or *holding*, q. d. book-keeper of the monies received and expended.

Meniſki calls him *ſupremus theſaurarius*, *high treaſurer*; and *præſes tameræ*, *preſident of the exchequer*. Caſtellus makes him the keeper, and comptroller of the books of receipts and payments.

The *deftardar*, or, as Vigenere calls him, *dephterderi*, has in his charge the rolls and accounts of the militia, and the treaſury: he receives all the grand ſignior's revenues, pays his forces, and furniſhes the expences of all public affairs: in which, his office differs from that of the chaznadar, who is treaſurer of the ſeraglio or court, as the *deftardar* is of the ſtate.

Ricaut makes a *deftardar*, whom he calls *teftardar*, in each beglerbeglic, or government. Vigenere aſſures us, there are but two, the one for Europe, and the other for Aſia; the firſt reſides at Conſtantinople, and has under him two general commiſſioners, or deputies, one for Hungary, Tranſylvania, Walachia, Croatia, Servia, Bulgaria, Boſnia, &c. the other for Greece and the Morea, with the iſlands of the Archipelago.

Each of theſe has under him as many ſub-commiſſioners, or agents, as there are ſangiackats in his province; which ſub-commiſſioners have as many clerks as there are ſabaſſi's in their ſangiackat, to keep the account of the timariots in their diſtricts. The *deftarder* of Aſia has two general deputies, the one for Anatolia; the other for Syria, Arabia, and Egypt: theſe have likewiſe their ſub-agents, clerks, &c. as thoſe of Europe.

DEGENERATION, the act of failing, or declining from a more perfect, or valuable kind, ſtate, or condition, to an inferior or worſe.

It is a great diſpute among the naturaliſts, whether or no animals, plants, &c. be capable of degenerating into other ſpecies? The affirmative is urged by many, as a ſtrong objection againſt the plant being contained in the ſeed, and that doctrine of generation wherein that is ſuppoſed to be ſo.

But our lateſt and beſt naturaliſts maintain the opinion of ſuch a *degeneration*, or tranſmutation, to be erroneous, and a chimera: not but they allow, that a plant, by being tranſplanted to an improper ſoil, or ſun, may be depraved; ſo as a Dutch roſe, of an hundred leaves, may only produce another roſe, far ſhort thereof in number of leaves, colour, ſmell, &c. Such a depravation is poſſible, and frequently happens; but a ſpecific tranſformation ſeems out of the power of nature; a new form ever ſuppoſing a new *generation*, which again ſuppoſes a corruption of the former kind.

DEGLUTITION, in *Medicine*, the act of ſwallowing the food.

Deglutition is performed, in the firſt place, by means of the tongue, driving the aliment into the œſophagus, or gullet; and then, by the contraction of the ſphincter, and the fleſhy fibres of the ſame œſophagus, which, leſſening the bore, or aperture thereof, protrude the contents downwards into the ſtomach, in our eating.

Deglutition ſucceeds *maſtication*, and is followed by *concoction*.

A difficulty of ſwallowing may be occaſioned by ulcers of the œſophagus, by a ſchirrhous bronchocele, by a thickening of the mucus in the œſophagus, by indurations of the œſophagus, by a fungus in it, by a facculus formed by ſome hard ſubſtance lodged in it, and weakening its coats, and by ſpaſms.

Dr. Duncan, in his Medical Caſes, 1778, mentions the caſe of a difficult *deglutition*, ſuppoſed to ariſe from a venereal infection, in which electrical ſparks, applied to the fauces, were of very conſiderable ſervice, and by degrees removed the complaint.

DEGRADATION, in our law-books called *diſgradation*, and *depoſition*, the act of depriving, or ſtripping a perſon for ever of a dignity, or degree of honour; and taking away the title, badge, and privileges thereof.

The *degradations* of a peer, a prieſt, a knight, a gentleman, an officer, &c. are performed with divers ceremonies. That which anciently obtained in *degrading* a perſon from his nobility, is very curious. It was practiſed in the time of Francis I. upon captain Fangel, who had in a cowardly manner given up Fontarabia, whereof he was governor.

On this occaſion, twenty or thirty cavaliers, without blemiſh or reproach, were aſſembled; before whom the gentleman was accuſed of treaſon, and breach of faith, by a king at arms. Two ſcaffolds were erected; the one for the judges, heralds, and purſuivants; and the other for the guilty cavalier, who was armed at all points, and his ſhield placed on a ſtake before him, reverſed with the point upwards. On one ſide aſſiſted twelve prieſts, in ſurplices, who ſung the vigils of the dead. At the cloſe of each pſalm they made a pauſe, during which the officers of arms ſtripped the condemned of ſome piece of his armour, beginning with the helmet, and proceeding thus, till he was quite diſarmed; which done, they broke his ſhield in three pieces with a hammer. Then the king at arms emptied a baſon of hot water on the criminal's head; and the judges, putting on mourning habits, went to the church. This done, the *degraded* was drawn from off the ſcaffold, with a rope tied under his armpits, laid on a bier, and covered with mortuary cloaths; the prieſt ſinging ſome of the prayers for the dead; and then he was delivered to the civil judge, and the executioner of juſtice.

For a more domeſtic inſtance: Sir Andrew Harcla, earl of Carliſle, being attainted and convicted of treaſon, 18 Edw. II. *coram rege*; after judgment was pronounced on him, his ſword was broken over his head, and his ſpurs hewn off his heels; Sir Antony Lucy, the judge, ſaying to him, "Andrew, now art thou no knight, but a knave."

By ſtat. 13 Car. II. William lord Monſon, Sir Henry Mildmay, and others, were *degraded* from all titles of honour, dignities, and pre-eminences, and prohibited to bear, or uſe, the title of lord, knight, eſquire, or gentleman, or any coat of arms, for ever afterwards.

It has been maintained that the king may *degrade* a peer; but it appears from later authorities, that he cannot be degraded but by act of parliament.

As to eccleſiaſtics, we have an inſtance of *degradation* before condemnation to death, in the eighth century, at Conſtantinople. It is in the perſon of the patriarch Conſtantine, whom Conſtantine Copronymus cauſed to be executed. He was made to aſcend the ambo; and the patriarch Nicetas ſent ſome of his biſhops to ſtrip him of the pallium, and anathematized him: then they made him go out of the church backwards.

But we have a much later inſtance in our own hiſtory: when Cranmer, archbiſhop of Canterbury, was *degraded*, by order of queen Mary, they dreſſed him in epiſcopal robes, made only of canvas, put the mitre on his head, and the paſtoral ſtaff in his hand; and in this attire ſhewed him to the people. Which done, they ſtripped him again, piece by piece.

At preſent, they do not ſtand ſo much on the ceremony of *degradation*, in order to the putting a prieſt to death; by reaſon of the delays and difficulties that it would occaſion. Pope Boniface pronounced, that ſix biſhops were required to *degrade* a prieſt; but the difficulty of aſſembling ſo many biſhops, rendered the puniſhment frequently impracticable.

With us, a prieſt, after having been delivered to his ordinary, if he cannot purge himſelf of the crime laid at his door, his gown, and other robes, are ſtripped over his ears by the common hangman; by which he is declared diveſted of his orders.

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It is decided, however, that *degradation* does not efface the prieſtly character.

Degradation only ſeems to differ from depoſition in a few ignominious ceremonies, which cuſtom has added thereto. Accordingly, in the buſineſs of Arnoul, archbiſhop of Rheims, ſentenced in the council of Orleans, in 991, it was deliberated, what form they ſhould follow in the depoſition; whether that of the canons, that is, ſimple depoſition; or that of cuſtom, viz. *degradation*. And it was declared, that he ſhould ſurrender the ring, paſtoral ſtaff, and pallium; but that his robes ſhould not be torn off.

In effect, the canons preſcribe no more than a mere reading of the ſentence. It is the reſt, therefore, added thereto by cuſtom, viz. the ſtripping off the ornaments, and the tearing the pontifical veſtments, that properly conſtitutes *degradation*.

DEGRADATION, in *Painting*, expreſſes the leſſening, and rendering dim and confuſed the appearance of diſtant objects in a landſcape, ſo that they ſhall appear there, as they would do to an eye placed at that diſtance from them. See PERSPECTIVE.

DEGRADED, in *Heraldry*. A croſs *degraded*, is a croſs marked, or divided into ſteps at each end, diminiſhing as they aſcend towards the middle, or center; by the French called *perronnée*. See CROSS.

DEGREE, in *Algebra*, is uſed in ſpeaking of equations. If the index of the higheſt power of the unknown quantity is 2, it is of the ſecond degree, &c.

DEGREE *of fire*, in *Chemiſtry*. See FIRE and HEAT.

DEGREE, in *Geometry*, an arc of a circle, including a three hundred and ſixtieth part thereof.

Every circle, great and ſmall, is ſuppoſed to be divided into 360 parts, called *degrees:* the *degree* is ſubdivided into 60 leſſer parts, called minutes: the minute into 60 others, called ſeconds: the ſecond into 60 thirds, &c. It follows, that the *degrees*, minutes, &c. of greater circles, are greater than thoſe of leſs.

The ſubdiviſions of *degrees* are fractions, whoſe denominators proceed in a ſexagecuple ratio; that is, a firſt minute is $= \frac{1}{60}$, a ſecond $= \frac{1}{3600}$, a third $= \frac{1}{216000}$, &c. But theſe denominators being troubleſome, their logarithms are ſubſtituted in common uſe, as indices thereof. Thus a *degree*, as being the integer, or unit, is denoted by 0, a firſt minute, or prime, by 1; a ſecond by 2, or ″; a third by 3, or ‴, &c. Accordingly, 3 *degrees*, 25 minutes, 16 thirds, are written 3°, 25′, 16‴.

But though the ancient Egyptians, to whom this diviſion is uſually aſcribed, did, by means hereof, free aſtronomical calculations from fractions; ſince ſexageſimal fractions may be managed as integers; and were very happy in the choice of ſuch a number of *degrees* in the circle, as admitted of a juſt diviſion, by 2, 3, 4, 5, 6, 8, and 9; yet Stevinus, Oughtred, Wallis, &c. with good reaſon, wiſh the ſexageſimal fractions ſet aſide, and decimals taken in their room; or that the *degree* were ſubdivided into 100 equal parts, and each of theſe again into 100, &c. For in decimals there is no occaſion for reducing leſſer fractions into greater, or greater into leſſer; which is a tedious article in ſexageſimals. Stevinus even holds, that this diviſion of the circle which he contends for, obtained in the wiſe age, *in ſæculo ſapienti*. Stevin. Coſmog. lib. i. def. 6.

The magnitude or quantity of angles is accounted in *degrees*; becauſe the curvature of the circle being uniform in all its parts, equal angles at the center are ſubtended by equal arcs, and by ſimilar arcs in peripheries of different diameters. Thus we ſay, an angle of 90 *degrees*, of 70 *degrees*, 50 minutes; of 25 *degrees*, 15 minutes, 45 ſeconds.

Such a ſtar is mounted ſo many *degrees* above the horizon, or declines ſo many *degrees* from the equator.

Such a town is ſituate in ſo many *degrees* of longitude and latitude.

A ſign includes 30 *degrees* of the ecliptic.

DEGREE *of latitude* is on the ſuppoſition of the ſphericity of the earth, the 360th part of the meridian; or more generally it is that ſpace through which an obſerver muſt move on the meridian, in order to increaſe or diminiſh the diſtance of a ſtar from the zenith by one *degree*. See LATITUDE.

The quantity of a *degree* of a meridian, or other great circle, on the ſurface of the earth, is variouſly determined by various obſervers: the methods too made uſe of are various. See EARTH.

Ptolemy fixes the *degree* at $68\frac{1}{3}$ Arabic miles, accounting $7\frac{1}{2}$ ſtadia to a mile. The Arabs themſelves, who made an exact computation of the diameter of the earth, by meaſuring the diſtance of two places under the ſame meridian, in the plains of Senna, by order of Almamon, only make 56 miles. Kepler, determining the ſemidiameter of the earth by the diſtance of two mountains, makes a *degree* 13 German miles; but his method is far from being accurate. Snellius, ſeeking the diameter of the earth, from the diſtance of two parallels of the equator, finds the quantity of a *degree*, by one method, to be 57064 Paris toiſes, or 342384 feet; and by another method, 57057 toiſes, or 342342 feet. The mean between which two numbers, M. Picart found by menſuration, in 1669, from Amiens to Malvoiſin, the moſt ſure, and he makes the quantity of a *degree* 57060 toiſes, or 342360 feet, which, reduced to other meaſures, gives the quantity of a *degree* of a great circle, in

Engliſh miles of 50000 feet each	$73\frac{7}{100}$
Florentine miles of 3000 braccios	$63\frac{7}{10}$
Common French leagues of 2282 toiſes	25
Rhinland perches of 12 feet	29556

However, M. Caſſini, at the command of the king of France, in the year 1700, repeated the ſame labour, and meaſuring the ſpace of 6 *degrees*, 18 minutes, from the obſervatory at Paris, along the meridian to the city of Collioure in Rouſſillon, that the greatneſs of the interval might diminiſh the error, found the quantity of a *degree* to be 57292 toiſes, or 343742 Paris feet, amounting to 365184 Engliſh feet. On which footing, the quantity of a minute of a *degree* of a great circle of the earth is 5710 Paris feet, and that of a ſecond, 95 feet.

With which account pretty nearly agrees that of our countryman Mr. Norwood, who, about the year 1635, meaſured the diſtance between London and York, and found it 905751 Engliſh feet; and finding the difference of latitudes 2° 28′, determined the quantity of one *degree* to be 367196 Engliſh feet, or 57300 Paris toiſes, or 69 Engliſh miles, 288 yards. See Newt. Princ. Phil. Nat. Math. prop. 19. p. 378. and Hiſt. Acad. R. Scienc. anno 1700. p. 153.

M. Caſſini, the ſon, completed the work of meaſuring the whole arc of the meridian through France, in 1718. For this purpoſe he divided the meridian of France into two arcs, which he meaſured ſeparately. The one from Paris to Collioure had given him 57097 toiſes to a *degree*; the other from Paris to Dunkirk 56960; and the whole arc from Dunkirk to Collioure 57060, the ſame as M. Picart's. M. Muſchenbroek, in 1700, reſolving to correct the errors of Snellius, found by particular obſervations, that the *degree* between Alcmaer and Berg-op-zoom contained 57033 toiſes. Meſſrs. Maupertuis, Clairaut, Camus, le Monnier, and Outheir of France, were deputed on a northern expedition, and began their operations, aſſiſted by M. Celſus, an eminent aſtronomer of Sweden, in Swediſh Lapland, in July, 1736, and finiſhed them by the end of the following May. They obtained the meaſure of a *degree*, the middle point of which was in lat. 66° 20′ N. and found it to be 57438,9 toiſes, when reduced to the level of the ſea. Another company of gentlemen was about the ſame time ordered to the ſouth, viz. Meſſrs. Godin, Bouguer, and la Condamine of France, to whom were joined Don Jorge Juan, and Don Antonio de Ulloa of Spain. They left Europe in 1735, and began their operations in the province of Quito in Peru, about October, 1736, and finiſhed them, after many interruptions, about eight years after. The Spaniſh gentlemen publiſhed a ſeparate account, and aſſign for the meaſure of a *degree* of the meridian at the equator 56767,8 toiſes. M. Bouguer makes it 56753 toiſes, when reduced to the level of the ſea; and M. de la Condamine ſtates it at 56749 toiſes.

M. de la Caille, being at the Cape of Good Hope in 1752, found the length of a *degree* of the meridian in latitude 33° 18′ ½ S. to be 57037 toiſes. In 1755, father Boſcovich found the length of a *degree* in latitude 43° N. to be 56972 toiſes, as meaſured between Rome and Rimini, in Italy. In the year 1740, Meſſrs. Caſſini and de la Caille again examined the former meaſures in France, and, after making all the neceſſary corrections, found the meaſure of a *degree*, the middle of which is in 49° 22′ N. to be 57074 toiſes; and in the latitude of 45°, 57050 toiſes. From theſe meaſures it appears that the earth is not a ſphere, but an oblate ſpheroid. See *Figure of the* EARTH. See Maupertuis's Figure of the Earth, &c. 8vo. 1738.

The method of meaſuring a *degree* of the terreſtrial meridian is to meaſure a certain diſtance upon it by a ſeries of triangles, whoſe angles may be meaſured by actual obſervation, connected with a baſe, whoſe length may be taken by an actual ſurvey, and then to obſerve the different altitudes of the ſame ſtar at the two extremities of that diſtance. By this means the length of the arc may be compared with its amplitude, or the number of minutes and ſeconds which it contains.

DEGREE *of longitude*, is the ſpace between two meridians;

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the quantity of which is variable according to the latitude.

These expressions are borrowed from the ancients, who were acquainted with a very large extent of earth, from east to west, which they accounted the length, and a much less from north to south, which passed with them for the breadth, of the earth. See LONGITUDE.

The quantity of a *degree* of a great circle, with the distance of any other parallel from the equator, being given, the quantity of a *degree* in that parallel is found by this canon: as the whole sine, or radius, is to the cosine of the distance of the parallel from the equator; so is the quantity of a *degree* of the equator to the quantity of a *degree* of the parallel.

Suppose, e. gr. the latitude of the parallel 51°, and a *degree* of the equator 69 miles.

Log. of whole sine	10000000
Cosine of 51°	97988718
Log. 69°	18388491
Log. required —	16377209

The number corresponding to which in the tables is $43\frac{42}{100}$, nearly; which being multiplied by 5280, the number of feet in a mile, gives the number of English feet in a *degree* in that parallel. On which foundation (supposing M. Cassini's proportion of 365184 English feet, or 69 miles, 864 feet to 1 *degree* of a great circle) is calculated the following table, exhibiting the quantity of a *degree* of longitude in each parallel of latitude.

Deg. of lat.	English stat. miles of 5280 feet.		Deg. of lat.	English stat. miles of 5280 feet.	
Equ.	69	864			
1	69	808	46	48	338
2	69	641	47	47	994
3	69	363	48	46	1575
4	68	5254	49	45	2082
5	68	4739	50	44	2515
6	68	4143	51	43	2777
7	68	3422	52	42	3069
8	68	2590	53	41	3293
9	68	1648	54	40	3449
10	68	595	55	39	3540
11	67	4714	56	38	3568
12	67	3443	57	37	3533
13	67	2064	58	36	3438
14	67	576	59	35	3283
15	66	4260	60	34	3072
16	66	2557	61	33	2804
17	66	747	62	32	2483
18	65	4110	63	31	2110
19	65	2088	64	30	1686
20	64	5240	65	29	1213
21	64	3008	66	28	743
22	64	672	67	27	128
23	63	3513	68	25	4800
24	63	972	69	24	4150
25	62	3609	70	23	3460
26	62	865	71	22	2732
27	61	3301	72	21	1968
28	61	358	73	20	1169
29	60	2597	74	19	338
30	59	4738	75	17	4756
31	59	1503	76	16	3866
32	58	3453	77	15	2948
33	58	29	78	14	2006
34	57	1791	79	13	1043
35	56	3461	80	12	53
36	55	5040	81	10	4327
37	55	1248	82	9	3303
38	54	2648	83	8	2264
39	53	3961	84	7	1212
40	52	5187	85	6	147
41	52	1147	86	4	3454
42	51	2204	87	3	3272
43	50	3178	88	2	2184
44	49	4071	89	1	1093
45	48	4884	90		0

DEGREE, in *Civil* and *Canon Law*, denotes an interval in cognation or kinship, whereby proximity and remoteness of blood are computed.

Degrees are the intervals whereby it is known what persons are neareſt to the stock or root. Or they are the distances of one person from another in the line of consanguinity or affinity, reckoned from some common parent or ancestor. See CONSANGUINITY.

We say, the second *degree*, the third *degree*; Gregory the Great was the first who prohibited marriage to the seventh *degree*; which restriction was long observed: the second council of Lateran, under Innocent III. restrained the prohibition to the fourth *degree* inclusive, that is, to cousin germans children. See MARRIAGE.

In computing *degrees* of consanguinity, the rule of the civil law is universal, either in the direct, or collateral, otherwise called the oblique line: *Quot sunt generationes tot sunt gradus.* Every generation in the direct line constitutes a different *degree*, reckoning either upwards or downwards; and this method of computation universally obtains, as well in the civil and canon, as in the common law. But in the canon law, the rule is different for the oblique line; and here a distinction is made between the *equal*, and *unequal* oblique line.

In the first case the rule is, *Quot gradibus personæ cognatæ distant a communi stipite, tot gradibus inter se distant.* In the other case the rule is, *Quot gradibus persona remotior distat a communi stipite tot gradibus personæ distant inter se.* Or, generally, in whatsoever *degree* two persons, or the most remote of them, are distant from the common ancestor, that is the *degree* in which they are related to each other. Thus, Titius and his brother are related in the first *degree*, because from the father to each of them is counted only one; Titius and his nephew are related in the second *degree*; for the nephew is two *degrees* removed from the common ancestor; viz. his own grandfather, the father of Titius. This rule of computation is adopted by our law; though the civilians count upwards, from either of the persons related to the common stock, and then downwards again to the other, reckoning a *degree* for each person both ascending and descending.

DEGREE, in *Medicine*, denotes a certain pitch, or intenseness, of the elementary qualities.

The *degrees* usually allowed are four, answering to the number of the Peripatetic elements.

In the school philosophy, the same qualities are divided into eight: the last, or highest *degree* of intension, is called *ut octo*.

They say, a thing is cold in the second *degree*, pepper is hot in the third *degree*, &c.

Fire was held hot in the eighth *degree*, and dry in the fourth *degree*.

DEGREES, in *Music*, are the little intervals whereof the concords, or harmonic intervals, are composed. See INTERVAL, and CONCORD.

The musical *degrees* are three; the greater tone, the lesser tone, and the semi-tone.

The primary cause of the invention of *degrees*, or intervals, less than concords, and whereby the concords are divided, and, as it were, graduated, Descartes judges to have been this: that if the voice were always to proceed by harmonical intervals, there would be too great a disproportion, or inequality, in the intenseness thereof, which would weary both the singer and the hearer.

Thus, supposing A and B the distance of a greater third; if the voice were immediately to ascend from A to B, then because B, being acuter, strikes the ear with more force than A, lest that disproportion should prove uneasy, another sound, C, is put between them; by which, as by a step, or *degree*, we may ascend more easily, and with less unequal force in raising the voice.

Hence it appears, says that author, that the *degrees* are only certain mediums contrived to be put betwixt the extremes of the concords, for moderating their inequality, but which of themselves have not sweetness enough to satisfy the ear, and are of use only with regard to the concords. So that when the voice has moved one *degree*, the ear is not yet satisfied till we come to another, which therefore must be a concord with the first sound.

The substance of what is here alleged amounts to this: that by a fit division of the concording intervals, into lesser ones, the voice will pass smoothly from one note to another, and the hearer be prepared for a more exquisite relish of the perfect intervals, whose extremes are the proper points in which the ear finds the expected rest and pleasure.

Such is the end, and office, of the *degrees*, or lesser intervals. Now there are only three, that experience recommends as agreeable, whose ratios are 8 : 9, called the greater tone; 9 : 10, called the lesser tone; and 15 : 16, called the *semi-tone*. By these alone a sound can move upwards or downwards successively, from one extreme of a concord to another, and produce true melody: and, by means of these, several voices are also capable of the necessary variety in passing from concord to concord. As to the original of these *degrees*, they arise out of the simple concords, and are equal to their differences. Thus, 8 : 9, is the difference of a fifth and fourth; 9 : 10, is the difference of a lesser third and fourth; or of a fifth

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and greater ſixth; and 15:16, the difference of a greater third and fourth, or of a fifth and leſſer ſixth.

DEGREES, *for the uſe of*, in the conſtruction of the ſcale of muſic, ſee SCALE.

DEGREE, in *Univerſities*, denotes a quality conferred on the ſtudents, or members of them, as a teſtimony of their proficiency in the arts or faculties; and entitling them to certain privileges, precedencies, &c.

The *degrees* are much the ſame in the ſeveral univerſities: but the laws of them, and the diſcipline or exerciſe previous to their being obtained, differ. The *degrees* are, *bachelor*, *maſter*, and *doctor*; inſtead of the ſecond, in ſome foreign univerſities, they have *licentiate*.

In each faculty there are but two *degrees*, viz. *bachelor* and *doctor*, which were anciently called *bathelor* and *maſter*: nor do the arts admit of more than two, which ſtill retain the denomination of the ancient *degrees*, viz. *bachelor* and *maſter*. At Oxford, *degrees* of maſter and doctor are only conferred once a year, viz. on Monday after the ſeventh of July; when a ſolemn act is held for the purpoſe. See ACT.

The expences of a *degree* of doctor in any of the faculties, in treats and ſet fees, uſually amount to 100*l.* and that of a maſter of arts, to 20 or 30*l.*

The *degree* of bachelor is only conferred in Lent.

To take the *degree* of bachelor of arts, four years are required, and three more for maſter of arts. See BACHELOR.

At Cambridge, matters are nearly on the ſame footing, only the diſcipline is ſomewhat more ſevere, and the exerciſes more difficult. The commencement, which anſwers to the act of Oxford, is the Monday before the firſt Tueſday in July. The *degrees* of bachelor are taken up in Lent, beginning on Aſh-Wedneſday.

The *degree* of maſter of arts is not given till above three years after that of bachelor; during which time, the candidate is obliged, three ſeveral times, to maintain two philoſophical queſtions in the public ſchools, and to anſwer the objections raiſed againſt him by a maſter of arts. He muſt alſo keep two acts in the bachelors ſchool, and declaim one.

For the DEGREE *of doctor*, ſee DOCTOR.

DEICIDE, DEICIDA, from *Deus*, *God*, and *cædo*, *I kill*, a term only uſed, by ſome writers, in ſpeaking of the condemnation, and execution, of the Saviour of the world, by Pontius Pilate, and the Jews.

Some have objected to the propriety of the term, ſince Chriſt ſuffered and died, not as God, but as man.

DEJECTION, from *dejicio*, *I throw off*, in *Medicine*, properly ſignifies the act of ejecting, or evacuating the excrements, by means of the periſtaltic motion of the guts.

In which ſenſe it comes to the ſignification of *excretion*.

DEJECTION is alſo, and that more ordinarily, applied to the excrements themſelves, thus evacuated; in which ſenſe it is of the ſame import with *ſtool*.

Viſcid, glutinous, or, as ſome call them, *unguinous dejections*, frequent in ſcorbutic diſeaſes, indicate a colliquation of the ſolids of the body.

Among the ſeveral circumſtances from which life and death are prognoſticated, ſtools are none of the leaſt conſiderable. Whether the nature of ſtools in general be good or bad, may be diſcovered, firſt, from their degree of concoction or crudity; ſecondly, from the particular times in which they appear; thirdly, from their ſubſtance; fourthly, from the quantity in which they are diſcharged; fifthly, from the time during which they continue, or the time when they ceaſe; ſixthly, from the advantages with which they are attended, and the eaſe or freedom from pain with which the patient diſcharges them; and in the ſeventh and laſt place, from the train of good or bad ſigns, from which prognoſtics by ſtools derive their certainty.

DEJECTION, in *Aſtrology*, is applied to the planets, when in their detriment, as aſtrologers ſpeak, i. e. when they have loſt their force, or influence, as is pretended, by reaſon of their being in oppoſition to ſome others, which check and counteract them.

Or, it is uſed when a planet is in a ſign oppoſite to that wherein it has its greateſt effect, or influence, which is called its exaltation. Thus, the ſign Aries being the exaltation of the ſun, the ſign Libra is its *dejection*. See EXALTATION.

DEJECTORIA denote purging medicines.

DEIFICATION, in the *Pagan Theology*, the act, or ceremony, of *deifying* their emperors, i. e. of placing them among the gods, and decreeing divine honours to be rendered them. See GOD, and CONSECRATION.

The *deification* is the ſame with APOTHEOSIS.

DEINCLINERS, or DEINCLINING *dials*, are ſuch as both decline, and incline or recline, at the ſame time.

Suppoſe, for inſtance, a plane to cut the prime vertical circle at an angle of 30 degrees, and the horizontal plane under an angle of 24 degrees, the elevation of the pole being 52 degrees; a dial, drawn on this plane, is called a *deincliner*. See DIAL.

DEIPARA, Θεοτοκος. See MOTHER *of God*.

DEIS, or DAGUS, the chief table in a monaſtery. *Solus in refectorio prandebit ſupremus habens vaſtellum, priore prandente ad magnam menſam quam* deis *vulgariter appellamus.*

It is thus called from a cloth called *dais*, with which the tables of kings were covered.

DEISM, the doctrine, or belief, of the *Deiſts*.

Deiſm, from Θεος, *God*, may properly be uſed to denote natural religion, as comprehending thoſe truths which have a real foundation in reaſon and nature; and in this ſenſe it is ſo far from being oppoſite to Chriſtianity, that it is one great deſign of the Goſpel to illuſtrate and enforce it. Thus ſome of the deiſtical writers have affected to uſe it; but *deiſm* more preciſely ſignifies that ſyſtem of religion, relating both to doctrine and practice, which every man is to diſcover for himſelf by the mere force of natural reaſon, independent of all revelation, and excluſive of it; and this religion Dr. Tindal, and others, pretend is ſo perfect, as to be incapable of receiving any addition or improvement, even from divine revelation.

DEISTS, a claſs of people, known alſo under the denomination of *Free-thinkers*, whoſe diſtinguiſhing character it is, not to profeſs any particular form, or ſyſtem, of religion; but only to acknowlege the exiſtence of a God, and to follow the light and law of nature, rejecting revelation, and oppoſing Chriſtianity.

This name ſeems to have been firſt aſſumed, as the denomination of a party, about the middle of the ſixteenth century, by ſome gentlemen in France and Italy, who were deſirous of thus diſguiſing their oppoſition to Chriſtianity by a more honourable appellation than that of atheiſts. Viret, an eminent reformer, mentions certain perſons, in his epiſtle dedicatory, prefixed to the ſecond tome of his Inſtruction Chretienne, publiſhed in 1563, who called themſelves by a new name, that of *Deiſts*. Theſe, he tells us, profeſſed to believe in God, but ſhewed no regard to Jeſus Chriſt, and conſidered the doctrine of the apoſtles and evangeliſts as fables and dreams. He adds, that they laughed at all religion, though they outwardly conformed to the religion of thoſe with whom they lived, or whom they wiſhed to pleaſe, or feared to offend. Some, he obſerves, profeſſed to believe the immortality of the ſoul; others denied both this doctrine, and that of Providence. Many of them were conſidered as perſons of acute and ſubtil genius, and took pains in diſſeminating their notions. See Bayle's Dict. art. VIRET. vol. v. or Leland's View of the Deiſtical Writers, vol. i. p. 2.

The *Deiſts* hold, that, conſidering the multiplicity of religions, the numerous pretences to revelation, and the precarious arguments generally advanced in proof thereof, the beſt and ſureſt way is, to return to the ſimplicity of nature, and the belief of one God; which is the only truth agreed to by all nations.

They complain, that the freedom of thinking and reaſoning is oppreſſed under the yoke of religion; and that the minds of men are ridden, and tyrannized, by the neceſſity impoſed on them of believing inconceivable myſteries; and contend, that nothing ſhould be required to be aſſented to, or believed, but what their reaſon clearly conceives.

The diſtinguiſhing character of modern *Deiſts* is, that they reject all revealed religion, and diſcard all pretences to it, as the effects of impoſture or enthuſiaſm. They profeſs a regard for natural religion, though they are far from being agreed in their notions concerning it. They are claſſed by ſome of their own writers into mortal and immortal *Deiſts*: the latter acknowleging a future ſtate, and the former denying it, or repreſenting it as very uncertain. Oracles of Reaſon, p. 99.

Dr. Clarke diſtinguiſhes four ſorts of *Deiſts*. 1. Thoſe who pretend to believe the exiſtence of an eternal, infinite, independent, intelligent Being, who made the world, without concerning himſelf in the government of it. 2. Thoſe who believe the being and natural providence of God, but deny the difference of actions, as morally good or evil, reſolving it into the arbitrary conſtitution of human laws; and therefore they ſuppoſe that God takes no notice of them. With reſpect to both theſe claſſes, he obſerves, that their opinion can conſiſtently terminate in nothing but downright atheiſm. 3. Thoſe who having right apprehenſions concerning the nature, attributes, and all-governing providence of God, ſeem alſo to have ſome notion of his moral perfections, though they conſider them as tranſcendent, and ſuch in nature and degree, that we can form no true judgment, nor argue with any certainty concerning them: but they deny

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deny the immortality of human ſouls, alleging, that men periſh at death, and that the preſent life is the whole of human exiſtence. 4. Thoſe who believe the exiſtence, perfections, and providence of God, the obligations of natural religion, and a ſtate of future retribution, on the evidence of the light of nature, without a divine revelation; ſuch as theſe, he ſays, are the only true *Deiſts*, but their principles, he apprehends, ſhould lead them to embrace Chriſtianity; and therefore he concludes, that there is now no conſiſtent ſcheme of *Deiſm* in the world. Evidence of Nat. and Rev. Religion, p. 12. 27.

The firſt *Deiſtical* writer of any note that appeared in this country, was Herbert baron of Cherbury. He lived and wrote in the laſt century. His book De Veritate was firſt publiſhed at Paris in 1624. This, together with his book De Cauſis Errorum, and his treatiſe De Religione Laici, were afterwards publiſhed in London. His celebrated work De Religione Gentilium, was publiſhed at Amſterdam in 1663, in 4to. and in 1700 in 8vo. and an Engliſh tranſlation of it was publiſhed at London in 1705.

As he was one of the firſt that formed *Deiſm* into a ſyſtem, and aſſerted the ſufficiency, univerſality, and abſolute perfection of natural religion, with a view to diſcard all extraordinary revelation, as uſeleſs and needleſs, we ſhall ſubjoin the five fundamental articles of this univerſal religion. They are theſe: 1. That there is one ſupreme God. 2. That he is chiefly to be worſhipped. 3. That piety and virtue are the principal part of his worſhip. 4. That we muſt repent of our ſins; and if we do ſo, God will pardon them. 5. That there are rewards for good men, and puniſhments for bad men, both here and hereafter. Our own age has produced a number of advocates in the ſame cauſe; and however they may have differed among themſelves, they have been agreed in their attempts of invalidating the evidence and authority of divine revelation. We might mention Hobbes, Blount, Toland, Collins, Woolſton, Tindal, Morgan, Chubb, lord Bolingbroke, Hume, &c. Some have alſo added lord Shafteſbury to the number.

But the friends of Chriſtianity have no reaſon to regret the free and unreſerved diſcuſſion which their religion has undergone. Objections have been ſtated and urged in their full force, and as fully anſwered; argument and raillery have been repelled; and the controverſy between Chriſtians and *Deiſts* has called forth a great number of excellent writers, who have illuſtrated both the doctrines and evidence of Chriſtianity in a manner that will ever reflect honour on their names, and be of laſting ſervice to the cauſe of genuine religion, and the beſt intereſts of mankind.

The number of *Deiſts* is ſaid to be daily increaſing: in England, many men of ſpeculation and letters are ſaid to incline that way; and the like is obſerved in ſome of our neighbour nations, where freedom of ſpeaking, writing, and thinking, are indulged. Not that unreſtrained liberty in this reſpect can ever injure Chriſtianity, or ſerve the cauſe of *Deiſm*: truth neither needs nor ſeeks diſguiſe; but where freedom is allowed, men's ſentiments, on the ſubject of religion, are more generally known.

DEITY, *Godhead*; a common appellation given to God; and alſo by the poets to the heathen gods and goddeſſes.

DEIVIRILE, a term in the ſchool theology, ſignifying ſomething divine and human at the ſame time. See THEANDRIC.

The word is a compound of *Deus*, *God*, and *virilis*, of *vir*, *man*.

DELEGATES, certain perſons *delegated*, or appointed, by the king's commiſſion, under the great ſeal, to ſit upon an appeal to the king in the court of chancery. See COURT *of Delegates*.

DELEGATION, a commiſſion extraordinary given a judge to take cognizance of and determine ſome cauſe, which ordinarily does not come before him.

In the civil law, *delegation* alſo denotes a ſort of ſurrender, whereby a perſon ſubſtitutes another debtor in his place. See Ulpian. l. 11. ff. *de novationibus & delegationibus*.

This *delegation* differs from transferring, or tranſlation, becauſe three perſons intervene in a *delegation*, viz. the creditor, the debtor, and a third, who himſelf is indebted to the debtor, and on whom the debtor transfers the obligation he was under to pay the creditor, *delegating* him, as it were, for that purpoſe. But, in a ſimple transfer, it is enough the transferrer and the transferree be preſent.

DELETERIOUS (from δηλεω, *noceo*, *I hurt*), a term ſometimes uſed among naturaliſts, for ſuch things as are of a pernicious and poiſonous nature. See POISON.

DELF, a quarry, or mine, where ſtone or coal is dug.

From the Saxon word *delfan*, *to delve*, or *dig*.

DELF *of coal*, denotes coal lying in veins under-ground, before it is dug up.

DELF, or DELVE *of coals*, is alſo a certain quantity, dug out of a mine, or pit. See COAL.

DELF is alſo uſed, in *Heraldry*, for one of the abatements of honour; being a ſquare in the middle of the eſcutcheon.

A *delf* tenne was anciently due to him that receded from his own challenge, or any way departed from his parole, or word. If there be two, or more, *delfs* in an eſcutcheon, it is then no longer an abatement: ſo alſo, if it be of metal, or charged upon; it then becomes a charge of perfect bearing.

DELF-*ware*, a kind of pottery of baked earth, covered with an enamel, or white glazing, which gives it the appearance and neatneſs of porcelain. The baſis of this pottery is clay; and the kinds of clay chiefly uſed are the blue and green, with an addition of marle or ſand, in order to leſſen the contraction of the clay, to render it leſs compact, and to afford a better ground for the enamel. Red clay is alſo added, which, on account of its ferruginous matter, binds and gives a greater ſolidity. The proportions of theſe ingredients vary in different works, according to the different qualities of the earths employed. Three parts of blue clay, two of red clay, and five parts of marle, form the compoſition uſed in ſeveral manufactories. Veſſels formed of theſe materials muſt be dried very gently, to avoid craeking. They are then to be placed in a furnace to receive a ſlight baking, and they are laſtly to be covered with an enamel or glazing, which is done by pouring upon the veſſels thus prepared, the enamel, which has been ground very fine, and diluted with water. The glazing, which is nothing but white enamel, ought to be ſo opake as not to ſhew the ware under it. The enamels for *delf-ware* are compoſed of ſand or flints, vitrifying ſalts, calx of lead, and calx of tin. The vitrification of ſand is effected by ſomewhat leſs than an equal part of alkaline ſalt, or twice its weight of calx of lead, and one part of calx of tin, which is deſigned for giving a white opake colour to the maſs, is to be added to three or four parts of all the other ingredients taken together. M. D'Antic recommends for the white enamel uſed in glazing a mixture of a hundred pounds of calx of lead, with about a ſeventh part of that quantity of calx of tin for common *delf*, or a fourth part of calx of tin for the fineſt *delf*; a hundred, or a hundred and ten pounds of fine ſand; and about twenty or thirty pounds of ſea-ſalt, or ſalt of glaſs. To make this enamel, lead and tin are calcined together with a ſtrong fire, and the ſand is alſo to be made into a fritt with the ſalt or aſhes. The whole, being well mixed and ground together, is placed under the furnace, where it is melted and vitrified during the baking of the ware. Then it is to be ground in a mill, and applied as above directed. Dict. of Chem. Eng. edit. 1777. See ENAMEL, GLAZING, and PORCELAIN.

DELIA, Δηλια, in *Antiquity*, a quinquennial feſtival in the iſland of Delos, inſtituted by Theſeus in honour of Venus. Pott. Archæol. Græc. lib. ii. cap. 20.

DELIA, in *Antiquity*, feaſts celebrated by the Athenians, in honour of Apollo, ſurnamed *Delius*.

The principal ceremony in this feaſt, was an embaſſy, or rather a pilgrimage, to Apollo of Delos, performed every five years, by a certain number of citizens, deputed for that purpoſe, and called *Deliaſtæ*, Δηλιασται, or *Theori*, Θεωροι, q. d. the *ſeers*; and the firſt perſon of the embaſſy, or deputation, *Architheorous*, Αρχιθεωρος. To him were added four more of the family of the *Ceryci*, prieſts deſcended from Mercury, who reſided all the year at Delos, to aſſiſt in the temple. The whole deputation ſet out in five veſſels, carrying with them every thing neceſſary for the feaſt, and the ſacrifices.

The *Deliaſts*, who went abroad, were crowned with laurel. At their arrival, they immediately offered a ſacrifice to Apollo: and, after the ſacrifice, a number of young maids danced round the altar, a dance called in Greek Τερανος, wherein, by their various motions, and directions, they repreſented the turnings and windings of a labyrinth. When the *Deliaſts* returned to Athens, the people went out to meet them, and received them with all the joy and acclamation imaginable. They never laid aſide their crown till their commiſſion was fully completed; and then they conſecrated it to ſome god in his temple.

The whole time of their going and returning, with all the ceremonies of their embaſſy, was called the *Delia*; during which time no criminal might be executed, which was a peculiar privilege of this feaſt, not allowed to any other, not even thoſe of Jupiter. Thus, Plutarch obſerves, that it was a day conſecrated to Jupiter, when Phocion was made to take the poiſon to which he was condemned; whereas they waited thirty days to give it to Socrates, by reaſon of the *Delia*.

According to Thucydides, the *Delia* were firſt inſtituted in the ſixth year of the Peloponneſian war, after the

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Athenians had extirpated the isle of Delos, removed all the tombs out of it, and ordained, that nobody should either be born or die in it; but that all the sick people should be removed into a little island, called Rhenia: though the Ionians, and the neighbouring islanders of Ionia, had long before that time held a sort of *Delia*; that is, feasts and games, like those which the Athenians celebrated afterwards.

DELIAC, DELIACUS, among the *Ancients*, denoted a poulterer; or a person who sold fowls, fatted capons, &c.

The traders in this way were called *Deliaci*; the people of the isle of Delos first practised this occupation. They also sold eggs, as appears from Cicero, in his Academic Questions, lib. iv. Pliny, lib. x. cap. 30. and Columella, lib. viii. cap. 8. likewise mention the *Deliaci*.

DELIACAL *problem*, *problema* DELIACUM, a famous problem among the ancients, concerning the duplication of the cube. See DUPLICATION.

DELIAS, Δηλιας, in *Antiquity*, the name of the ship in which the Delian procession was annually made by the Athenians. See DELIA.

DELIBAMENTA, in *Antiquity*, a libation offered to the infernal gods, which was always poured downwards; hence this act was expressed by the word *defundere*.

DELIBERATIVE, is applied to that kind, or branch, of rhetoric employed in proving a thing, or convincing an assembly thereof, in order to oblige them to put it in execution.

The *deliberative* kind was much in vogue among the Greeks and Romans, when the orators harangued the people.

To have a *deliberative* voice in the assembly, is when a person has a right to give his advice, and his vote, therein. In councils, the bishops have *deliberative* voices; those beneath them have only consultative voices.

DELICT, in the *Law of Scotland*, is used to express an offence of an inferior degree to a crime, to be punished only by the effect of a civil action, for reparation of private damage.

DELIGATION, *Deligatio*, that part of surgery which relates to the binding up of wounds, ulcers, broken bones, &c.

That bandages are very useful, and even necessary, for curing the disorders of the human body, is evident not only from the testimony of Hippocrates, Galen, and other eminent physicians; but also from this, that there can scarcely be any operation in surgery performed successfully without their assistance. For should a surgeon perform an operation with the greatest judgment and care, but miscarry in the application of the bandage, all his endeavours would be to no purpose: and more especially in the treatment of wounds, fractures, luxations, and amputations. And we often find that in fractures and luxations, after a proper reduction of the parts, the cure depends more on a skilful application of the bandage, to the part affected, than on the medicines. In the case of violent hæmorrhages, a proper application of the bandage and compresses, proves the most effectual and speedy remedy, as must be acknowleged by every one who has any skill in surgery: not to mention, that the making and applying a bandage after a genteel and ready manner, is justly reckoned among the good qualifications of a surgeon; as it gains him the esteem of the spectators, and the confidence of the patient, which is of great influence in forwarding the cure: for both the one and the other judge of a surgeon's abilities by his performance on such occasions. See BANDAGE.

DELILERS, a kind of Turkish hussars, collected from Servia, Bulgaria, and Croatia. They are violent and furious, whence their name, and disorderly in their attack, which some have ascribed to their belief of predestination. Encycl.

DELIMA, in *Botany*, a genus of the *polyandria monogynia* class. This genus has no corolla, the calyx is five-leaved, and the fruit is a double-seeded berry.

DELINEATING. See DESIGNING.

DELINQUENT, a person who has committed some fault, or offence.

It is the business of a magistrate to be severe in punishing *delinquents*.

DELIQUESCENCE, in *Chemistry*, denotes the property which certain bodies possess of attracting moisture from the air, and of thereby becoming liquid. It is peculiar to saline substances, or bodies containing them, and results from their AFFINITY with water. See DELIQUIUM.

DELIQUIUM, or DELIQUIUM *animi*, from *delinquo*, *I swoon*, a swooning, or fainting away; called also syncope, lipothymia, lipopsychia, eclysis, and asphyxia.

DELIQUIUM, from *deliquesco*, *to be dissolved*, in *Chemistry*, is the dissolution, or melting, of a salt, or calx, by suspending it in a moist cellar.

Salt of tartar, or any fixed alkali, set in a cellar, or other cool moist place, and in an open vessel, resolves, or runs, into a kind of liquor, called by the chemists oil of tartar *per deliquium*.

DELIQUIUM is also used, in some authors, for a distillation by means of fire. See DISTILLATION.

DELIRIUM, light-headedness, in *Medicine*, a symptom frequent in fevers, caused by internal inflammations, wounds, &c. whereby the mind is disordered to a degree of folly, or even phrensy.

Some derive the word from *de*, and *lira*; which, among the ancients, signified a furrow drawn in a right line; whence *delirare*, *a recto aberrare*.

Deliriums also frequently arise from immoderate losses of blood, whereby the brain is too much weakened; from the stings of venomous beasts; from the seed, or menses, being retained in the womb; from the rotting of a gangrened member, &c.

A disorder in the diaphragm commonly produces a *delirium*.

There are various species and degrees of *deliriums*. In some the patient is fierce and outrageous; in others more mild and easy, offering no violence to any body, but only indulging idle, ridiculous discourse; some laugh and sing; others cry and are sullen, &c.

As it is good for a patient under all disorders of the body, to have his mind untouched, or to have all his actions under the command of the ruling faculty, as at other times; so, on the contrary, to be in any manner delirious, or to be deprived in whole or in part of the use of his reason, is a bad prognostic; and in acute diseases often portends death. James.

DELIVERY, *Parturition*, or *child-birth*, the bringing forth of a perfect fœtus, or child, out of its mother's womb; whether it be living or dead. See FOETUS, BIRTH, &c.

To a natural *delivery*, according to the physicians, are required three conditions: first, that both the mother and the child strive alike, the one to *deliver*, and the other to be *delivered*: the second, that it come into the world head foremost, which is its natural posture: and the third, that it be quick and easy, without ill accidents.

When the child presents its feet foremost, or comes across or double, it is no natural *delivery*; and the Latins call such children *agrippæ*, q. d. *ægre parti*.

A *legitimate delivery* is that which happens at the just term, i. e. in the tenth lunar month; and an *illegitimate*, that which comes either sooner, or later; as in the eighth, or after the tenth. Hoffman says, that the usual time of gestation is nine solar months. Junker is of opinion, that the natural time of *delivery* is in the fortieth week, from the first suppression of the menses, or the twentieth, or twenty-first, from the time when the motion of the fœtus is first perceived; and he adds, that it is a good omen if the time of *delivery* be at or near that of the usual discharge of the menses in a state of health. Women are indeed *delivered* at seven, eight, nine, ten, and eleven months, and not later: though there are some physicians who hold, that a *delivery* may be regular in the fourteenth month.

It has been observed, that *deliveries* are more happy in the seventh month than in the eighth, i. e. that the child is easier saved, and more frequently lives, when it comes in the seventh than when in the eighth month.

Monsr. Peysonnel, a physician of Lyons, has a Latin treatise expressly *on the term of delivery*; wherein he undertakes to reconcile all the apparent contradictions of Hippocrates, with respect to it. He holds, that the shortest term of a *legitimate* birth, according to Hippocrates, is a hundred and eighty-two days, or six complete months; and the longest two hundred and eighty days, or nine months, and ten days; and that the children who come earlier, or later, than those terms, do not live, or are not *legitimate*.

DELIVERY, *symptoms*, *causes*, *and process of*. Besides the more decisive symptoms of approaching *delivery*, women in these circumstances are subject to pains, which are called false and spurious. They exhaust the strength of the patient without promoting the birth: pains of this kind may be distinguished from true labour pains, by their being of a flatulent kind, and running sometimes transversely across the abdomen, and sometimes upwards from it towards the breast; they are usually owing to costiveness, a purging, or a plethora. If the *os tincæ* is shut during these pains, it may be concluded that they are false; and if the patient is costive, a clyster should be administered; if a purging attends them, gentle opiates will relieve; and if a plethora, bleeding will be proper. Some have recommended stimulating cordials; but others have observed, that true labour pains are best promoted by opium. The true symptoms of approaching *delivery*, and the process of it, are as follow. Some days before the labour commences, the contents of the belly sink, and its size is apparently diminished: soon after pains are felt, which are at first slight, and return at

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conſiderable intervals; in conſequence of theſe the uterus begins to contract, and a mucous matter is diſcharged from the vagina; then the pains return quicker, continue longer, and are more ſevere; the pulſe is affected, the ſkin becomes hotter, the face reddens, and a general agitation follows; the mucus is tinged with blood; the *os tincæ* opens, and its edges grow thin; the membranes protrude with the waters, dilating and widening the orifice. The child, at the inſtant of pain, is raiſed by the compreſſed waters from the *os internum* towards the fundus, whilſt the uterus itſelf deſcends by degrees into the inferior baſin. When the pain ceaſes each time, the womb riſes, the tumor formed by the membranes diſappears, the *os tincæ* is relaxed, and the diameter diminiſhed; the child falls upon the lower part of the womb, and may be eaſily diſtinguiſhed, as well as the part that preſents itſelf to the paſſage, through the relaxed membranes. Towards the end of labour, the pains ſucceed more rapidly, and with greater violence; at firſt they uſually begin in the ſmall of the back, and terminate about the pudenda, but now they begin in the *regio umbilicalis*, and die away towards the fundament, where they commonly leave a ſenſibility of weight. The tumor formed by the waters diſtending the membranes below the mouth of the womb, dilates the parts, till at length it burſts, and diſcharges the waters. If the child's head preſents fairly, it ſtops the diſcharge of the waters. Sometimes the ſame effort which burſts the membranes, expels the infant, and terminates labour. At other times, the interval is long before the *delivery* of the child. The head of the child, having paſſed the *os internum*, enters the vagina, which widens in proportion as it ſhortens; the perinæum is much ſtretched, and the frenulum ſometimes torn in the paſſage; the nymphæ are obliterated, and the labia pudendi turned inward, and confounded in the general diſtenſion. At length the head forces the *os externum*, and the body readily follows, with the reſt of the waters mixed with blood. In this laſt period the woman trembles, and is convulſed, but is ſoon relieved by the expulſion of the child; ſome time after which, returning efforts are exerted for the excluſion of the PLACENTA.

The proximate cauſe of *delivery* is the contraction and compreſſion of the womb, which is muſcular and reticulated, formed of fibres running parallel on its inner ſurface from the fundus to the neck, of others croſſing theſe diagonally, and of others again horizontally interlaced, and cloſely wove towards the fundus; and the irritation which the womb ſuffers at the end of pregnancy from the increaſed bulk of the fœtus, and the conſequent dilatation of the uterine fibres beyond their limited dimenſions, is the remote cauſe of *delivery*. For a recital of the principal circumſtances attending *delivery* in caſes of difficult and preternatural labour, ſee LABOUR.

In order to *delivery* in a natural labour, the moſt convenient poſture both for the woman and her aſſiſtant, is that of lying on her left-ſide upon a bed, with the knees drawn up towards the belly. The perſon who aſſiſts on this occaſion ſhould be attentive and patient, and watch every opportunity of aiding the efforts of nature, without forcing them. Whenever he examines the patient by touch, in order to know the ſtate of the uterus, he ſhould convey a ſmall portion of ſome oily matter, as ſoft pomatum, &c. into the vagina, to anoint the mouth of the uterus, that it may dilate itſelf with greater eaſe and expedition. When the infant preſents itſelf for birth, he may gently draw it forward, obſerving that it is not in any part entangled by the navel-ſtring. When it is brought alive into the world, it ſhould be laid on its ſide, that it may breathe more freely, and have its face kept out of the waters, &c. diſcharged, during the *delivery*. If after the *delivery* of one child, the uterus is much diſtended, and the operator upon touch finds another ſet of membranes, he may conclude that another child remains in the uterus; he ſhould therefore tie the navel-ſtring of the firſt in two places, and wait for pains coming on to deliver the next, unleſs it preſents itſelf in a bad poſition, in which caſe it ſhould be brought away by the feet. But if after the *delivery* of one child, the uterus is contracted into a firm hard ball above the *os pubis*, he may infer that there is not another, and proceed to bring away the ſecundines. When the infant is diſengaged from the navel-ſtring, which now hangs out of the vagina, the operator ſhould twiſt it about two or three fingers of his left-hand, then paſſing his right-hand up the vagina, he muſt, with his thumb and fore-finger, hold the navel-ſtring as near the ſecundines as he poſſibly can; and if on drawing the navel-ſtring gently, he perceives the after-birth advancing gradually, there is hope that he may ſoon bring it away. If, on the contrary, he perceives, that it does not in the leaſt yield to his attempts, it adheres too ſtrongly to the uterus; in this caſe he muſt draw the navel-ſtring ſometimes to the right, and ſometimes to the left, in order gradually to diſengage the ſecundines. But this muſt be done gently, and without the leaſt violence. If, through inadvertence and precipitation, the navel-ſtring ſhould be pulled with violence, it might be broke, which would render the extraction of the after-birth very difficult; or the ſecundines being forcibly ſeparated from the uterus might occaſion an hæmorrhage, in conſequence of a rupture of the veſſels of the womb, or it might bring along with it the bottom of the womb; a falling down of which often occaſions the death of the mother. See SECUNDINE.

As ſoon as the woman is delivered, the parts of generation ſhould be covered with a moderately warm cloth, conſiſting of ſeveral folds. She is to be kept warm in bed, and left for ſome time in a ſtate of repoſe. James, and Motherby's Med. Dict. See LABOUR, LYING-IN, PREGNANCY, &c. &c.

Bartholine has compoſed a book, De Inſolitis Partus Viis, on the extraordinary paſſages of the fœtus; where he gives divers inſtances of very extraordinary *deliveries*. Some have been delivered by the navel, and others by the anus. See Salmuth, Obſ. 94. Cent. 3. Phil. Tranſ. N° 416. p. 435.

In the year 1686, at Leckerkerck, eight or ten leagues from the Hague, the wife of one Chriſtian Claes was *delivered* of five children: the firſt was a boy, who lived two months; ſeventeen hours afterwards came a ſecond ſon, who was dead; twenty-four hours afterwards a third ſon was born, who lived about two hours; in twenty-four hours more ſhe had a fourth, dead: laſtly, ſhe died in bringing forth the fifth, who died alſo in the birth.

DELIVERY, in *Law*, is an eſſential requiſite of a valid DEED, which is done by the party himſelf, or his attorney, lawfully authorized, and expreſſed in the atteſtation. This *delivery* is either abſolute, i. e. to the party or granter himſelf; or conditional, to a third perſon to hold, till ſome conditions be performed on the part of the granter.

DELPHIN, in *Literary Hiſtory*. See DAUPHINS.

DELPHINIA, in *Antiquity*, feaſts which the inhabitants of Egina celebrated in honour of Apollo, ſurnamed Delphinius, ſo called, as it is pretended, becauſe he aſſumed the form of a dolphin to conduct Caſtalius and his colony from the iſle of Crete to the *Sinus Criſſæus Delphinium*, one of the courts of judicature of the Athenians; ſo called from the proximity of the place, where they held their aſſemblies, to the temple of Apollo Delphinius.

DELPHINIUM, in *Botany*. See LARKSPUR.

DELPHINUS, the *Dolphin*, in *Aſtronomy*, a conſtellation of the northern hemiſphere; whoſe ſtars, according to Ptolemy, are 10; according to Tycho, as many; according to Hevelius 14; and, according to Mr. Flamſteed, 18. The longitudes, latitudes, magnitudes, &c. whereof, are as follow:

Names and ſituations of the ſtars.	Bayer's Cha.	Signs.	Longitud.			Latitude. N.			Magnitude.
			°	′	″	°	′	″	
		♓	8	49	50	28	54	38	6
First of three in the tail	ε		9	44	27	29	6	21	3
Between the tail and the preceding rhombus	η		10	30	6	30	42	6	6
That immediately preced. the tail	ζ		11	27	4	32	10	27	5
North of the following in the tail	ι		11	00	18	28	51	3	6
5.									
Preced. ſouth in the rhombus	β		12	1	14	31	56	52	3
South of the follow. in the tail	κ		10	54	6	27	31	40	6
Between the tail and the hind rhombus	θ		11	54	5	30	38	14	6
North of preced. in the rhombus	α		13	3	24	33	2	58	3
			13	2	25	31	39	48	6
10.									
South in the hind rhombus	δ		13	48	7	31	58	12	3·4
North of the following	γ		15	3	41	32	44	32	3
			11	54	12	23	00	5	5
Informes following the *Dolphin* towards *equuleus*			13	00	33	24	37	30	6
			14	28	25	29	7	5	6
15.									
			16	7	40	28	40	19	6
			16	31	5	29	46	35	6
		♒	16	15	57	26	49	5	6

DELPHINUS, in *Ichthyology*. See DOLPHIN.

DELPHOS, in *Antiquity*, now called Caſtri, the capital of Phocis in Achaia; anciently much celebrated for its temple, and oracle of Apollo. This temple was a magnificent ſtructure, enriched with innumerable gifts; in it was the dark cave Pythium, where the prieſteſs, named PYTHIA, ſitting on a tripos, or three-legged ſtool,

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ſtool. pretended to receive the inſpiration of the god, ſwelling, foaming, and raving, like one diſtracted. The anſwers were always ambiguous, and ſo myſterious, that it was difficult to underſtand them; yet were they plainer than others; for Hermes the philoſopher ſays, that thoſe who did not underſtand the anſwers given at Dodona, came hither for an explanation. *Delphos* ſtands in the middle of Greece, and was by the ancients called the navel of the earth; the poets ſaying, that Jupiter let fly two eagles, the one from the eaſt, and the other from the weſt, that he might diſcover the middle; and that thoſe eagles met at this place. At preſent the town of Caſtri does not conſiſt of above two hundred houſes, and thoſe very ill built. It ſtands between Salena and Livadia, about ten miles diſtant from the latter, on the ſouth ſide of mount Parnaſſus, ſo famous in antiquity, and ſacred to the Muſes and Apollo.

DELTOIDES, in *Anatomy*, a triangular muſcle of the ſhoulder; thus called from the Greek *delta*, Δ, and εἶδος, *form*. See *Tab. Anat.* (*Myol.*) *fig.* 1. *n.* 21. *fig.* 6. *n.* 10. It ariſes exactly oppoſite to the trapezius, from one third part of the clavicula, from the acromium, and ſpine of the ſcapula, and is inſerted tendinous into the middle of the os humeri, which bone it lifts up directly; and it aſſiſts, with the ſupra-ſpinatus, and coracobrachialis, in all the actions of the humerus, except the depreſſion; it being convenient, that the arm ſhould be raiſed and ſuſtained, in order to its moving on any ſide.

DELTOIDE *leaf*, among *Botaniſts*. See LEAF.

DELTOTON, a conſtellation, the ſame as the Northern Triangle, which ſee.

DELUBRUM, in *Roman Antiquity*, a temple with a large ſpace of conſecrated ground round it. See TEMPLE.

DELUGE, DILUVIUM, in *Natural Hiſtory*, a flood, or inundation, of water, covering the earth, either in the whole, or part.

We meet with divers accounts of *deluges* in ancient hiſtory, both ſacred and profane: that which happened in Greece, in the time of Deucalion, called *diluvium Deucalioneum*, is famous: this *deluge* only overflowed Theſſaly. Its date is fixed to the year before Chriſt 1529, being the third year before the Iſraelites coming out of Egypt, according to the computation of Petavius, Rat. Temp. part i. lib. i. cap. 7.

The *deluge* of Ogyges happened near three hundred years before that of Deucalion, 1020 years before the firſt Olympiad, and 1796 before Jeſus Chriſt, according to the ſame author, Rat. Temp. par. i. lib. i. cap. 4. par. ii. lib. ii. cap. 5. This only ravaged Attica.

Theſe two *deluges* are frequently mentioned, in ancient Greek authors, under the denomination of *cataclyſmus prior*, and *poſterior*.

Of the like kind were thoſe inundations in the Netherlands, which, in 1727, overwhelmed and covered with ſea all that part now called the Gulf Dollart in the United Netherlands; and in 1421, all that part between Brabant and Holland.

But the moſt memorable *deluge* is that which we particularly, by way of eminence, call the *deluge*, or the *univerſal deluge*, or *Noah's flood*; recorded in Scripture as a general inundation ſent by God to puniſh the corruption of the world, at that time, by deſtroying every thing (Noah, and his family, and what was ſhut up with him in the ark, only excepted) from the face of the earth.

This flood makes one of the moſt conſiderable epochas in chronology. Its hiſtory is given by Moſes, Gen. ch. vi. and vii. Its time is fixed, by the beſt chronologers, to the year from the creation 1656, anſwering to the year before Chriſt 2293. From this flood, the ſtate of the world is divided into *diluvian*, and *antediluvian*.

The *deluge* has been, and remains, a ſubject of much inquiry and diſpute among naturaliſts, critics, &c. The points chiefly controverted may be reduced to three: firſt, its extent; viz. whether it were *general*, or *partial*; ſecondly, its natural cauſe; and, thirdly, its effects.

1. The immenſe quantity of water, requiſite to furniſh an univerſal *deluge*, has occaſioned ſeveral authors to ſuſpect it only partial. An univerſal *deluge*, they think, had been unneceſſary, conſidering the end for which it was brought; viz. to extirpate the wicked inhabitants. The world was then but new, and the people not very many; the holy Scriptures making only eight generations from Adam to Noah. It was but a ſmall part of the earth that could be yet inhabited: the country about the Euphrates, which is ſuppoſed to have been the ſcene of the firſt antediluvian inhabitants, was ſufficient to bear them all. Now Providence, ſay they, which ever acts wiſely, and frugally, would never have diſproportioned the means to the end, ſo far as to overflow the whole globe, only to drown a little corner of it. They add, that, in the Scripture-language, the *whole earth* expreſſes no more than *all the inhabitants*; and on this principle advance, that an overflowing of the Euphrates and Tigris, with a vehement rain, &c. might anſwer all the phænomena of the *deluge*.

But the *deluge* was univerſal. God declared to Noah, Gen. vi. 17. that he was reſolved to deſtroy every thing that had breath under heaven, or had life on the earth, by a flood of waters: ſuch was the menace; ſuch the execution. The waters, Moſes aſſures us, covered the whole earth, buried all the mountains, and were no leſs than fifteen cubits above the higheſt of them: every thing periſhed therein; birds, beaſts, men, and all that had life, excepting Noah, and thoſe with him in the ark, Gen. vii. 19, &c. Can an univerſal *deluge* be more clearly expreſſed? If the *deluge* had only been partial, there had been no neceſſity to ſpend an hundred years in the building of an ark, and ſhutting up all the ſorts of animals therein, in order to re-ſtock the world: they had been eaſily and readily brought from thoſe parts of the world not overflowed, into thoſe that were; at leaſt, all the birds would never have been deſtroyed, as Moſes ſays they were, ſo long as they had wings to bear them to thoſe parts where the flood did not reach. If the waters had only overflowed the neighbourhood of the Euphrates and Tigris, they could not be fifteen cubits above the higheſt mountains; they could not have riſen to that height, but they muſt ſpread themſelves, by the laws of gravity, over the reſt of the earth: unleſs, perhaps, they had been retained there by a miracle; and, in that caſe, Moſes, no doubt, would have related the miracle, as he did that of the waters of the Red ſea, and the river Jordan, which were ſuſtained in a heap, to give paſſage to the Iſraelites, Exod. xiv. 22. and Joſh. iii. 16. Add, that, in regions far remote from the Euphrates and Tigris, viz. in Italy, France, Switzerland, Germany, England, &c. there are frequently found, in places many ſcores of leagues from any ſea, and even in the tops of high mountains, whole trees ſunk deep under-ground; as alſo teeth and bones of animals, fiſhes entire, ſea-ſhells, ears of corn, &c. petrified; which the beſt naturaliſts are agreed could never have come there but by the *deluge*; to which may be added the almoſt univerſal traditions of this great event in all countries of the globe.

2. The *deluge* allowed univerſal, the philoſophers are ſolicitous to find water to effect it.

Moſes brings it from two ſources: *the fountains of the great deep were broken up; and the windows of heaven were opened.* Dr. Burnet, in his Telluris Theoria ſacra, ſhews, that all the waters in the ocean were not near enough to cover the earth fifteen cubits above the tops of the higheſt mountains. According to his computation, no leſs than eight oceans were required. Suppoſing the ſea, therefore, drained quite dry, and all the clouds of the atmoſphere diſſolved into rain, we ſhould ſtill want much the greateſt part of the water of a *deluge*.

To get clear of this embarraſſment, many of our beſt naturaliſts, as Steno, Burnet, Woodward, Scheuchzer, &c. adopt Des Cartes' ſyſtem of the formation of the earth. That philoſopher will have the primitive world to have been perfectly round and equal, without mountains, or vales; and accounts for its formation on mechanical principles, by ſuppoſing it at firſt in the condition of a thick turbid fluid, replete with diverſe heterogeneous matters, which, ſubſiding by ſlow degrees, formed themſelves into different concentric ſtrata, or beds, by the laws of gravity; and thus, at length, left a dry, ſolid earth. Dr. Burnet improves on this theory: he ſuppoſes the primitive earth to have been no more than an orbicular cruſt, inveſting the face of the abyſs, or deep, which grew chinky, clave, burſt, and fell down into the water, and ſo drowned its inhabitants.

The ſame theoriſt adds, that by this cataſtrophe, the globe of earth was not only ſhaken, and broken in a thouſand places, but the violence of the ſhock it then underwent ſhifted its ſituation; ſo that the earth, which before was placed directly under the zodiac, became thenceforth oblique to the ſame. Whence aroſe the difference of ſeaſons, which the antediluvian earth was not expoſed to.

Dr. Burnet's hypotheſis is very elegantly recited; but it not only contradicts the phyſical principles of nature, but is alſo utterly inconſiſtent with the ſacred text above cited, which expreſly mentions mountains as the ſtandard of the height of the water; or with that other paſſage, Gen. viii. 22. where God, promiſing not to bring any more *deluges*, but that every thing ſhould be reſtored to its ancient ſtate, ſays, that *ſeed-time and harveſt, and cold and heat, and ſummer and winter, and day and night, ſhall ceaſe no more.* See Keil's Exam. of the Theory of the Earth.

Other authors, ſuppoſing a ſufficient fund of water in the abyſs, or ſea, are only concerned for an expedient to bring it forth: accordingly, ſome, as Mr. Ray, &c. have recourſe

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recourſe to a ſhifting of the earth's center, which, drawing after it the water out of its channel, overwhelmed the ſeveral parts of the earth ſucceſſively. But this could only occaſion a partial deluge in that part of the globe towards which the center of gravity was tranſlated: nor can the poſſibility of ſuch a tranſlation be allowed, ſince the center of gravity is the neceſſary reſult of the materials compoſing our globe, and not alterable whilſt the parts remained in the ſame poſition.

Dr. Hook's opinion of the compreſſion of a ſhell of earth into a prolate ſpheroid, thereby preſſing out the water of an abyſs under the earth, may very well account for the waters overflowing two oppoſite zones of the globe; but the middle zone being by much the greater part of the earth's ſurface, muſt by this means be raiſed higher from the center, and conſequently ariſe more out of the water than before.

Dr. Halley aſcribes the *deluge* to the ſhock of a comet, or ſome other ſuch tranſient body, whereby the polar and diurnal rotation of the globe would be inſtantly changed. The great agitation that muſt have been occaſioned by it in the ſea, he obſerves, would be ſufficient to account for all thoſe ſtrange appearances of heaping vaſt quantities of earth and high cliffs upon beds of ſhells, which were once the bottom of the ſea, and raiſing up mountains where none were before. Such a ſhock as this impelling the ſolid parts, would occaſion the waters, and all fluid ſubſtances that were unconfined, as the ſea is, to run violently with an impetus towards that part of the globe where the blow was received, and that with force ſufficient to take with it the very bottom of the ocean, and remove it to the land. In this caſe, it is much more difficult to ſay, how Noah and his family could be preſerved, than how all other creatures were deſtroyed: ſuch a ſhock would change the length of the day and year, by altering the axis of the globe, according to the obliquity of the incidence of the ſtroke. It is objected to this ſyſtem, that ſuch a ſhock muſt have brought on the *deluge* inſtantaneouſly, and not gradually, as it is ſaid to have happened. Phil. Tranſ. N° 383. p. 120, or abr. vol. vii. p. 1, &c.

The inquiſitive Mr. Whiſton, in his New Theory of the Earth, has a very ingenious hypotheſis, ſimilar to that ſuggeſted by Dr. Halley, with reſpect to the primary cauſe of the *deluge*, but much more largely applied and explained. He ſhews, from ſeveral remarkable coincidences, that a comet, deſcending in the plane of the ecliptic towards its perihelion, paſſed juſt before the earth on the firſt day of the *deluge*; the conſequences whereof would be, firſt, that this comet, when it came below the moon, would raiſe a prodigious, vaſt, and ſtrong tide, both in the ſmall ſeas, which, according to his hypotheſis, were in the antediluvian earth, for he allows no great ocean there, as in ours; and alſo in the abyſs, which was under the upper cruſt of the earth; and that this tide would riſe, and increaſe all the time of the approach of the comet towards the earth; and would be at its greateſt height when the comet was at its leaſt diſtance from it. By the force of which tide, as alſo by the attraction of the comet, he judges, that the abyſs muſt put on an elliptic figure, whoſe ſurface being conſiderably larger than the former ſpherical one, the outward cruſt of the earth, incumbent on the abyſs, muſt accommodate itſelf to that figure, which it could not do while it remained ſolid, and conjoined together. He concludes, therefore, that it muſt of neceſſity be extended, and at laſt broke, by the violence of the ſaid tides, and attraction; out of which, the included water iſſuing, was a great means of the *deluge*; this anſwering to what Moſes ſpeaks of the *fountains of the great deep being broken open.* Again, the ſame comet, he ſhews, in its deſcent towards the ſun, muſt have paſſed ſo cloſe by the body of the earth as to involve it in its atmoſphere, and tail, for a conſiderable time; and of conſequence, it muſt have left a vaſt quantity of its vapours, both expanded and condenſed, on its ſurface; a great part of which, being afterwards rarefied by the ſolar heat, would be drawn up again into the atmoſphere, and afterwards return again in violent rains; and this he takes to be what Moſes intimates *by the windows of heaven being opened*; and particularly by the *forty days rain.* For as to the following rain, which, with this, made the whole time of raining a hundred and fifty days, Mr. Whiſton attributes it to the earth coming a ſecond time within the atmoſphere of the comet, as the comet was on its return from the ſun. Laſtly, to remove this vaſt orb of waters again, he ſuppoſes a mighty wind to have ariſen, which dried up ſome, and forced the reſt into the abyſs again through the clefts by which it came up: only a good quantity remained in the alveus of the great ocean, now firſt made, and in leſſer ſeas, lakes, &c.

To the credit of this theory, it muſt be obſerved, that it was at firſt only propoſed hypothetically: that is, the author only ſuppoſed ſuch a comet, merely as it would account well, and philoſophically, for the phenomena of the *deluge*; without any aſſurance, that there really was any comet ſo near the earth at that time; and the hypotheſis pleaſed even under ſuch circumſtances: but, upon further conſideration, he has ſince, he thinks, proved, that there actually was a comet near the earth at that time, or 28th November, in the 2365th year of the Julian period, or the 2349th year before Chriſt, to which time he aſſigns the beginning of the *deluge*, viz. the ſame great comet which appeared again in 1680. The author no longer, therefore, looks upon it as an hypotheſis, but has republiſhed it in a particular tract, intituled, The Cauſe of the Deluge demonſtrated.

3. But the great difficulty ſtill remains. The orderly ſtrata, or layers of the earth, with the exuviæ, or remains of fiſhes, as their teeth, bones, ſhells, &c. both marine, and fluviatile, found in the bodies even of the moſt ſolid ſtrata, and in flints, marbles, &c. are not yet accounted for. Thoſe who adhere to Des Cartes' ſyſtem, as Steno, &c. take the finding of the part of terreſtrial, and aquatic animals, branches of trees, leaves, &c. in the beds, or ſtrata of ſtone, to be a direct proof of the primitive fluidity of the earth. But then they are obliged to have recourſe to a ſecond formation of ſtrata, much later than the firſt; becauſe at the time of the firſt there was neither plant, nor animal, in being. Steno, therefore, maintains ſecond formations, occaſioned at different times by extraordinary inundations, earthquakes, volcanos, &c. But Burnet, Woodward, Scheuchzer, &c. chooſe rather to attribute a ſecond general formation to the *deluge*; without excluding, however, the particular ones of Steno. But the great objection againſt this ſyſtem of fluidity, is mountains; for the whole globe being liquid, whence ſhould ſuch inequalities ariſe? Mr. Scheuchzer, rather than part with a ſyſtem which ſeems ſo promiſing, gives into the opinion of thoſe who hold, that, after the *deluge*, God, to remit the waters into their ſubterranean reſervoirs, broke, and diſplaced, with his own almighty hand, a great number of ſtrata, that were before horizontal, and raiſed them above the ſurface of the earth; whence it is, that the ſtrata in mountains, though concentrical, are never horizontal. Hiſt. de l'Acad. 1708. p. 32.

Dr. Woodward, taking the ſeveral ſtrata for the ſediments of a *deluge*, and conſidering the circumſtances of thoſe fiſhes, ſhells, and other exuviæ, found in them, draws ſeveral inferences, which very much illuſtrate the effects of the *deluge*. As, firſt, that theſe marine bodies, and other ſpoils of ſalt-water fiſhes, were borne forth out of the ſea, by the univerſal *deluge*; and, on the return of the water back again, were left behind upon the land. Secondly, that while the flood covered the globe, all the ſolid matters, as ſtones, metals, minerals, and foſſils, were totally diſſolved, and the coheſion of their corpuſcles deſtroyed; and that their corpuſcles, with thoſe of the leſs ſolid bodies, as earth, fleſh of animals, and vegetables, were ſuſtained promiſcuouſly in the water, and made one common maſs. Thirdly, that all the maſs, thus ſuſtained, was at length precipitated to the bottom; and that according to the laws of gravity, the heavieſt ſettled firſt, and the reſt in order. And that the matters, thus ſubſiding, conſtituted the ſeveral ſtrata of ſtone, earth, coal, &c. Fourthly, that theſe ſtrata were originally all parallel, even, and regular, and rendered the ſurface of the earth perfectly ſpherical; and that the whole maſs of water lay upon them, and conſtituted a fluid ſphere encompaſſing the globe. Fifthly, that after ſome time, by the force of an agent ſeated within the earth, theſe ſtrata were broken on all ſides of the globe, and their ſituation varied; being elevated in ſome places, and depreſſed in others; whence mountains, valleys, grottos, &c. with the channel of the ſea, iſlands, &c. In one word, the whole terraqueous globe was put, by this diſruption, and diſlocation of the ſtrata, into the condition we now behold it in. Sixthly, that upon the diſruption of the ſtrata, and the depreſſion of ſome, and elevation of other parts, which happened towards the end of the *deluge*, the maſs of water fell back again into the depreſſed, and loweſt parts of the earth, into lakes, and other cavities, and the channel of the ocean, and through the fiſſures, whereby this communicates with the abyſs, which it filled till it came to an equilibrium with the ocean. Nat. Hiſt. of Earth, p. 1. and 2.

But of all the ſyſtems yet advanced, there ſeems none better calculated to ſolve the phenomena of theſe petrified exuviæ, than that of M. de la Pryme. The antediluvian world, according to this author, had an external ſea, as well as land, with mountains, rivers, &c. and the *deluge* was effected by breaking the ſubterraneous caverns, and pillars thereof, with dreadful earthquakes,

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and causing the same to be for the most part, if not wholly, absorbed and swallowed up, and covered by the seas that we now have. Lastly, this earth of ours arose out of the bottom of the antediluvian sea, and in its room; just as many islands are swallowed down, and others thrust up in their stead.

From this system, which is very agreeable to Scripture, the great difficulties that clog all the other systems, seem easily solved. It is no longer a wonder, that shells, and shell-fish, and the bones of fishes, and four-footed creatures, with fruits, &c. should be found in beds and quarries, in mountains and valleys, and the very bowels of the earth: for here they bred in the antediluvian sea; thither they were elevated with the hills and mountains, in the time of the *deluge*; and there they fell into, were absorbed, and buried in chasms, and holes, and clefts, that would necessarily happen in the extrusion of the earth. Phil. Trans. N° 266.

Mr. King has more lately adopted an hypothesis resembling this last. He ascribes the *deluge* to subterraneous fires found within the bowels of the earth, which, at the appointed time, burst forth with great violence under the sea, and raised up the bottom of the ocean, so as to pour out the waters over the face of what was before dry land, which by that means became the sea, and has since continued, and that which was before the bottom of the sea became dry land. An earthquake thus occasioned will account, he supposes, for the access of the *deluge*, and the confused disposition of marine productions in the post-diluvian earth. Phil. Trans. vol. lvii. p. 44, &c.

M. Buffon recites the principal hypotheses relating to the universal *deluge*, in his Hist. Nat. tom. i.

DELUGE *of Deucalion*. See DEUCALION.

DELVIN, in *Natural History*, a name sometimes given by the miners in Cornwall to that sort of talcy stone or slate, which they more generally call *killas*; but in some places, as at Lowancowiggan, they use it as the name of a coarse, but very hard stone, in which the ore lies. The ore is tin, and is considerably rich there, but the hardness of this stone makes it difficult to be got out.

DEMAIN, or DEMESNE, in its popular sense, denotes the lord's manor-place, with the lands thereto belonging; which he and his ancestors have from time to time kept in their own manual occupation. See MANOR.

DEMAIN, or DEMESNE, in a law-sense, signifies, according to Hottoman, *patrimonium domini*, the *lord's patrimony*; called also *domain*, and by the civilians, *dominicum*.

The same author proveth those lands to be *demain*, which a man holdeth originally of himself; and those to be *feodum*, which he holdeth of a superior lord.

In England, no common person has any *demain*, simply understood; for all depends either mediately, or immediately, on the crown. When a man, therefore, in pleading, would signify his land to be his own, he saith, that he is or was seised thereof in his *domain*, as of fee; whereby he means, that although his land be to him and his heirs for ever, yet it is no true *demain*, but depends upon a superior lord, and he holdeth by service, or rent in lieu of service, or by both service and rent.

DEMAIN is sometimes also taken, more largely, for lands and tenements held for life, &c. and sometimes more strictly for such only as are generally held in fee.

DEMAIN is sometimes again used for a distinction between those lands that the lord of a manor has in his own hands, or in the hands of his lessee, demised upon a rent, for a term of years, or life; and such other lands, pertaining to the said manor, which belong to the free, or copy-holders.

The reason why the copy-hold is accounted *demain*, is, because they, who are tenants to it, are judged in law to have no other right but at the will of the lord; so that it is reputed still, after a sort, to be in the lord's hands; and yet in common speech that is ordinarily called *demain*, which is, neither free, nor copy-free.

DEMAIN, again, is used in a more special signification, in opposition to *frank-fee*.

Thus, those lands, which were in the possession of Edward the Confessor, are called *ancient demain*; and all others are called *frank-fee*; and the tenants who hold any of those former lands, are called *tenants in ancient demain*; and the others, *tenants in frank-fee*, and also, *tenants at common law*. The reason is, because tenants in *ancient demain* cannot be sued out of the lord's court.

DEMAND, in its proper sense, denotes a calling for, or requiring one's due.

DEMAND, in *Law*, has a more special signification, as contradistinguished from *plaint*: for all civil actions are pursued, either by *demands* or plaints; according to which the pursuer is called either *demandant*, or *plaintiff*; viz. in real actions, *demandant*; and in personal actions, *plaintiff*.

Where the party pursuing is called *demandant*, the party pursued is called *tenant*; and where the former is called *plaintiff*, the latter is termed *defendant*.

There are two kinds of *demands*: the one in *deed*, *de facto*, as in every precipe; the other in *law*, *de jure*; such is entry in land, distress for rent, &c.

If a man release another from *all demands*, it is the best release the releasee can have, and shall redound most to his advantage. A release of facts is more large than of quarrels or actions; and a release of *demands* more large and beneficial than either: by a release of all *demands* to the disseisor, the right of entry into the land, and all contained therein, is released; and he that releaseth all *demands*, excludes himself from all actions, entries, and seizures. But it is no bar to a writ of error to release an outlawry.

DEMANDANT, *Petens*, he who is actor, or plaintiff, in a real action; thus called, because he *demands* lands, &c.

DEMARCHUS, in *Antiquity*, the chief of a region, or district, in the country of Attica.

The Athenians divided their country into certain regions, or districts, which they called δημοι, i. e. *people*; and established a magistrate at the head of each, under the denomination of δημαρχος, *demarchos*, of δημος, and αρχη, *rule*, *government*.

It was also an appellation given to the chief magistrate of the city Neapolis.

DEMEMBRE', in *Heraldry*, is when an animal is *dismembered*, i. e. the limbs cut off its body.

DEMESNE. See DEMAIN.

DEMETRIA, Δημητρια, in *Antiquity*, a festival in honour of Ceres, called by the Greeks *demeter*, δημητηρ, of δη, i. e. γη, *earth*, and μητηρ, *mother*. It was usual on this occasion for the worshippers to lash themselves with whips made of the bark of trees, and called μυροπτοι. Pott. Archæol. Græc. tom. i. lib. ii. cap. 20. p. 379.

DEMETRIA was likewise the name of another festival celebrated by the Athenians in honour of Demetrius Poliorcetes, and was the same with that afterwards called *Dionysia*. Pott. loc. cit.

DEMI, a word of the same use and effect in the French language with *semi*, in the Latin and English; being formed from *dimidium*; and used, in composition with other words, to signify *half*.

In words borrowed from the Latins, we use *semi*; and in those from the French, we retain their *demi*. See SEMI.

DEMI, or DEMY, in *Heraldry*, signifies the *half* of a thing; as, a *demy lion*, &c.

Colombiere has what he calls *croix & demy*, a cross and a half; being a shaft crossed in the upper-part like the Cavalry cross, and having but one arm at the lower-part.

DEMI-AIR, or DEMI-VOLT, in *Horsemanship*, is one of the seven artificial motions of a horse; being an air, in which his fore-parts are more raised than in terra à terra: but the motion of the horse's legs is more quick in the latter than in the *demi-volt*.

DEMI-BASTION, is a kind of fortification, that has only one face, and one flank. See BASTION.

DEMI-CANNON, a piece of ordnance, usually about six inches bore, 5400 pounds weight, ten or eleven feet long, and carrying a shot of 30 or 32 pound weight.

It carries point-blank 150 paces; its charge of powder is 14 pound weight.

There are also two sizes of *demi-cannon* above this, which are something larger: as, the *ordinary demi-cannon*, which is six inches $\frac{1}{6}$ bore, twelve feet long, weighs 5600 pounds; its charge of powder 17 pounds 8 ounces, carries a shot six inches and a half diameter, and whose weight is 32 pounds: this piece shoots point-blank 162 paces.

Demi-cannon of the largest size, is six inches $\frac{6}{8}$ bore, twelve feet long, 6000 pounds weight; its charge is 18 pounds of powder, and it carries 180 paces. See CANNON, and ORDNANCE.

DEMI-CROSS, an instrument used by the Dutch to take the sun's altitude, or that of a star at sea; but instead of which we use the cross staff or fore-staff. See *Tab.* II. *Astronomy*, *fig.* 67.

The staff AG is graduated easily, being only a line of whole tangents, whose radius is EB, the length of the cross-piece, or transom. It hath three vanes; a horizontal vane, as A; a sight vane, as H; and the shade vane, as E.

When the vanes are on the staff and cross-piece, to take the sun's altitude, hold the instrument with the transom as upright as you can, and looking through the sight vane, as H, look for the horizon through the slit in the horizon vane, and then slide the cross-piece or transom to and fro, till you make the shade of the vane at E to fall at the same time upon the slit of the horizon vane, and also at A; then are the degrees cut on the staff, by the edge of the cross-piece, the sun's altitude required. But to take the height of a star, you must remove the horizon vane A, and put it on the end G, and transfer

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the ſight vane H to A; then holding up the inſtrument as before, looking through the ſight vane, ſee for the horizon through the horizon vane, and for the ſtar by the ſhade vane, ſliding the tranſom to and fro, till the horizon and ſtar are both ſeen by their reſpective vanes, and then the tranſom will cut the degrees of the ſtars altitude on the ſtaff, allowing about eight or ten minutes for your height above the level of the water, as muſt be done in all ſuch caſes.

DEMI-CULVERIN, is a piece of ordnance commonly $4\frac{1}{2}$ inches bore, ten feet long, 2700 pounds weight; its charge is 7 pounds 4 ounces of powder; and it carries a ſhot of 10 pounds 11 ounces, and ſhoots point-blank 175 paces.

Demi-culverin of the leaſt ſize, is $4\frac{1}{4}$ inches bore, ten feet long, 2000 pounds weight; it carries a ball of 4 inches diameter, its charge is 6 pounds 4 ounces of powder, and its level range is 174 paces.

Demi-culverin of the largeſt ſort, is 4 inches $\frac{6}{8}$ bore, ten feet long; its charge of powder is 8 pounds and 8 ounces; the ball is $4\frac{1}{2}$ inches diameter, weighs 12 pounds 11 ounces; and the point-blank ſhoots 178 paces. See CANNON, and ORDNANCE.

DEMI-DITONE, in *Muſic*, is uſed by ſome for a third minor.

DEMI-GOD, &c. See GOD, HERO, &c.

DEMI-GORGE, in *Fortification*, is half the gorge, or entrance, into the baſtion; not taken directly from angle to angle, where the baſtion joins to the curtin, but from the angle of the flank to the center of the baſtion; or the angle the two curtins would make, were they thus protracted to meet in the baſtion.

DEMI-HAQUE. See HARQUEBUSS.

DEMI-LUNE, *Half-Moon*, in *Fortification*, an outwork, as EFGHK (*Tab. Fortif. fig.* 3.) conſiſting of two faces, and two little flanks; frequently built before the angle of a baſtion, and ſometimes alſo before the curtin, though now much diſuſed. The gorge terminates in a creſcent or half-moon, whence the denomination *demi-lune*. See RAVELIN.

DEMI-QUAVER, is a note in muſic, two of which are equal to the quaver.

DEMI-SEMI-QUAVER. See QUAVER.

DEMI-SEXTILE. See SEMI-SEXTILE.

DEMISE, in *Law*, is applied to an eſtate either in fee-ſimple, fee-tail, or for term of life, or years; and ſo it is commonly taken in many writs.

The king's death is, in law, termed, the *demiſe* of the king.

DEMISE *of the king* does not diſcontinue any writ or proceſs. Vid. Stat. 1 Ed. VI. cap. 7. ſect. 1, 2, 3.

Nor does it determine any commiſſion civil or military, or great office of ſtate, but they ſhall continue in force for ſix months after the ſovereign's *demiſe*, unleſs made void by the next ſucceſſor. Stat. 7 & 8 Will. III. cap. 27. ſect. 21. 1 Ann. ſtat. 1. cap. 8. 6 Ann. cap. 7. ſect. 8.

Neither is a parliament thereby determined till after ſix months. 7 & 8 Will. III. cap. 15.

Nor is a defendant, who hath pleaded to an information, obliged to plead to it again. But he may plead again upon requeſt made to the court, within five months after the *demiſe*. 4 & 5 Will. & Mar. cap. 18. ſect. 7.

DEMISE, and REDEMISE, denote a conveyance where there are mutual leaſes made from one to another of the ſame land, or ſomething out of it.

DEMI-VILLS. See VILL.

DEMIURGE, Δημιυργος, from δημιος, which denotes a *public ſervant*, and εργον, *work*, in the *Mythology of the Eaſtern Philoſophers*, was one of the ÆONS, employed by the ſupreme Deity in the creation of the world. The character they give him is a compound of ſhining qualities, and inſupportable arrogance; and his exceſſive luſt of empire effaces his talents and virtues. He is repreſented as claiming dominion over the new world he has formed, as his ſovereign right; and, excluding totally the ſupreme Deity from all concernment in it, he demands from mankind, for himſelf and his aſſociates, divine honours.

DEMOCRACY, a form of government, wherein the ſovereignty, or ſupreme authority, is lodged in the people, who exerciſe the ſame by perſons of their own order, deputed for that purpoſe.

The word is formed of the Greek δημος, *people*, and κρατειν, *to command, govern*.

The moſt flouriſhing *democracies* were thoſe of Rome and Athens; the modern republics, as Venice, and the United Provinces, are rather ariſtocracies than *democracies*. The government of Baſil, however, is a *democracy*; and ſo are ſome of the free cities in Germany.

In a *democracy*, where the right of making laws reſides in the people at large, public virtue, or goodneſs of intention, is more likely to be found than either of the other qualities of government; and therefore it uſually poſſeſſes a conſiderable degree of patriotiſm and public ſpirit. *Democracies* are uſually the beſt calculated to direct the end of a law; ARISTOCRACIES to invent the means by which that end ſhall be obtained; and MONARCHIES to carry thoſe means into execution. See REPUBLIC.

DEMOISELLE, the *dancing-bird*, a long-legged and long-necked bird of the crane kind, a native of Numidia. It is remarkable for its jumping or dancing in its walk. It has the ſame kind of plication in the wind-pipe with the common CRANE. See *Tab. of Birds*, N° 12. Phil. Tranſ. vol. lvi. p. 211.

DEMON. See DÆMON.

DEMONIAC. See DÆMONIAC.

DEMONIACAL *poſſeſſion*. See DÆMONIACAL *poſſeſſion*.

DEMONIUS *lapis*, in *Natural Hiſtory*, a name given to a ſtone famous among the writers of the middle ages for a number of imaginary virtues, ſuch as rendering people victorious over their enemies, and the like. All the deſcription they have left us of it is, that it was variegated with two colours laid in lines ſo as to repreſent a rainbow. It was probably an agate.

DEMONSTRABLE, a term uſed in the ſchools, to ſignify ſomewhat that may be clearly and evidently proved.

It is *demonſtrable*, that the ſide of a ſquare is incommenſurable with the diagonal.

DEMONSTRATION, in *Logic*, a ſyllogiſm in form, containing a clear and irrefragable proof of the truth of a propoſition.

A *demonſtration* is a convincing argument, the two firſt propoſitions whereof are certain, clear, and evident; whence of neceſſity ariſes an infallible concluſion.

A *demonſtration* uſually conſiſts of three parts: *explication*, *preparation*, and *concluſion*.

The *explication* is the laying down of the things ſuppoſed to be given or granted; from which the *demonſtration* is to be made.

The *preparation* is ſomething to be previouſly done, according to the nature of the *demonſtration* intended.

The *concluſion* is a propoſition that concludes the thing to be *demonſtrated*, fully perſuading, and convincing the mind.

The method of *demonſtrating* things in mathematics is the ſame with that of drawing concluſions from principles in logics. In effect, the *demonſtrations* of mathematicians, are no other than ſeries of enthymemes; every thing is concluded by force of ſyllogiſm, only omitting the premiſes, which either occur of their own accord, or are recollected by means of quotations. To have the *demonſtration* perfect, the premiſes of the ſyllogiſms ſhould be proved by new ſyllogiſms, till at length you arrive at a ſyllogiſm, wherein the premiſes are either definitions, or identic propoſitions.

Indeed it might be *demonſtrated*, that there cannot be a genuine *demonſtration*, i. e. ſuch a one as ſhall give full conviction, unleſs the thoughts be directed therein according to the rules of ſyllogiſm. Clavius, it is well known, reſolved the *demonſtration* of the firſt propoſition of Euclid into ſyllogiſm: Herlinus, and Daſipodius, *demonſtrated* the whole ſix firſt books of Euclid, and Heniſchus, all arithmetic, in the ſyllogiſtic form.

Yet people, and even mathematicians, uſually imagine, that mathematical *demonſtrations* are conducted in a manner far remote from the laws of ſyllogiſm; ſo far are they from allowing that thoſe derive all their force and conviction from theſe. But we have men of the firſt rank on our ſide the queſtion. M. Leibnitz, for inſtance, declares that *demonſtration* to be firm and valid, which is in the form preſcribed by logic; and Dr. Wallis confeſſes, that what is propoſed to be proved in mathematics, is deduced by means of one, or more ſyllogiſms: the great Huygens, too, obſerves, that paralogiſms frequently happen in mathematics, through want of obſerving the ſyllogiſtic form. See SYLLOGISM.

Problems conſiſt of three parts: a *propoſition*, *reſolution*, and *demonſtration*.

In the *propoſition* is indicated the thing to be done.

In the *reſolution*, the ſeveral ſteps are orderly rehearſed, whereby the thing propoſed is performed.

Laſtly, in the *demonſtration* it is ſhewed, that the things enjoined by the reſolution being done, that which was required in the propoſition is effected. As often, therefore, as a problem is to be *demonſtrated*, it is converted into a theorem; the reſolution being the hypotheſis, and the propoſition the theſis: for the general tenor of all problems to be *demonſtrated* is this; that the thing preſcribed in the reſolution being performed, the thing required is done.

The ſchoolmen make two kinds of *demonſtration*: the one τα διοτι, or *propter quod*; wherein an effect is proved by the next cauſe. As when it is proved, that the moon is

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eclipsed, because the earth is then between the sun and moon. The second τὸ ὅτι, or *quia*; wherein the cause is proved from a remote effect: as when it is proved, that fire is hot, because it burns; or that plants do not breathe, because they are not animals; or that there is a God, from the works of creation. The former is called *demonstration à priori*, and the latter *demonstration à posteriori*.

DEMONSTRATION, *affirmative*, is that which, proceeding by affirmative and evident propositions, dependent on each other, ends in the thing to be *demonstrated*.

DEMONSTRATION, *apagogical*. See APAGOGICAL.

DEMONSTRATION, *geometrical*, is that framed of reasonings drawn from the elements of geometry.

DEMONSTRATION, *mechanical*, is that, the reasonings whereof are drawn from the rules of mechanics.

DEMONSTRATION *à priori*, is that whereby an effect is proved from a cause, either a next, or remote one; or a conclusion proved by something previous, whether it be a cause, or only an antecedent.

DEMONSTRATION *à posteriori*, is that whereby either a cause is proved from an effect, or a conclusion is proved by something posterior; whether it be an effect, or only a consequent.

DEMONSTRATIVE, in *Rhetoric*, one of the genera, or kinds, of eloquence; being that which obtains in the composing of panegyrics, invectives, &c.

Rhetoric is divided into three kinds; *deliberative*, *demonstrative*, and *judiciary*. See RHETORIC.

DEMONSTRATIVE, in *Grammar*, is applied to pronouns which serve to shew, point out, or indicate a thing: as, *this*, *that*, *those*, &c.

They are also called definitive, because they define and limit the extent of the common name, or general term, to which they either refer, or are joined.

DEMONSTRATIVE *evidence*. See DEDUCTIVE, and EVIDENCE.

DEMULCENTS, *Demulcentia*, in *Pharmacy*, are medicines which render the acrimonious humours mild. This they do by obtunding or sheathing their sharp particles.

They are distributed into general and specific; the former including those which pertain to all kinds of acrids indiscriminately; and the latter such as obtund only a particular kind of acrimony. See EMOLLIENTS.

DEMURRAGE, in *Traffic*, an allowance made to the master of a ship, by the merchants, for staying in a port longer than the time first appointed for his departure.

DEMURRER, in *Law*, a kind of pause or stop, put to the proceeding of any action, upon some difficult point, which must be determined by the court, before any further progress can be had in it.

In every action, the controversy is either as to fact, or as to law: the first, decided by the jury; the second, by the judge. Now, if any thing turn up in the cause so rare and difficult, that the judge cannot pronounce upon it, a *demurrer*, or stop, is made, and time taken, either for the court to consider and agree of it among themselves, or otherwise for the judges to meet in the exchequer chamber; there, after hearing counsel on both sides, to determine what is law. For this purpose a *demurrer* book is made up, containing all the proceedings at length, which are afterwards entered on record, and copies thereof, called paper books, are delivered to the judges to peruse.—This *demurrer* is expressed, in our records, by *moratur in lege*.

In common law, the defendant sometimes *demurreth* to the plaintiff's count, or declaration; and sometimes the plaintiff *demurreth* to the defendant's plea, by averring, that it is not a sufficient plea in law, &c.

In chancery, the defendant *demurreth* to the plaintiff's bill, averring it to be defective in such and such a point; and demands the judgment of the court thereupon, whether he shall not be compelled to make any farther or other answer thereunto.

DEMURRER *to evidence* takes place, when a record, or other matter, is produced in evidence, concerning the legal consequences, of which there arises a doubt or question in law; in which case the adverse party may, if he pleases, *demur* to the whole evidence. This draws the question of law from the cognizance of the jury, to be decided by the court. But this kind of *demurrer* is now seldom used.

DEMURRER *to indictments* is incident to criminal cases, as well as civil, when the fact as alleged is allowed to be true, but the prisoner joins issue upon some point of law in the indictment; by which he insists that the fact, as stated, does not amount to the crime charged.

Some have held, that if, on *demurrer*, the point of law be adjudged against the prisoner, he shall have judgment and execution, as if convicted by verdict: but this is denied by others, who maintain, that in such case he shall be directed and received to plead the general issue, not guilty, after a *demurrer* determined against him. However, upon this doubt, *demurrers* to indictments are seldom used; since the same advantages may be taken upon a plea of not guilty; or, afterwards, in arrest of judgment, when the verdict has established the fact. Blackst. Comm. vol. iv. p. 328.

DEMY *Sangue*. See HALF *Blood*.

DEN, a syllable added to the names of places, and shews their situation to be in a valley, or near woods, as Tenterden, Biddenden, &c.

The word is Saxon *den*, i. e. *vallis*, or *locus sylvestris*.

DEN and *strond*, &c. in *Law*, was a liberty for ships or vessels to run or come ashore. King Edward I. by charter, granted this privilege to the barons of the cinque ports.

DENARIATUS *terræ*, in *Ancient Law-Books*, as much land as is worth a penny by the year. See FARDING-*deal*. *Sibylla Barthelot tenet unam acram, & 5 denariatos terræ in eodem tenemento.* Du-Cange.

DENARIUS, in *Antiquity*, the Roman penny; a silver coin equivalent to, from six to eight pence half-penny sterling. See COIN.

The Romans having, for a long time, used brass money, which they call *as*, quasi *æs*; or *libra* and *ponda*, because it was a pound weight, began in the year of Rome 485, to coin silver; and coined first the *denarius*, which was marked with the letter X, because it was worth ten asses, and divided into two quinarii, marked with V, which were subdivided into two sestertia, marked with these three letters, IIS. Afterwards, about the year 537, the silver *denarius* was made to pass for sixteen asses, the quinarius for eight, and the sesterce for four; though in the pay of the army, the soldier always received a silver *denarius* for ten asses. Pliny. Nat. Hist. lib. xxxiii. cap. 3. Livy, lib. xv.

The most ancient *denarii* have on one side the head of a woman in a helmet, with the inscription ROMA, and the mark of the *denarius* X or Ⅹ, and some few XVI, and a biga or quadriga on the other; whence they are denominated bigati and quadrigati. The next to these in antiquity have the head of Roma, or some other deity, on one side, and on the reverse the name of the mint-master, with historical or emblematical figures. Many of these have the mark X or Ⅹ, which remained long after the *denarius* passed for sixteen asses. A third sort have the head of a consul or general on one side, with an historical or emblematical reverse: few of these have the mark X or Ⅹ upon them. These three sorts are called consular *denarii*, because they were struck during the republican government by consuls. The imperial *denarii* have commonly the head of the reigning emperor, with his names and titles on one side, and some emblematical figures on the reverse, with suitable inscription. The Romans did not use the *denarius* for a weight, as the Greeks did their drachm, till the Greek physicians coming to Rome, and finding the two coins nearly equal, prescribed by it, as they had been used to do by the drachm in their own country.

We are informed both by Celsus and Pliny, that eighty-four *denarii* were coined out of the pound of silver; and therefore by determining the true weight of the Roman pound, we shall obtain that of the *denarius*, which depended upon it. Celsus de Medicina, lib. v. cap. 17. Pliny, Nat. Hist. lib. xxxiii. cap. 9.

If we take 5040 troy grains for the weight of the Roman pound, as determined from the gold coins, the consular *denarius* of 84 in the pound will weigh just 60 troy grains. Mr. Raper took the mean weight of forty-six of the fairest *denarii* in the British Museum, and found it to be 60,95 troy grains; but as some of these were imperfect, he found the mean of twenty perfect *denarii* to amount to 60,92: and he questions whether the *denarii* of above sixty-three grains ever passed as current coin. The weight of the *denarius* was diminished under the emperors; and Greaves found, by examining many imperial *denarii*, that from Augustus's time to Vespasian they continually almost decreased, till, from being the seventh part of the Roman ounce, they came now to be the eighth part; and ninety-six were coined out of the Roman libra, whereas under the consuls they coined only eighty-four. Under Severus and Gordianus they recovered their weight, but with a considerable mixture of allay. J. Caspar Eisenschmid of Strasburg, in a book De Ponderibus & Mensuris veterum, &c. published in 1708, informs us, that he found the weight of the imperial *denarius* from Nero to Sept. Severus, to be to the consular *denarius* in the proportion of 7 to 8.

In order to determine the value of the consular *denarius* of 60 troy grains of fine silver, we are to consider, that sixty-two English shillings are coined out of eleven ounces two penny weight, troy, of fine silver, and eighteen penny weight allay; and therefore the troy grain of fine silver

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ſilver is worth $\frac{62}{111}$ths of a farthing; and ſixty grains, or the *denarius*, worth ſomewhat more than eight pence farthing and a half ſterling; and the as, or ſixteenth part of the *denarius*, a little more than a half-penny. Phil. Tranſ. vol. lxi. part ii. art. 48.

Others, as Greaves, and after him Arbuthnot, have made the conſular *denarius* the ſeventh part of an ounce in weight, a little more than ſixty-two grains, allowing 5256 troy grains to the Roman pound, and its value, allowing eight Engliſh grains to the ſilver penny, $7\frac{3}{4}d.$ of our money; and the imperial *denarius* the eighth part of an ounce, and worth about $6\frac{1}{2}d.$ ſterling.

M. Tillemont obſerves, that the *denarius* was held ſufficient to keep a perſon handſomely for a day; and, upon the whole, ſeems to intimate, that it was equal to twelve French ſous, or eleven Engliſh pence: but this eſtimate errs in exceſs more than the preceding does in defect.

The *denarius* continued to be the current ſilver money of the empire, till Conſtantine ſubſtituted the milliarenſis in its ſtead. See Greaves's Diſcourſe of the *Denarius*, in his works, by Dr. Birch, vol. i. p. 235. and Arbuthnot on Coins, p. 15. See MILLIARENSIS and POUND.

DENARIUS is alſo uſed, in our *Law-Books*, for an Engliſh penny.

Denarius Angliæ, qui nominatur ſterlingus, rotundus ſine tonſura, ponderabit 32 *grana frumenti in medio ſpicæ*; & 20 *denarii facient unciam*; & 12 *unciæ facient libram.* Stat. Ed. I. De menſuris.

DENARIUS *Dei* denotes *earneſt-money*; called alſo *argentum Dei*, by the French *deniers de Dieu*, and in ſome parts of our country *arles*.

Ita quod neuter mercatorum ab illo contractu poſſit diſcedere, vel reſilire poſtquam denarius Dei *inter perſonas contrahentes datus fuerit & receptus.* Charti Eduardi I.

DENARIUS *tertius comitatus*, denoted a third part of the profits of county courts. When thoſe courts had ſuperior juriſdiction, before other courts were erected, two parts of the fines, and other profits belonging to them, were reſerved to the king, and a third part to the earl of the county. Paroch. Ant. 418.

DENARII *de caritate* were cuſtomary oblations made to cathedral churches charged upon pariſh prieſts; though at firſt they were but a gift of charity for maintaining and adorning the biſhop's ſee.

DENARIUS *St. Petri.* See PETER-PENCE.

DENATES, in *Antiquity*, domeſtic gods, more frequently called PENATES.

DENCHE', DENCHEA, or ENDENCHE', in *Heraldry*. See DANCHE'.

DENDRITIS, or DENDRACHATES, in *Natural Hiſtory*, a ſort of ſlate or agate, whereon are ſeen trees, ſhrubs, and other ruſtic figures; repreſented, in miniature, in blackiſh or yellowiſh figures; now called Mochoa ſtones. Some rank the *dendritis* in the claſs of entrochi, which they wrongly call ſtone plants: but againſt this it is urged, firſt, that the branches of trees, &c. repreſented on the *dendritis*, are never confounded together, nor ſhoot acroſs each other, as thoſe of entrochi are uſually found to do.

Secondly, that the fire ſtrips the *dendritis* of all its figures, without deſtroying the ſtone, or reducing it to aſhes; which does not hold of any entrochus. See *Tab. Foſſils, Claſs* 5.

Their true hiſtory is no more than this: the ſtone, or ſlate, on which the *dendritæ* moſt frequently occur, is ſubject, like our common flints, to imperceptible cracks and flaws, into which the ſteams and effluvia from minerals, and other foſſile bodies, continually pervading the whole ſtructure of the earth, find their way, and perhaps in ſome caſes water itſelf has been at ſome time in them: either water or theſe vapours, we well know, may be naturally enough tinged with black, or capable of leaving a black tinge on the ſurfaces of the bodies they have long remained on; and theſe finding their way into the natural cracks or ſmall crevices of the ſtone, have from the ſides of theſe inſinuated themſelves farther and farther into the maſs, and run into branched figures; or the water wherever included has, as the maſs of the ſtone ſhrunk and contracted in the drying, ſpread and diffuſed itſelf into the various detached figures we ſee; for all the delineations we find in theſe ſtones may be referred either to theſe looſe detached figures or cloudy ſpots, or to thoſe which evidently ariſe from the ſides of ſome long cracks or fiſſures.

That water is continually to this day getting into theſe natural crevices of ſtone, and diffuſing itſelf beyond their natural limits in irregular, and often in beautifully branched figures, we ſee in many of our gravel-pits, where many of the larger flints and pebbles being ſtruck eaſily fall to pieces at theſe crevices, the ſides of which are always either wet, or plainly marked with waters having been once there; and if from theſe we trace the leſſer cracks, we ſhall uſually find numbers of figures imperfectly reſembling the delineations in the agates, and the very ſame often alſo on their ſurfaces, merely the effect of mineral effluvia.

From hence it appears, that the figures of the *dendritis* are accidental; and the effect of a colour applied on the ſtone not artificially, but by nature. Two poliſhed marbles being applied on each other, with oil between, upon parting them again, the oil running into certain tracks, its impreſſion exhibits divers figures like thoſe on the *dendritis*; the ramification always beginning on the ſide on which the marbles are begun to be ſeparated. So that it appears, the figures of the *dendritis* are formed by ſome bituminous, vitriolic, ferruginous, or cupreous exhalation, inſinuating between the beds, or ſtrata, of the ſtones; and, accordingly, we actually find, that the *dendritis* being expoſed to the fire, yields a bituminous ſmell; and other experiments prove the exiſtence of the other mineral principles.

In ſome *dendritis*, the figures, or ſignatures, penetrate quite through; in others they go but to the middle; and, in others, not ſo deep.

On the ſurfaces of the natural crevices of our ſeptariæ, or ludus Helmontii of the harder kinds, we often alſo meet with what authors call *dendritæ*, or fuliginous delineations of trees, which are of the very ſame kind with thoſe of this agate, and are ſo far from being inferior to them in beauty, that they even greatly excel them; nay, ſo low and poor a ſubſtance as common chalk is not without them, but is frequently found beautifully marked with branches, trees, ſtars, and a thouſand other figures like thoſe formed by pulling aſunder two levigating ſtones with the fine matter between them, or the ſhooting of ſalts in chemical veſſels, or the figures of hoar-froſt on our windows. Da Coſta's Hiſt. of Foſſ. p. 178. Hill's Hiſt. of Foſſ. p. 473. See AGAT.

DENDRANATOMY, from δενδρον, *tree*, and ανατομη, *anatomy*, a term uſed by Malpighi, and others, to expreſs the diſſection of the ligneous parts of trees and ſhrubs, in order to the examination of their ſtructure and uſes. Galen has uſed the ſame word, and taken ſome pains to diſcover ſome of the ſubjects of theſe reſearches. There is a very remarkable analogy between the parts of ſome trees, and thoſe of peculiar parts of animal bodies; and Malpighi has, with great juſtice, uſed the comparative anatomy of trees, to explain, by the formation of the galls, and other preternatural tumors on them, the puſtules and other unnatural fleſhy excreſcences on animal bodies.

DENDROMETER, from δενδρον, a *tree*, and μετρεω, *I meaſure*, an inſtrument lately invented by Meſſrs. Duncombe and Whittel, for which they obtained a patent, ſo called from its uſe in meaſuring trees. This inſtrument (*Tab.* II. *Surveying*, *fig.* 39.) conſiſts of a ſemicircle A, divided into two quadrants, and graduated from the middle; upon the diameter B there hangs a plummet L for fixing the inſtrument in a vertical poſition; there is alſo a chord D parallel to the diameter, and a radius E, paſſing at right angles through the diameter and chord. From a point on the radius hangs an altimeter C, between the chord and diameter, to which is fixed a ſmall ſemicircle G, and a ſcrew, to confine it in any poſition. The altimeter, which is contrived to form the ſame angle with the radius of the inſtrument as the tree forms with the horizon, is divided from its center both ways into forty equal parts; and theſe parts are again ſubdivided into halves and quarters. Upon the ſmall ſemicircle G, on which is accounted the quantity of the angle made by the altimeter and radius, are expreſſed degrees from 60 to 120, being 30 on each quadrant. The radius is numbered with the ſame ſcale of diviſions as the altimeter. There is alſo a nonius to the ſmall ſemicircle, which ſhews the quantity of an angle to every five minutes. On the back of the inſtrument the ſtock M (*fig.* 40.) of the ſliding-piece is confined to the axis N, which moves concentrically parallel to the elevation index F (*fig.* 39.) on the oppoſite ſide, to which it is fixed. This index is numbered by a ſcale of equal diviſions with the altimeter and radius: at the end of the index is a nonius, by which the angles of elevation above, or of depreſſion below the horizon, meaſured upon the ſemicircle of the inſtrument, are determined to every five minutes. There is alſo a groove in the radius, that ſlides acroſs the axis by means of a ſcrew I, working between the chord and ſemicircle of the inſtrument; and this ſcrew is turned by the key O. Upon the ſtock M (*fig.* 40.) is a ſliding piece P, that always acts at right angles with the altimeter, by means of a groove in the latter. To the ſhank of the ſliding piece is affixed a moveable limb Q, which forms the ſame angle with the altimeter as the bough forms with the body, or trunk of the tree. This limb

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limb may be of any convenient length, divided into equal parts of the ſame ſcale with all the foregoing diviſions. At the extremity of the fixed axis, on a center, an index R, with teleſcopic ſights, works horizontally upon the moveable limb of the ſliding piece. Upon this horizontal index R may be fixed a ſmall quadrant T, deſcribed with any convenient radius from the center on which the index moves, and divided into 90 degrees, beginning at a right line drawn from the center at right angles with the fiducial edge of the ſaid index; and upon the extremity of the axis is a nonius, whereby to determine the quantity of an angle upon the quadrant to every five minutes. There are alſo two ſmall circular arches S, S, ſerving to keep the ſights in a parallel poſition, each containing an equal number of degrees. Upon theſe arches is meaſured the angle, ſubtending a ſide equal to the difference of the altitudes of the obſerved objects above the plane of the horizon, and whoſe baſe is the neareſt diſtance between the perpendiculars, in which theſe objects are ſituated. The *dendrometer* is fitted to a theodolite, and may be uſed either with or without it, as occaſion requires.

The principal uſe of this inſtrument is for meaſuring the length and diameter of any tree, perpendicular or oblique, to an horizontal plane, or in any ſituation of the plane on which it reſts, or of any figure, whether regular or irregular, and alſo the length and diameter of the boughs, by mere inſpection; and the inventors of it have calculated tables, annexed to their account of the inſtrument itſelf, by the help of which the quantity of timber in any tree is obtained without calculation, or the uſe of the ſliding rule. The inſtrument is rectified by ſetting it in a perpendicular poſition, by means of the plummet, and ſcrewing it to the ſtaff; then the altimeter is placed in the exact poſition of the tree, whether perpendicular, reclining, or inclining, and ſcrewed faſt. If the tree ſtands on level ground, the horizontal diſtance from the tree to the axis of the inſtrument is meaſured with a tape line, and the radius is moved with the key, till that diſtance be cut upon it by the inſide of the diameter: but if the ground be ſlanting, the diſtance from the tree to the inſtrument is meaſured, and the elevation index is moved, till the point of the tree from which the diſtance was meaſured is ſeen through the ſights, and there ſcrewed faſt; and the radius is moved backwards or forwards with the key, till this diſtance is cut upon the elevation index by the perpendicular line of the altimeter; and the horizontal line will be marked upon the radius by the inſide of the diameter. In order to obtain the length of the tree, the elevation index is firſt moved downwards, till the bottom of the tree cut by the horizontal wires is obſerved through the ſights, and the feet and inches marked by the index upon the altimeter below the point of ſight, or horizontal line, are noted down: then the index is moved upwards, till the part to which you would meaſure, cut by the horizontal wires, is ſeen, and the feet and inches marked on the altimeter above the point of ſight, are noted: theſe two quantities added together give the exact length of the tree, which is inſerted in a field-book.

For the girth of the tree, the circumference in that part where the horizontal diſtance was taken, is meaſured with the tape line; and a ſixth part of this circumference is added to the diſtance on the radius, which was before cut by the inſide of the diameter, becauſe the tape-line, in taking the diſtance, cannot be applied to the center of the body of the tree; then the elevation index is lowered to that part of the tree, of which the diameter is to be taken and ſcrewed faſt. Set the moveable limb of the ſliding piece quite ſtrait, and the edge of the horizontal index upon the firſt diviſion of it. Turn the whole inſtrument about to the left hand, till you ſee, through the ſights, the left ſide of the tree cut exactly by the perpendicular wires; then, the inſtrument being fixed, move the ſights only upon the ſliding piece, till you ſee the right ſide of the tree cut alſo by the perpendicular wires; and you will find the true diameter marked by the horizontal index upon the ſliding piece, which is to be entered in a diſtinct column of the field-book.

For the boughs: let the diſtance on the radius be now reduced to its former quantity, and the elevation index moved upwards, till the bough is ſeen through the ſights, and ſcrewed faſt: ſet the moveable part of the ſliding piece in a poſition parallel to the bough, and the edge of the horizontal index on the firſt diviſion of it. Turn the whole inſtrument about, till you ſee, through the ſights, the ſhoot of the bough, cloſe to the trunk cut by the perpendicular wires; then move the ſights, till you ſee the other end of the bough cut by the ſaid wires, and note the feet and inches marked by the horizontal index on the moveable limb of the ſliding piece, which will give the true length of the bough, to be inſerted in the field-book. And the girth of the bough may be obtained, by directing the ſights to that part of it, whoſe girth is deſired; then by moving the elevation index downwards, till you ſee the under-ſide of the bough cut by the horizontal wires; and there noting the feet and inches marked by the ſaid index on the altimeter: after which, let the elevation index be moved upwards, till the upper-ſide of the bough cut by the horizontal wires is ſeen; the feet and inches marked upon the altimeter are to be noted as before: the former quantity ſubtracted from the latter will give the true diameter of the bough, which is entered in the field-book. The true ſolidity both of the body of the tree, and of the boughs, may be found from the diameter and lengths in tables calculated for this purpoſe.

The *dendrometer*, fitted to a theodolite, may be applied to meaſuring the heights and diſtances of objects, acceſſible or inacceſſible, whether ſituated in planes parallel, or oblique, to the plane in which the inſtrument is placed. It may be alſo uſed for taking all angles, whether vertical, horizontal, or oblique, in any poſition of the planes in which they are formed; and thus for facilitating the practical operations of engineering, land-ſurveying, levelling, mining, &c. and for performing the various caſes of plane trigonometry, without calculation; of which the inventors have ſubjoined to their account of this inſtrument many examples. See a Treatiſe upon the *Dendrometer*.

DENDROPHORIA, in *Antiquity*, the carrying of one, or more, trees, in ceremony, through a city, at certain feaſts, and in honour of certain deities.

The word is formed of δενδρον, *tree*, and φερω, *I bear*.

The *dendrophoria* was performed at the ſacrifices of Bacchus, Cybele, and the god Sylvanus. Arnobius, lib. v. makes mention of that performed in the ſacrifices of the mother of the gods. It conſiſted in carrying a pine in proceſſion through the city; which pine was afterwards planted in memory of that under which Atys, the favourite of this goddeſs, mutilated himſelf. The branches of this tree they crowned, in memory of Cybele's doing the ſame; and they covered its trunk with wool, becauſe the goddeſs covered Atys's breaſt with the ſame matter.

The perſons who performed the office of carrying the tree were called *dendrophori*.

In the Roman hiſtory we find mention made of a company, or college of *dendrophori*, who attended the army; and the critics have laboured much to aſſign their office. Some hold, that they hewed and faſhioned the wood for the tents: others, that they provided the wood neceſſary for the military works, machines of war, &c. Salmaſius, in his notes on the Life of Caracalla by Spartian, owns this to be the general opinion of all the learned men of his time; but aſſures us, that they were all miſtaken, and that the *dendrophori* of the army were the ſame with thoſe of the feaſts and ſacrifices.

DENEB, an Arabic term, ſignifying *tail*; uſed by aſtronomers as a denomination of ſeveral fixed ſtars.

Thus *deneb elecet* ſignifies the bright ſtar in the lion's tail; *deneb adigege*, that in the ſwan's tail, &c.

DENEB, or ALDENEB *alchail*, in the *Writings of the Arabian Phyſicians*, the name of the equiſetum or horſe-tail: there is, however, no great dependence to be had on what authors ſay of this plant.

DENIER, the French penny; a ſmall copper coin; twelve whereof make a ſol, or French ſhilling.

The French *denier* is now about the twenty-third part of the Engliſh penny. It is ſubdivided into two mailles, and the maille into two oboles. Anciently *denier* was a general name for all ſort of monies in France; as nummus for thoſe in Rome. Thus, a piece of gold money was called *denier d'or*; ſilver money, *denier d'argent*: after the ſame manner as the Romans ſaid *nummus aureus*, and *nummus argenteus*.

There were two kinds of *deniers*; the one Tournois, the other Pariſis; whereof the latter was worth a fourth part more than the former, and was called *monnoye royale*, or *forte monnoye*, and ſometimes *denier d'or*, and *denier à valeur d'or*. See MONEY, &c.

There are at preſent in France ſeveral little copper pieces, which having no proper name, are diſtinguiſhed only by their value in *deniers*: ſuch are the pieces of 36. 30. 24. 18. 12. 6. 4. and 2 *deniers*. The pieces of 4 and 2 *deniers* were coined at Straſburg for currency, in the province of Alſace, purſuant to the declaration of Sept. 6, 1695. Thoſe of ſix *deniers* were coined in the mints of Aix, Montpelier, Rochelle, Bourdeaux, and Nantz, by the edict of 1709, and are little current. Poſt. Dict. Comm.

DENIZEN, from the Britiſh *dinaſddyn*, *man of the city*, or *dineſydd*, *free of the city*, in *Law*, an alien enfranchiſed in England by the king's letters-patent, and donation; and

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and thereby enabled, in many reſpects, to do as the king's native ſubjects do; namely, to purchaſe, poſſeſs, and deviſe lands, &c.

Denizenſhip is a right inferior to naturalization by parliament: for a ſtranger naturalized may inherit lands by deſcent, which a *denizen* cannot. Neither can his iſſue born *before denization*, inherit to him; but his iſſue born after may. No *denizen* can be of the privy-council, or either houſe of parliament, or have any office of truſt civil or military, or be capable of any grant from the crown. Stat. 12 Will. III. cap. 2.

Add, that, in the charter, whereby a perſon is made a *denizen*, there is uſually ſome clauſe or other, which abridges him of that full benefit which natural ſubjects enjoy.

When a man is thus enfranchiſed, he is ſaid to be, *ad fidem regis Angliæ*, or, *under the king's protection*; till ſuch time his goods might be ſeized to the king's uſe.

DENOMINATION, from *denomino*, of *de* and *nomen*, a *name*, a name impoſed on any thing, uſually expreſſing ſome quality predominant therein.

Hence, as the qualities and forms of things are of two kinds, viz. internal and external, *denomination* becomes twofold.

DENOMINATION, *internal*, is that founded on the intrinſic form: thus Peter is *denominated* learned, on account of his learning, which is ſomething internal.

DENOMINATION, *external*, is that founded, or ariſing from the external form. Thus, a wall is ſaid to be ſeen, and known, from the viſion and cognition employed upon it; and thus Peter is *denominated* honoured, by reaſon of honour, which is not in the perſon honoured, but in him that honours.

DENOMINATOR, in *Arithmetic*, a term only uſed in ſpeaking of fractions, or broken numbers. See FRACTION.

The *denominator of a fraction* is the number or letter below the line; ſhewing into how many parts the integer is ſuppoſed to be divided by the fraction.

Thus in the fraction $\frac{7}{12}$ ſeven twelfths, the number 12 is the *denominator*, and ſhews, that the integer is here divided into 12 parts. So in the fraction $\frac{a}{b}$, b is the *denominator*.

The *denominator* always repreſents an integer.

The number above the line, 7, is called the *numerator*.

DENOMINATOR *of a ratio* is the quotient ariſing from the diviſion of the antecedent by the conſequent.

Thus 6 is the *denominator* of the ratio 30 : 5, becauſe 5) 30 (6. The *denominator* is what we otherwiſe call the *exponent* of the ratio.

DE NON *reſidentia clerici regis*, in *Law*, the name of an ancient writ, the form whereof ſee 2 Inſt. fol. 624. for excuſing a parſon employed in the king's ſervice for non-reſidence.

DENS *canis*, in *Botany*. See DOG'S *Tooth*.

DENSHIRING *of land*, in *Agriculture*, is the caſting parings of earth, turf, and ſtubble, into heaps, which when dried are burnt to aſhes, for a compoſt on poor barren land. This method of improvement is uſed, on taking in and encloſing common waſte grounds. In many parts of England this is called burn-beating; but in Staffordſhire, and other counties, they term it *denſhiring* of land. See BURNING *of land*.

DENSITY, *Denſitas*, that property, or habitude of bodies, whereby they contain ſuch a quantity of matter, under ſuch a bulk.

Accordingly, a body that contains more matter than another, under the ſame bulk, is ſaid to be *denſer* than the other.

Denſity ſtands in oppoſition to *rarity*.

Hence, ſince the maſs is proportional to the gravity, a *denſer* body is ſpecifically heavier than a rarer; and a ſpecifically heavier is *denſer* than a ſpecifically lighter.

The *denſities*, and bulks of bodies, are the two great points, whereon all mechanics, or laws of motion, turn: it is an axiom, that bodies of the ſame *denſity* contain equal maſſes under equal bulks. If the bulks of two bodies be equal, their *denſities* are as their maſſes: conſequently, the *denſities* of equal bodies are as their gravities. If two bodies have the ſame *denſity*, their maſſes are as their bulks: and hence, the gravities of bodies of the ſame *denſity* are in the ratio of their bulks. The maſſes of two bodies are in a ratio compounded of their *denſities* and bulks; conſequently, their gravities are in the ſame ratio; and if their maſſes or gravities be equal, their *denſities* are reciprocally as their bulks. The *denſities* of any two bodies are in a ratio compounded of the direct ratio of their maſſes, and the reciprocal one of their bulks. Thus, let D repreſent the *denſity*, M the magnitude or bulk, and Q the maſs or weight of one body; and d, m, q, thoſe reſpectively of another: then we ſhall have $D = \frac{Q}{M}$ and $d = \frac{q}{m}$, and therefore $D : d :: \frac{Q}{M} : \frac{q}{m}$; and $DMq = QmD$; whence the preceding propoſitions may be eaſily deduced.

The Peripatetics define *denſity* a ſecondary quality, whereby a body is full of itſelf; its parts cohering without any interſtice. So that the form of *denſity* conſiſts in the immediate coherence of parts. Hence Porphyry in his Predicaments defines a *denſe* body, that whoſe parts are placed ſo near each other, that no other body can come between them; as gold.

The efficient cauſe of *denſity* they uſually attribute to cold. Scaliger, and ſome others, attribute it to moiſture. Many of the moderns take the ſmallneſs of the parts of bodies, to contribute much to their *denſity*; as by this means the pores are left the ſmaller: though it is added, that the *denſity* of bodies does not only depend on the ſmallneſs of the pores, but alſo on their fewneſs; ſo far are we from having any body abſolutely *denſe* in the ſenſe of the ancients, that gold itſelf, the *denſeſt* and heavieſt of all natural bodies, Sir Iſaac Newton obſerves, contains a great deal more pore, or vacuity, than ſubſtance.

When the preſſures of two liquids are equal, the quantities of matter in columns which have equal baſes do not differ; wherefore the bulks, that is, the height of the columns, are inverſely as the *denſities*; whence may be deduced a method of comparing them together. For if in communicating tubes there be different fluids, and they remain at reſt, their preſſures are equal; and by meaſuring their altitudes, the ratio of their *denſities* is found.

The *denſities* of liquids are alſo compared together by immerging a ſolid into them: for if a ſolid lighter than the liquids to be compared together, be immerſed ſucceſſively into different liquids, the immerſed parts will be inverſely as the *denſities* of the liquids. For, becauſe the ſame ſolid is made uſe of, the portions of the different liquors, which in every caſe would fill the ſpace taken up by the immerſed parts, are of the ſame weight; therefore the bulks of thoſe portions, that is, the immerſed parts themſelves, are inverſely as the *denſities*.

DENSITY *of the air* is a property that has much employed the later philoſophers, ſince the diſcovery of the Torricellian experiment, and the air-pump.

It is demonſtrated, that in the ſame veſſel, or even in veſſels communicating with each other, at the ſame diſtance from the center, the air has every where the ſame *denſity*. The *denſity* of the air always increaſes in proportion to the compreſſion, or the compreſſing powers.

And hence, the lower air is always *denſer* than the upper; yet the *denſity* of the lower air is not proportional to the weight of the atmoſphere, by reaſon of heat and cold, which make conſiderable alterations as to rarity and *denſity*.

If the air be rendered *denſer*, the weight of bodies therein is diminiſhed; and if rarer, increaſed; becauſe bodies loſe more in heavier than in lighter mediums.

And hence, if the *denſity* of the air be ſenſibly altered, bodies, equally heavy in a lighter air, if their ſpecific gravities be conſiderably different, will have their equilibrium taken away in a *denſer* air, and the ſpecifically heavier will preponderate; which is the foundation of the MANOMETER, an inſtrument for meaſuring the alterations in the *denſity* of the air.

DENSITY *of the planets*; in homogeneous, unequal, ſpherical bodies, the gravities on their ſurfaces are as their diameters, if the *denſities* are equal. But if the bodies be equal, the gravities will be as the *denſities*. Therefore in bodies of unequal bulks and *denſities*, the gravity will be in a compound ratio of the diameters and *denſities*; conſequently the *denſities* will be as the gravities divided by the diameters, and therefore in the ſeveral bodies as follows, viz.

In the Sun.	Jupiter.	Saturn.	Earth.	Moon.
10000	9385	6567	39539	48911
Or $25\frac{1}{2}$	19	15	100	$123\frac{1}{2}$

As it is not likely that theſe bodies are homogeneal, the *denſities* here determined are not ſuppoſed to be true; but rather the mean *denſities*, or ſuch as the bodies would have if they were homogeneal, and of the ſame maſs of matter and magnitude.

DENTAL, DENTALIS, from *dens*, a *tooth*, is applied to certain letters, in the pronunciation whereof the teeth have a principal ſhare.

Grammarians, and eſpecially the Hebrew ones, diſtinguiſh the letters into *dental*, *labial*, *guttural*, *lingual*, *palatal*, &c.

DENTALIS, or DENTALIUM, is a kind of univalve ſhell, which the apothecaries are ordered to pulverize, and uſe in ſeveral medicaments, as an alkali.

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The genuine *dentalis*, described by M. Tournefort, is of a tubular, or conical form, about three inches long; of a ſhining, greeniſh-white colour; hollow, light, and divided lengthwiſe by parallel lines running from top to bottom. It is about the thickneſs of a quill, and bears ſome reſemblance to a dog's tooth, whence its name.

The *dentalium* is a genus of the *teſtacea* worms, in the Linnæan ſyſtem. It is very ſcarce; and therefore, in lieu of it, they uſually ſubſtitute a ſhell of divers colours found among the ſand when the ſea is withdrawn; but not channelled, or fluted like the *dentalis*.

Dr. Liſter, in the Philoſophical Tranſactions, makes mention of two ſpecies of *dentalia*; the firſt commonly enough found about the iſland of Guernſey, &c. being a long, ſlender, white pipe, a little bending and tapering, and open at both ends; the other properly called *entalium*, longer and thicker than the former; and beſides, ſtreaked with ridges; whence the Italian term *intaglia*. See *Tab. of Foſſils, Cloſs* 9. See ENTALIUM.

There are two principal kinds of them, the one ſmooth, the others ſtriated. Of the ſmooth kind, ſome are all over white, others are tipped with red at the end; and of the ſtriated ones, ſome are altogether white, others are green, and in ſome the ſtriæ are more prominent, in others fainter, eſpecially in the leſſer ones. See *Tab. of Shells*, N° 4.

This ſhell is alſo called *dentalium* and *ſyringites*. Taken inwardly, it is uſed as an alkali to ſweeten acids, to ſtop a looſeneſs of the belly, and for ſpitting of blood. It is alſo uſed externally as a drier.

DENTALIUM. See the preceding article.

DENTARIA, in *Botany*. See TOOTH-WORT.

DENTATED *Leaf*, in *Botany*. See LEAF.

DENTED, *indented, toothed*. See INDENTED.

DENTED *verge*, among *Botaniſts*, is applied to ſuch leaves of plants as are notched, or jagged about the edge or rim: of theſe ſome are *fine-dented*; others *large*, or *deep dented*, i. e. cut into the leaf. See LEAF.

DENTED *wheel*, *rota* DENTATA. See WHEEL.

DENTES, in *Anatomy*. See TEETH.

DENTEX, in *Zoology*, the name of a ſea-fiſh, caught in great plenty in the Mediterranean, and common in the markets of Italy.

It is a well-taſted fiſh, and is caught of five, or ſix, and ſometimes ten pound weight: it is ſomewhat broad and flat in its ſhape, yet conſiderably thick and long. Its head is flatted, its ſnout very long, and its back ridged and ſharp; its back and ſides are of a duſky yellowiſh green colour, and ſometimes, in the full grown fiſh, purpliſh, always ſpotted with very bright blue and black ſpots; the back and gill-fins have each a black ſpot near their origin, and their belly-fins are yellow.

The teeth are diſpoſed in a ſingle row in each jaw, and there are at diſtances four, which are longer and broader than the reſt, and look like the canine teeth of men, or of quadrupeds: it is from theſe that it has its name, and theſe as well as the reſt of the teeth are in this fiſh covered with lips, as in quadrupeds; its tail is forked, and its ſcales are very large. Geſner.

DENTICLES, or DENTILS, in *Architecture*, an ornament in corniches, bearing ſome reſemblance to teeth; particularly affected in the Ionic and Corinthian orders; and of late alſo in the Doric.

They are cut on a little ſquare member, properly called *denticulus*; and the notches, or ornaments themſelves, *dentils*; by the Italians, *dentelli*, and *denticoli*, from *dens*, *tooth*, as having the appearance of a ſet of teeth.

Anciently *dentils* were ſcarce ever uſed but in the Ionic cornich; yet we find them in the remains of the theatre of Marcellus; and this is an argument with ſome, that Vitruvius had not the direction of that building. Vitruvius preſcribes the breadth of each *dentil*, or tooth, to be half its height; and the metopa, or interval between each two, he orders to be two-thirds of the breadth of the *dentil*, lib. iii. cap. 4.

The ſame author, cap. ii. of his fourth book, obſerves, that the Greeks never uſed *dentils* underneath modillions, becauſe modillions repreſent purlins, and *dentils* repreſent ends of rafters, which can never be placed underneath purlins.

The Romans were not ſo ſcrupulous as to this decorum; excepting in the Pantheon, where there are no *dentils* under the modillions, neither in the portico, nor in the inſide of the building.

DENTICULI *Elephantis*, in the *Hiſtory of Shells*, a name given by many authors to the *dentale*, a ſmall ſhell of the tubulus marinus kind, which is ſomewhat bent and pointed at one end, and in ſome meaſure repreſents the elephant's tuſk. See DENTALIS.

DENTIFORMIS *proceſſus*, the ſame as *pyrenoides*. See PYRENOIDES.

DENTRIFICE, from *dens*, a *tooth*, and *frico*, *I rub*, in *Medicine*, *tooth-powder*; a remedy to rub the teeth, in order to cleanſe, or faſten them.

There are *dentrifices* of divers kinds and forms; ſome in form of a powder, compoſed of corals, pumice-ſtone, ſalt, alum, egg-ſhells, crabs-claws, hartſhorn, cuttle-bone, tartar vitriolated, &c. Others in form of an electary, conſiſting of the ſame powders, mixed up with honey.

There are others, prepared with roots boiled with alum, and dried in the oven. Others in form of a liquor, drawn by diſtillations from drying herbs, and aſtringent medicines.

The Dutch hold butter the beſt *dentrifice*, to keep the teeth white and ſound; and the Spaniards, urine.

The generality of operators for the teeth allow acids, ſuch as ſpirit of vitriol, &c. to be the readieſt of all *dentrifices*, to take off the foulneſs and yellowneſs of the teeth; but though they allow that theſe render them white, for the preſent, they diſcountenance a frequent uſe of them, as wearing away too much of the teeth, and injuring the gums.

Tachenius attacks ſpirit of vitriol even in a ſtronger manner, and affirms that it cannot anſwer the firſt purpoſe of making the teeth white: he alleges, that the mixture of ſpirit of vitriol, with any white alkali, produces a yellowiſh colour, not a white one. It is evident, that our ſweat, and all other matter, tranſpiring through the pores, is of an alkaline nature, and there continually tranſpires through the gums ſomething of this kind, which lodging itſelf upon the teeth, muſt needs mix with the remains of the ſpirit of vitriol left on them in the cleaning; and, by that means, the whiteneſs at firſt given will gradually go off; and the yellow, which is the natural reſult of an alkali, with ſpirit of vitriol, will appear in its place. Tachenii Hippocrat. Chym.

DENTIL, in *Architecture*. See DENTICLE.

DENTILLARIA, in *Botany*, a name by which ſome authors call the *plumbago*, or LEADWORT.

DENTISCALPRA, from *dens*, *tooth*, and *ſcalprum*, *ſcraping inſtrument*, in *Surgery*, an inſtrument for ſcouring yellow, livid, or black teeth; to which being applied near the gums, it ſcrapes off the foul morbid cruſt. Some of theſe inſtruments are furniſhed with narrow points; others with broader, and with edges; and ſome again are falciform; but all of them adapted to one and the ſame handle.

DENTITION, *Dentitio*, the act of breeding, or cutting the teeth.

The time of *dentition* is uſually from about the ſixth or ſeventh month to the age of twenty. The *inciſores* come firſt; then the *canini*; after them the *molares*: ſo that at the end of the ſecond year, in general, a child is furniſhed with ten teeth in each jaw, called the milk-teeth: this is the firſt *dentition*. Theſe generally laſt till the ſixth or ſeventh year, when they fall ſucceſſively without any conſiderable pain, and are ſucceeded by others, till the fourteenth or fifteenth year. The ſeventh year is uſually the period of the ſecond *dentition*: it often happens at this period, ſays an ingenious dentiſt, Mr. Magenis, that the roots of the milk-teeth are too firmly fixed, to give way to the progreſſive growth of the ſucceeding ones, which are in a ſoft feeble ſtate, and incapable of forcing their way in a proper order. In this caſe the new teeth become indented, and otherwiſe deformed; and by forcing their way on either ſide of the milk-teeth, form a double row, and aſſume the appearance of ſupernumerary teeth: and beſides, the root of the milk-tooth is ſometimes united in the ſocket with the root of the adult tooth, thus forming one root with two diſtinct teeth in the crown; in conſequence of which, the partitions of the ſockets are immoderately diſtended and weakened, and become incapable of retaining the ſtamina in their diſtinct alveoli or ſockets. It will therefore require peculiar attention, to determine when an extraction of the milk-teeth is neceſſary, whether they be faſt or looſe in their ſockets, in order to inſure a quicker growth, and a beautiful arrangement of the ſucceeding ſet. This ſecond *dentition* produces the four firſt great *dentes molares*, one at either extremity of both jaws: and from the tenth to the fifteenth year a third *dentition* happens, which furniſhes four other great *molares*, one cloſe by each of the former. The *molares* of the ſeventh year are ſubject to a caries and early decay, which is ſometimes attended with violent inflammations, tumours, and ulcerations of the gums. When theſe ſymptoms appear, and before the ulcer corrodes deeply, it will be neceſſary to extract the tooth, which will commonly remove theſe dreadful ſymptoms. It has been obſerved, that in ſome caſes the increaſed ſize of the *molares* forces and diſtends the lower jaw beyond its proper place, ſo that the lower teeth project as they approach the upper ones; and a timely extraction of the two great grinders in the lower

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jaw, whether they are decayed or not, has been recommended for preventing this deformity. About the twentieth year comes the laſt *dentition*, which gives the four extreme *dentes molares*, called *dentes ſapientiæ*, becauſe they come after puberty.

Dentition, Hippocrates obſerves, is uſually preceded with an itching of the gums, and with convulſions, fevers, and looſeneſs; eſpecially when the canine teeth are cut. Moſt of theſe ſymptoms Dr. Liſter, on this paſſage of Hippocrates, obſerves, happen to birds upon moulting, or caſting their feathers; on which occaſion alſo they become mute, and ſullen.

The germen, or ſeed of the tooth, ſays Dolæus, is a tender mucous matter, like the white of an egg, contained in the cells, or alveoli, of the jaw-bone, which grows harder and bigger every day, till it be fit to break through the gum. In this rupture the poor child is afflicted with terrible ſymptoms, inflammations of the jaws, gripes, waking, inquietude, terrors, dejections, vomiting, ſalivation, epilepſy, abſceſſes, and frequently death.

There are two terms, or periods of *dentition*; the one, when the tooth makes its firſt endeavour to get out of the maxillary bone, and wherein the outer and upper part of the gum uſes to be encompaſſed with a whitiſh circle; the other, when the tooth, conſiderably enlarged in bulk, renders the gum tumid, and ſtrives with all its force to break its way through the ſame. The remedies againſt the ſymptoms of *dentition* are abſorbents, and gentle purgatives.

If the fever be high, bleeding will be neceſſary: though this is an evacuation which children bear the worſt of any. Sydenham ſays, that in fevers occaſioned by *dentition*, he never found any remedy ſo effectual, as two, three, or four drops of ſpirits of hartſhorn in a ſpoonful of ſimple water, given every four hours. It may be given from five drops to fifteen or twenty, according to the age of the child; and when coſtiveneſs does not forbid it, three or four drops of laudanum may be added to each doſe. In convulſion fits, a bliſtering plaſter may be applied betwixt the ſhoulders, or one behind each ear. A ſmall Burgundy pitch plaſter between the ſhoulders has been ſometimes applied, when children are cutting their teeth; and has been found to eaſe the tickling cough which attends teething. The gums may be rubbed with a little fine honey three or four times a day: and children ſhould be always ſupplied with ſomething that will yield a little to the preſſure of their gums, as a cruſt of bread, a wax-candle, a bit of liquorice-root, &c. Cutting the gums is ſeldom of any uſe; however, in obſtinate caſes it ought to be tried. The food of children ſhould at this time be light, and their nerves braced by ſufficient exerciſe without doors, the uſe of the cold bath, &c. With theſe precautions, there would be little occaſion for teething necklaces, and other abſurd amulets, which are often worn, under the notion of aiding *dentition*.

DENUDATION, from *de*, and *nudus*, *naked*. See EXFOLIATION.

DENUNCIATION, *Denunciatio*, a ſolemn publication, or promulgation of any thing.

All veſſels of enemies are lawful prize after *denunciation*, or proclamation of war.

The deſign of the *denunciation* of excommunicated perſons is, that the ſentence may be the more fully executed; that the perſons may be known, the entrance into the church refuſed them, and that other people may be warned not to have any communication with them.

DEOBSTRUENTS, from *de*, and *obſtruo*, *I obſtruct*, are ſuch medicines as open obſtructions.

There is ſomething further intimated by *deobſtruent* than by *detergent*: for a medicine may be *deobſtruent*, that is not in the ſtricteſt ſenſe *detergent*: as, in effect, are moſt of thoſe which are made of metalline ſubſtances, ſuch as ſteel and mercury; which obtain the appellation *deobſtruents* from their acting by their natural weight, whereby they increaſe the momentum of the circulating fluid, and make it ſtrike againſt the ſecretory outlets with greater force; becauſe the momentum, or *vis percuſſionis*, of all projectiles, of which kind is a circulating fluid, is as their ſolidities, ſuppoſing their velocities equal. The more, therefore, the animal fluids are ſaturated with denſe and ſolid particles, with the greater force they diſtend the veſſels, and the more eaſily break through, where the ſtructure favours their eſcape; and upon that account are medicines which add to theſe qualities in the fluids called *deobſtruents*.

DEODAND, in our *Cuſtoms*, a thing given, or forfeited, as it were, to God, for the pacification of his wrath in a caſe of miſadventure, whereby a man or woman comes to a violent end, without the fault of any reaſonable creature.

As, if a horſe ſtrike his keeper, and kill him; if a man, in driving a cart, falls ſo that the cart-wheel runs over him, and preſſes him to death; if one be felling a tree, and gives warning to the ſtanders by, to take care of themſelves, yet a man is killed by the fall thereof: in the firſt place, the horſe; in the ſecond, the cart-wheel, or the cart and horſes; and in the third, the tree, is *Deo dandus*, *to be given to God*, that is, to the king, to be diſtributed to the poor by his almoner, for expiation of this unhappy event; though effected by unreaſonable creatures, or inanimate ſubſtances.

Omnia quæ movent ad mortem ſunt deodanda.

What moves to death
Is *deodand*.

This law ſeems to be an imitation of that in Exodus, chap. xxi. *If an ox gore a man, or a woman, with his horn, ſo as they die, the ox ſhall be ſtoned to death, and his fleſh not be eat; ſo ſhall his owner be innocent.*

Fleta ſays, the *deodand* is to be ſold, and the price diſtributed to the poor, for the ſoul of the king, his anceſtors, and all faithful people departed this life.

It was originally deſigned, in the ſuperſtitious times of popery, as an expiation for the ſouls of ſuch as were ſnatched away by death; and was given to the church in order to procure the ſoul of ſuch deceaſed perſon to be prayed out of purgatory.

DE ONERANDO *pro rata portionis*, in the law of England, a writ that lies where one is diſtrained for a rent that is to be paid proportionably by others: thus, if a man holds ten acres of land, by fealty and ten ſhillings rent, of the king; and aliens, one acre to one, and another to another, in fee; and afterwards the ſheriff diſtrains only one of them for the rent; he that is ſo diſtrained may have this writ for his relief.

DEOPPILATIVE, from *de*, and *oppilo*, *I obſtruct*, a remedy proper to ſoften, reſolve, and remove obſtructions. See OBSTRUCTION.

Deoppilatives are the ſame with what we otherwiſe call *deobſtruents*. See DEOBSTRUENT.

DEOSCULATION, *Deoſculatio*, in *Antiquity*, one of the moſt ancient forms of adoration. See ADORATION.

DEPART, a method of refining, or ſeparating gold from ſilver by means of *aqua fortis*.

There are three ways of refining gold: the firſt by antimony; the ſecond by ſublimate; and the third, which is the moſt uſual, by *aqua fortis*. The two former, ſee under REFINING.

For the operation of the *depart*, they take at the rate of one pound of impure gold, and two or three of ſilver; theſe they fuſe together in a crucible, and, when fuſed, caſt them into cold water, where they become divided into grains of the bigneſs of peas. Theſe grains taken out, and dried by the fire, are put in a *departing* veſſel, which is a ſtone matraſs, and to the metal are added four pounds of *aqua fortis*. Then taking the veſſel, they ſet it on the coals, and in about an hour's ſpace the refining is done. For, upon opening the veſſel, they find nothing appear therein but the *aqua fortis*, and the gold reduced into a calx, or ſand; the ſilver being all diſſolved, and imbibed by the liquor.

To raiſe the gold to its due fineneſs, they uſually give it the *aqua fortis* again and again; uſing for the firſt time half a pound, and for the ſecond a quarter of a pound of the water, to eight ounces of metal. If the third water be found good and clear, the operation is ended: and the calx of the gold, being waſhed in repeated waters, is melted down again in a crucible, firſt by a gentle, and afterwards a vehement fire, to be caſt into ingots, or wedges.

It muſt be added, that the ſilver, with the impurities of the gold, is ſo thoroughly incorporated with the water, that to the eye there does not appear any thing beſide the pure liquid; yet is not this ſilver loſt. To recover it again out of the menſtruum, they divide their ſtock of *aqua fortis* into ſeveral ſtone veſſels, which they fill up with ſpring water, obſerving to put ſeven or eight times as much of this, as that. This done, in each veſſel they put a quantity of copper; and leaving the whole for twenty-four hours, at the end thereof they find the ſpirits of the *aqua fortis* have quitted the ſilver, and are with the copper, leaving the former in form of a calx, or incorporated aſhes at bottom. This calx, being dried, is melted into an ingot, with a little ſaltpetre.

To huſband the *aqua fortis*, and make it ſerve again for a ſecond operation, they diſtil it in an earthen, or glaſs alembic; and when the diſtillation is about a third over, change the recipient. The water of the firſt recipient ſerves for the firſt operation of *departing*, and the reſt for the ſubſequent ones.

If the *aqua fortis*, having quitted the ſilver, and being united with the copper, be then filtrated, it is called *aqua ſecunda*; in which if you ſteep an iron plate ſome

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hours, you will have another *departure:* for the menſtruum will let go the copper, and prey on the iron, leaving the copper in powder on the iron plate. And filtrating this diſſolution, you may get the iron out of it, by laying in it a piece of *lapis calaminaris*; for the iron in that caſe will *depart* to the bottom, and the calamine be diſſolved. And if you again filtrate this water, and pour on it the liquor of fixed nitre, you will have another *depart*, the calamine precipitating to the bottom. And laſtly, filtrating this water, as before, and evaporating part of it, you will have cryſtals of ſaltpetre. See ASSAYING, and QUARTATION.

DEPARTERS *of gold and ſilver.* See DEPART, and FINERS.

DEPARTMENT, in *Juriſprudence*, ſignifies diſtribution, diviſion, or allotment of certain employments among ſeveral perſons. Thus the great officers of ſtate, &c. have each their ſeveral *departments:* and the buſineſs of the ſecretaries of ſtate in particular, is generally divided into two partitions; the one officiating for the ſouthern, the other for the northern *department:* though ſometimes another is added on particular occaſions.

DEPARTMENT, in *Architecture*, that part of an edifice, deſtined for ſome peculiar purpoſe: as in a palace, the *department* of the kitchen, of the ſtables, &c.

DEPARTURE, or DEPARTER, in *Law*, a term properly applied to a perſon, who firſt pleading one thing in bar of an action, and that being replied to, waves it, and inſiſts on ſomething different from his firſt plea.

Or, it may be applied to a plaintiff, who in his replication ſhews a new matter different from that in his declaration. So if a man plead a general agreement in bar, and in his rejoinder allege a ſpecial one, it ſhall be adjudged a *departure* in pleading. The defendant hereupon demurreth, becauſe it was a *departure* from the declaration. Coke, part ii. fol. 147.

DEPARTURE *in deſpite of the court*, is when the tenant, or defendant, after appearing to the action brought againſt him, and having a day over in the ſame term, does not appear at the day, but makes a default. This is a *departure in deſpite of the court*; and therefore he ſhall be condemned.

The *departure* is always on the part of the tenant, or defendant; and its entry is, *Quod prædictus A, licet ſolemniter exactus, non revenit, ſed in contemptum curiæ receſſit.*

DEPARTURE, in *Navigation*, is the eaſting, or weſting of a ſhip, with reſpect to the meridian from which it *departed* or ſailed. Or, it is the difference of longitude, either eaſt or weſt, between the preſent meridian the ſhip is under, and that where the laſt reckoning or obſervation was made. This *departure*, any where but under the equator, muſt be accounted according to the number of miles in a degree proper to the parallel the ſhip is under.

DEPESTA, in *Antiquity*, a wine veſſel, which the Sabines, on any feſtival day, ſet on the table of their gods.

DEPHLEGMATION, in *Chemiſtry*, is the act of purifying, or clearing a fluid of its phlegm, or water.

This is performed either by EVAPORATION, or by diſtilling the ſpirit, or other fluid, again and again; by which means the ſpirituous part riſes, and leaves the phlegm, or water, behind. When the ſpirit is thus diſengaged of all its phlegm, or, at leaſt, as much as it can be, it is called a *dephlegmated ſpirit.*

Dephlegmation is alſo called CONCENTRATION, particularly when acids are the ſubject.

DEPILATORY, in *Medicine*, a plaſter, or medicine, applied on any hairy place, in order to bring off the hair.

The word is formed of the particle *de*, and *pilus*, *hair.*

Depilatories are principally compoſed of lime and orpiment, which is very cauſtic, and even a dangerous mineral.

DEPONENT, *Deponens*, in the Latin *Grammar*, a term applied to verbs which have active ſignifications, but paſſive terminations, or conjugations, and want one of their participles paſſive.

Such is *minor*, *I threaten*, which has for participles *minans*, *minaturus*, and *minatus*, but no *minandus*, which ſhould be the participle paſſive.

They are called *deponents*, as having depoſited, or laid aſide, their paſſive ſignification.

DEPONENT, in a legal ſenſe, a perſon who makes a depoſition or affidavit.

DEPOPULATION, the act of waſting, deſtroying, deſolating, or unpeopling a place. Coke, Inſtit. part iii. fol. 204.

DEPOPULATORES *agrorum*, in our *Statutes*, ſuch as depopulate or diſpeople lands.

It appears by the ſtatute 4 Hen. IV. c. 2. that theſe were great offenders by the ancient law, and that the appeal or indictment againſt them ought not to be in a general, but in a ſpecial manner. They got their name of *depopulatores agrorum*, becauſe by proſtrating or decaying the houſes and habitations of the king's people, they depopulate towns. Coke, 3 Inſt. fol. 204.

DEPORTATION, from *deporto*, *I carry away*, a ſort of baniſhment in uſe among the Romans, whereby ſome iſland, or other place, was allotted to a criminal for the place of his abode, with a prohibition from ſtirring out of the ſame on pain of death.

Ulpian makes this difference between *deportation* and *relegation:* that the former confined the party to one certain place for ever; whereas relegation was frequently revoked, and allowed the exile a little more liberty.

By *deportation* a perſon loſt the rights of a Roman citizen.

DEPOSIT, *Depoſitum*, a thing put into the hands of another, to be kept gratis.

The civilians divide *depoſitum* into *ſimple* and *judiciary.*

DEPOSIT, *Judiciary*, is that whoſe property is conteſted between ſeveral perſons, and depoſited in the hands of ſome third perſon, by decree of a judge.

DEPOSIT, *Simple*, is either voluntary, or neceſſary. Neceſſary is that done in caſe of hoſtility, ſhipwreck, fire, &c.

Innholders are reſponſible for the baggage brought to them, as being a *neceſſary depoſit.*

DEPOSITARY, in the French law, a perſon entruſted as keeper, or guardian of any thing.

Ordinary depoſitaries are not to warrant the thing left with them, in caſe it be loſt, or ſtolen. They are only to anſwer for a fraud, or breach of faith; not for negligence. But a *neceſſary depoſitary*, as an innkeeper, is accountable for a theft or robbery, if there have been any negligence in the caſe: and by the Engliſh law, even whether there were any negligence or not.

DEPOSITIO, in *Grammar*, is a name which the Latins gave to the final cadence, which terminates as it were the meaſure of the verſe. The Greeks called it αποθεσιν and καταλεξιν. Hence ariſeth the diſtinction of verſe into four ſpecies, viz. *acatalectic*, *catalectic*, *brachycatalectic*, and *hypercatalectic.*

DEPOSITION, *Depoſitio*, among the *Ancients*, a ceremony obſerved immediately upon a perſon's expiring, and was a ſolemn manner of laying the corpſe upon the ground. See BURIAL.

DEPOSITION, in *Law*, a teſtimony given in court by a witneſs upon oath.

In chancery, *depoſition* is a teſtimony ſet down in writing, by way of anſwer to the interrogatories exhibited in chancery, where ſuch witneſs is called *deponent.*

DEPOSITION is alſo uſed for the ſequeſtering, or depriving a perſon of his dignity and office.

This *depoſition* only differs from abdication, in that the latter is ſuppoſed voluntary, and the act of the dignitary, or officer himſelf; and the former of compulſion, being the act of a ſuperior power, whoſe authority extends thereto. Some ſay the *depoſition*, and ſome the abdication, of king James II.

Depoſition does not differ from deprivation: we ſay indifferently, a *depoſed*, or deprived biſhop, official, &c.

Depoſition differs from ſuſpenſion, in that it abſolutely and for ever ſtrips or diveſts a prieſt, &c. of all dignity, office, &c. whereas ſuſpenſion only prohibits, or reſtrains, the exerciſe thereof.

Depoſition only differs from degradation, in that the latter is more formal, and attended with more circumſtances, than the former; but in effect and ſubſtance they are the ſame; thoſe additional circumſtances being only matter of ſhew, firſt ſet on foot out of zeal and indignation, and kept up by cuſtom, but not warranted by the laws or canons. See DEGRADATION.

DEPOT, in *Military Language*, denotes a particular place at the tail of the trenches, out of the reach of the cannon of the place, where the troops commonly aſſemble, that are ordered either to attack the outworks, or to ſupport the troops in the trenches, when there is reaſon to imagine that the beſieged intend to make a vigorous attack.

DEPOT alſo ſignifies a temporary magazine for forage, faſcines, gabions, tools, &c. neceſſary for the ſupport of an army, or for carrying on a ſiege.

DEPRECATION, from *deprecor*, *I intreat*, in *Rhetoric*, a figure whereby the orator invokes the aid or aſſiſtance of ſome one; or prays for ſome great evil or puniſhment to befal him who ſpeaks falſely, either himſelf, or his adverſary.

DEPRECATORY, or DEPRECATIVE, in *Theology*, a term applied to the manner of performing ſome ceremonies in the form of prayer.

Among the Greeks, the form of abſolution is *deprecatory*; being conceived in theſe terms, *May God abſolve you!* whereas in the Latin, and even in ſome of the reformed churches, it is in the declarative form, *I abſolve you.*

DEPRESSED *Leaf*, in *Botany.* See LEAF.

DEPRESSION *of equations.* See EQUATION.

DEPRESSION *of the pole.* So many degrees as you ſail, or travel from the pole towards the equator, ſo many you are

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are ſaid to *depreſs* the pole, becauſe it becomes, reſpectively, ſo much lower, or nearer to the horizon.

DEPRESSION *of the viſible horizon*, denotes its ſinking or dipping below the true horizontal plane; whether cauſed by ſome variation of the atmoſphere, or by the different height of the obſerver's eye above the ſurface of the ſea. Thus, let *a S f* (*Tab.* II. *Surveying*, *fig.* 38.) be the ſurface of the ſea, E S the height of the eye above that ſurface, and A F the obſerver's horizon: then the eye looking along E *a* for the horizon, which dips below the true one by the arc A *a*, perceives the apparent altitude *a* B of an object, leſſened by the arc A *a*; but if the obſerver has his back towards the object B, then looking along the line E *f*, the apparent horizon now becoming the line *f* E *c*, and dipping below the true one by the arc F *f* or A *c*; it is plain the apparent altitude *c* B is too little, and muſt be augmented by the arc A *c* = F *f*. The *depreſſion* or dip of the horizon may be eaſily computed: thus, let C be the earth's center, E the eye, and the tangent E *f* meeting the ſurface in *f*, where the ſky and water ſeem to meet; then C *f* E is a triangle, right-angled at *f*; wherein are known C *f* = C S = 20899059 feet, the earth's ſemidiameter, and C E = (C S + S E) the height of the eye added to the earth's radius: then as C E : rad. :: C *f* : ſine ∠ C E *f*, whoſe complement is the angle F E *f*, the dip ſought. The following table ſhews the *depreſſion* or dip of the horizon of the ſea for different heights of the eye, from one to a hundred feet.

Elevation of the eye above the ſea, in feet.	Depreſſion of the horizon of the ſea.	Elevation, &c. Feet.	Depreſſion, &c.
	′ ″		′ ″
1	0 57	22	4 28
2	1 21	24	4 40
3	1 39	26	4 52
4	1 55	28	5 3
5	2 8	30	5 14
6	2 20	35	5 39
7	2 31	40	6 2
8	2 42	45	6 24
9	2 52	50	6 44
10	3 1	60	7 23
12	3 18	70	7 59
14	3 34	80	8 32
16	3 49	90	9 3
18	4 3	100	9 33
20	4 16		

See Robertſon's Elem. of Navigation, book ix. p. 391. and Tables requiſite to be uſed with the Nautical Ephemeris, p. 14. See LEVELLING.

DEPRESSION *of the ſun*, or *of a ſtar*, is its diſtance from the horizon, below it, meaſured by an arch of the VERTICAL *circle*, intercepted between it and the HORIZON.

DEPRESSOR, in *Anatomy*, a name common to divers muſcles, from their office in lowering, or bringing down, the parts they are faſtened to.

DEPRESSOR *alæ naſi*, in *Anatomy*, a name given by Albinus to a muſcle of the face, called by Cowper *conſtrictor alæ naſi*, and *depreſſor labii ſuperioris*.

DEPRESSOR *anguli oris*, in *Anatomy*, a name given by Albinus to the muſcle called by others *depreſſor labiorum communis*; which ſee.

DEPRESSOR *labii ſuperioris*, is a muſcle called alſo *conſtrictor alæ naſi*. See CONSTRICTORES *naſi*.

DEPRESSOR *labii inferioris proprius*, or *quadratus*, a muſcle placed between the *depreſſores labiorum communes*, on the part called the *chin*. It appears to be but one muſcle, aſcending with a twofold order of fleſhy fibres, and terminating in the lower lip. Its office is ſhewn by its name; it depreſſes the lower lip. See *Tab. Anat.* (*Myol.*) *fig.* 1. *n.* 6.

DEPRESSOR *labiorum communis*, by ſome called *depreſſor labii ſuperioris*, and *triangularis*, is common to both lips. It ariſes with a broad origin from the lower margin of the under jaw, by the ſide of the chin, and is inſerted with a narrow tail into each lip near their coalition; ſerving to draw them obliquely down. See *Tab. Anat.* (*Myol.*) *fig.* 1. *n.* 7.

DEPRESSOR *maxillæ inferioris*. See DIGASTRICUS and BIVENTER.

DEPRESSORES *oculi*, a pair of muſcles ſpringing from each corner of the eye, and anſwered by another pair of like figure and ſtructure in the lower eye-lid. Theſe are often conſidered together by anatomiſts as one orbicular muſcle; the fibres environing the eye-lids, and being inſerted into them, not unlike the ſphincters of other parts.

DEPRIMENS, in *Anatomy*, the ſame with DEPRESSOR.

DEPRIMENS *biventer*, in *Anatomy*, a name given by Spigelius, and others, to one of the muſcles of the lower jaw, called by others *digaſtricus ſive biventer*; and, by Albinus, *biventer maxillæ inferioris*.

DEPRIMENS *humerum rotundus*, in *Anatomy*, a name given by Spigelius, and others, to a muſcle called by others the *teres major*, and *rotundus major*.

DEPRIMENS *oculi*, in *Anatomy*, a name given by Riolanus, and others, to one of the muſcles of the eye, called the *humilis*, and *rectus inferior* by others. It is the *depreſſor oculi* of Cowper and of Albinus, being one of his four *recti*.

DEPRIMENS *quintus*, in *Anatomy*, a name given by Spigelius, and ſome others, to the muſcle called the CERATOGLOSSUM.

DEPRIVATION, in the *Canon Law*, the act of bereaving, diveſting, or taking away a ſpiritual promotion, or dignity: as when a biſhop, vicar, prebend, or the like, is depoſed, or *deprived* of his preferment, for ſome matter, or fault, in fact, or in law. See DEPOSITION.

Deprivation is of two kinds; *à beneficio*, *& ab officio*.

DEPRIVATION *à beneficio* is, when for ſome great crime a miniſter is wholly and for ever deprived of his living, or preferment: which differs from ſuſpenſion, in that the latter is only temporary.

DEPRIVATION *ab officio*, is when a miniſter is for ever deprived of his orders: which is the ſame, in reality, with what we otherwiſe call *depoſition* and *degradation*; and is uſually for ſome heinous crime deſerving death, and is performed by the biſhop in a ſolemn manner. See DEGRADATION.

DEPTH, in *Geometry*, &c. See ALTITUDE, ELEVATION, &c.

DEPTH *of a ſail*, denotes the extent of any ſquare or oblong SAIL from the head-rope to the foot-rope; or the length of the after-leech of any boom-ſail or ſtay-ſail.

DEPTH *of a ſquadron*, or *battalion*, is the number of men in a file, or the number of ranks. Infantry is now generally drawn up three deep, and in the defence of a breaſt-work only two deep. The cavalry is commonly drawn up three deep, and ſometimes only two deep. See RANK.

DEPURATION, from *depurgo*, *I purify*, in *Pharmacy*, the ſame as clarification, or purification; viz. the purging a body of all the lees, fæces, and other craſs, coarſe, and excrementitious parts contained therein.

Fermentation ſerves to *depurate* liquors: ſyrups, juices, &c. are *depurated* by paſſing them through the *manica Hippocratis*, or ſtraining-bag. See CLARIFICATION.

DEPURATORIA *Febris*, in *Medicine*, a fever thus called by the illuſtrious Sydenham, which prevailed much in the years 1661, 2, 3, 4. This, ſays he, ſeems to be the only one, as far as I could hitherto obſerve, in which nature regulated all the ſymptoms in ſuch a manner, as to fit the febrile matter, prepared by proper concoction, for expulſion in a certain time, either by a copious ſweat or a freer perſpiration; and upon this account I call it the *depuratory fever*: and in reality, continues he, I am inclined to believe, that this is the capital and primary fever of nature, as well with reſpect to the regular method which nature uſes in promoting and accompliſhing the digeſtion of the morbific matter at the appointed time, as alſo becauſe it occurs more frequently than other fevers. It ſeems alſo reaſonable to think, that the neceſſary and excellent rules left us by Hippocrates and other ancient phyſicians, are adapted to this primary fever; by means of which it is to be regulated in ſuch a manner, that the febrile matter may be prepared to make a proper criſis by ſweat.

DEPUTATION, from *deputare*, *to depute*, a miſſion of certain ſelect perſons out of a company, or body, to a prince, or aſſembly, to treat of matters in their name, or to proſecute ſome affair therein.

Deputations are more or leſs ſolemn, according to the quality of thoſe who ſend them, and the buſineſs they are ſent upon.

Deputation is not properly applied where a ſingle perſon ſends another with ſuch commiſſion; but only where a body are concerned. The parliament *deputed* the ſpeaker, and ſix members, to preſent their addreſs to his majeſty. The chapter *deputed* two canons to ſolicit their affair in council.

DEPUTY, a perſon ſent, or *deputed*, by ſome community, in their name and behalf.

The ſeveral provinces of the French dominions ſend *deputies* to the king every year, to preſent him the cayer des etats: there are always three *deputies*, one from each order. It is the *deputy* of the firſt order that makes the compliment to the king. In the cities of Turky there are always *deputies* to treat with the grand ſignior's officers,

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cers, as to taxes, and other concerns. These *deputies* are three or four of the richeſt and moſt conſiderable among the burghers.

DEPUTY is alſo frequently uſed among us for an office, or employ, not a dignity; and ſtands indifferently for a vice, or lieutenant.

DEPUTY, in *Law*, is one who exerciſes an office in another's right: and the forfeiture or miſdemeanor of ſuch *deputy* ſhall cauſe the perſon whom he repreſents to loſe his office. A principal officer may not appoint a *deputy* in all caſes, unleſs the grant of the office will juſtify him in ſo doing; but when an office deſcends to an infant, ideot, &c. he may make a *deputy* of courſe. A ſuperior officer muſt anſwer for his *deputy* in civil actions, but not in criminal caſes. Judges have no power to hold their courts by *deputy*: recorders, however, may do it. Coroners cannot appoint *deputies*, becauſe theirs is a judicial office of truſt, annexed to their perſons. Sheriffs, ſtewards of a court, bailiffs of a liberty, and conſtables, are allowed to appoint *deputies*.

DEPUTATUS, among the *Ancients*, was applied, firſt, to armourers, or workmen employed in the making of armour in the forges, &c. And ſecondly, to a ſort of active people, who followed the army, and in engagements were truſted to bring off, and take care of the wounded.

DEPUTATUS, Δεπουτατος, was alſo an inferior officer in the church of Conſtantinople, whoſe buſineſs was to call perſons of condition the patriarch had a mind to ſpeak with, and to keep off the crowd where that prelate walked.

This *deputy* appears to have been a ſort of uſher, or tipſtaff; but he had likewiſe the care of the ſacred veſtments, in which he approached the office of a ſacriſtan.

DE QUIBUS *ſur diſſeiſin*, in *Law*, a writ of entry. See Fitzherb. Nat. Brev. fol. 191.

DER, a ſyllable frequently prefixed to the names of places in England. It is ſaid to ſignify that ſuch were formerly places where wild beaſts herded together, ſo called from the Saxon *deop*, *fera*, unleſs the ſituation was near ſome river.

DERBY-*neck*. See BRONCHOCELE.

DERDER, in the *Materia Medica of the Ancients*, a name uſed by Avicenna and Serapion, to expreſs the common elm, whoſe bark they uſed on many occaſions.

DEREFELD, in our *Old Writers*, is uſed for a park, q. d. a field of deer.

DEREIGNMENT, or DERAIGNMENT, in *Law*. The ſubſtantive *dereinment*, is ſometimes uſed in the ſame ſenſe with the French *deſrayer* or *deſranger*; that is, to diſplace or ſet out of order. Thus we find *deraignment* or departure out of religion, ann. 31 Hen. VIII. c. 6. and 5 and 6 Edw. VI. c. 13. Thus alſo we meet with *dereinment* or diſcharge of their profeſſion, 33 Hen. VIII. cap. 29. which is ſaid of thoſe religious men, who forſook their orders or profeſſion. See Kitchin, fol. 152. The leſſee enters into religion, and afterwards is *deraigned*. And Briton, c. 21. uſes *ſemonenſe deſrenable*, for a ſummons that may be challenged as defective, or not lawfully made. Skene, De Verb. Signific. Verbo *diſrationare*, makes it ſignify what we call waging and making of law.

DERELICTS, from *de*, and *relinquo*, *I leave*, in the *Civil Law*, are ſuch goods as are wilfully thrown away, or relinquiſhed by the owner.

DERELICT is alſo applied to ſuch lands, as the ſea receding from, leaves dry, and fit for cultivation.

If they are left by a gradual receſs of the ſea, they are adjudged to belong to the owner of the adjoining lands: but when an iſland is formed in the ſea, or a large quantity of new land appears, ſuch *derelict* lands belong to the king.

DERELSIDE, in *Botany*, a name by which ſome authors have called the tamarind-tree. Alpin. Egypt. p. 328.

DE REVOCATIONE *parliamenti*, the name of a writ for recalling a parliament. Thus in 5 Edw. III. the parliament being ſummoned, was recalled by ſuch a writ before it met. Vide Pryn's Animad. on the 4 Inſt. f. 44.

DEREYN, or DARAIGN, *diſrationare* vel *dirationare*, in our *Old Laws*, is generally uſed for the act of proving: thus we find *dirationabit jus ſuum hæres propinquior*. Glanv. lib. ii. c. 6. And, *dirationavit terram illam in curia mea*. Id. lib. ii. c. 20. Bracton uſes it in the ſame ſenſe, *Habeo ſufficientem diſratiocinationem & probationem*, lib. iv. tract. 6. c. 16. And ſo he makes uſe of *diſrationare*, lib. iv. c. 22. And we find to *dereyn the warranty* in Old Nat. Br. fol. 146. To *deraign* that right, 3 Edw. I. c. 4. and Weſtmin. tom. ii. c. 5. When the parſon of any church is diſturbed to demand tithes in the next pariſh, by a writ of *indicavit*, the patron ſhall have a writ to demand the advowſon of the tithes, being in demand; and when it is *deraigned*, then ſhall the plea paſs in the court Chriſtian, as far forth as it is *deraigned* in the king's court.

DERIVATIO, in *Rhetoric*, is a figure in which words that are *derived* from the ſame root come together in the ſame ſentence. The figure is repeated in the following example: *He wiſhed rather to die a preſent death, than to live a miſerable life.*

DERIVATION, from *de*, and *rivus*, *a ſtream*, in *Grammar*, the affinity one word has with another, by having been originally formed from it.

DERIVATION, in *Medicine*, the act of diverting a humour which flows on ſome noble part, and drawing it to ſome other neighbouring part, where it is leſs dangerous.

Thus, in defluctions upon the eyes, or teeth, they apply a bliſter behind the neck, to draw the matter thither: and in a quinſy, they preſcribe bleeding in the *ranulæ*, or veins under the tongue, to divert the humour from falling on the throat.

DERIVATION. See ANGLE.

DERIVATIVE, in *Grammar*, a word which takes its origin from another word, called its *primitive*.

Such is the word *derivative* itſelf, which takes its origin from the primitive *rivus*; a rivulet, or channel, out of which leſſer ſtreams are drawn; and thus *manhood*, *deity*, *lawyer*, &c. are *derived* from *man*, *deus*, *law*, &c.

DERIVATIVE or *ſecondary Conveyances*, in *Law*, are thoſe which preſuppoſe ſome other conveyance precedent, and only ſerve to enlarge, confirm, alter, reſtrain, reſtore, or transfer the intereſt granted by ſuch original conveyance. Theſe are *releaſe*, *confirmation*, *ſurrender*, *aſſignment*, and *defeazance*.

DERMA, in *Anatomy*, the *cutis*, or ſkin of an animal; or the tegument inveſting the whole body immediately under the cuticle, or ſcarf-ſkin.

The word comes from the Greek δερειν, *to flay*, or *excoriate*.

The *derma* conſiſts of two parts; the *corpus reticulare*, and *papillæ pyramidales*. See SKIN.

DERMESTES, in *Zoology*, a genus of inſects of the order of the *coleopteræ*, the antennæ of which are of a clavated figure, and perfoliated tranſverſely. There are ſeveral ſpecies of this genus, confounded by ſome with beetles, or *ſcarabæi*.

DERNIER *reſſort*. See RESSORT.

Whatever power is committed by the king to any other, the *dernier reſſort* is ſtill remaining in himſelf; ſo that he may ſit in court, and take cognizance of all cauſes: except in treaſons, and other caſes, where he himſelf is a party.

DEROGATION, from *derogo*, an act contrary to the preceding one, and that annuls, deſtroys, and revokes it, either in whole, or part.

Derogations, in general terms, are not regarded in judicature; they muſt be in ſpecific, and in formal terms.

A new law imports a *derogation* of a former one: a ſecond teſtament is a *derogation* of a firſt.

DEROGATORY, a clauſe importing *derogation*.

By the French law, if a perſon own himſelf indebted in a certain ſum; notwithſtanding any quittance he has obtained for the ſame, the act is *derogatory*.

DERVIS, or DERVICH, a name given to a ſort of monks among the Turks, who lead a very auſtere life, and profeſs extreme poverty; though they are allowed to marry.

The word is originally Perſian, דרויש, ſignifying a *beggar*, or perſon who has nothing: and becauſe the religious, and particularly the followers of Mevelava, profeſs not to poſſeſs any thing, they call both the religious in general, and the Mevelavites in particular, *Derviſes*, or *Derviches*.

The *Derviſes*, called alſo *Mevelavites*, are a Mahometan order of religious; the chief, or founder whereof, was one Mevelava. They are now very numerous. Their chief monaſtery is that near Cogna in Natolia, where the general makes his reſidence, and where all the aſſemblies of the order are held; the other houſes being all dependent on this, by a privilege granted to this monaſtery under Ottoman I.

The *Derviſes* affect a great deal of modeſty, patience, humility, and charity. They always go bare-legged, and open-breaſted, and frequently burn themſelves with hot irons, to inure themſelves to patience. They always faſt on Wedneſdays, eating nothing on thoſe days till after ſun-ſet. Tueſdays and Fridays they hold meetings, at which the ſuperior of the houſe preſides. One of them plays all the while on a flute, and the reſt dance, turning their bodies round and round with the greateſt ſwiftneſs imaginable. Long cuſtom to this exerciſe from their youth has brought them to ſuch a habitude, that it does not diſcompoſe them at all. This practice they obſerve with great ſtrictneſs, in memory of Mevelava their patriarch's turning miraculouſly round, as they pretend, for the ſpace of four days, without any food or refreſhment; his companion Hamſa playing all the while on the flute: after which he fell into an extaſy, and therein received wonderful revelations for the eſtabliſh-

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eſtabliſhment of his order. They believe the flute an inſtrument conſecrated by Jacob, and the ſhepherds of the Old Teſtament, becauſe they ſang the praiſes of God upon them. They profeſs poverty, chaſtity, and obedience, and really obſerve them while they remain *Derviſes*; but if they chooſe to go out, and marry, they are always allowed.

The generality of *Derviſes* are mountebanks: ſome apply themſelves to legerdemain, poſtures, &c. to amuſe the people; others give into ſorcery and magic: but all of them, contrary to Mahomet's precept, are ſaid to drink wine, brandy, and other ſtrong liquors, to give them the degree of gaiety their order requires.

Beſide their great ſaint Mevelava, there are particular ſaints honoured in ſome particular monaſteries: as Kiderle, greatly revered in the monaſteries of Egypt, and held by ſome to be St. George; and by others, with more probability, the prophet Elias.

The *Derviſes* are great travellers; and, under pretence of preaching, and propagating their faith, are continually paſſing from one place to another: on which account they have been frequently uſed as ſpies.

There are alſo *Derviſes* in Perſia, called in that country *Abdals*, q. d. *ſervants of God*. They lead a very penurious, auſtere life, and preach the Alcoran in the ſtreets, coffee-houſes, and wherever they can meet with auditors. The Perſian *Derviſes* retail little but fables to the people, and are in the utmoſt contempt among the men of ſenſe, and letters.

There are in Egypt two or three kinds: thoſe that are in convents, are in a manner of the religious order, and live retired; though there are of theſe ſome who travel and return again to their convents. Some take this character, and yet live with their families, and exerciſe their trades: of this kind are the dancing *Derviſes* at Damaſcus, who go once or twice a week to a little uninhabited convent, and perform their extraordinary exerciſes; theſe alſo ſeem to be a good people: but there is a third ſort of them who travel about the country, and beg, or rather oblige people to give, for whenever they found their horn ſomething muſt be given them. The people of theſe orders, in Egypt, wear an octagonal badge, of a greeniſh white alabaſter, at their girdles, and a high ſtiff cap without any thing round it. Pococke's Egypt, p. 178.

DESART, or DESERT, a wild, uncultivated, uninhabited place or country: as the *deſarts* of Lybia, of the Thebaid, &c. Geographers uſe the word in the general for all countries little, or not at all, inhabited. In Scripture, we find ſeveral places in the Holy Land, or places adjoining thereto, called *deſarts*. The *Deſart*, or wilderneſs, abſolutely ſo called, is that part of Arabia on the ſouth of the Holy Land, wherein the Iſraelites wandered, from the time of their evacuating Egypt to their entry into the Promiſed Land. The *Deſart* of Beerſheba was that part of the *Deſart* juſt mentioned, which bordered on the Holy Land, running towards the Mediterranean. The *Deſart* of Idumæa is Idumæa itſelf, a barren, mountainous country. The *Deſarts* of Betharen, Bethſaida, Cadeſh, Damaſcus, Dibon, Engeddi, Edom, Gibeon, Horeb, Jazer, Juda, Moab, Pharan, Sin, Sinai, Zur, Zin, &c. are ſo many dry, uncultivated, and in general mountainous places, like our downs, &c. where there are few or no habitations or inhabitants; whence the Hebrews call them by antiphraſis מדבר, which properly ſignifies *human word*, or *ſpeech*, becauſe there is none heard there.

DESART, in *Cookery*. See DESSERT.

DESCANT, from *de*, and *cantus*, *ſong*, in *Muſic*, originally ſignified an extemporaneous ſong, which was no ſooner uttered than loſt; but it was afterwards applied to the art of compoſing in ſeveral parts.

Deſcant is threefold; viz. *plain*, *figurative*, and *double*.

DESCANT, *Plain*, is the ground-work or foundation of muſical compoſition, and conſiſts altogether in the orderly placing of many concords; anſwering to ſimple COUNTERPOINT.

DESCANT, *Figurative*, or *florid*, is that wherein diſcords are concerned as well, though not ſo much, as concords. This may be well termed the ornamental or rhetorical part of muſic; becauſe that in this are introduced all the varieties of points, figures, ſyncopes, diverſities of meaſures, and whatſoever elſe is capable of adorning the compoſition.

DESCANT, *Double*, is when the parts are ſo contrived, that the treble may be made the baſs; and, on the contrary, the baſs the treble.

DESCENDANT, in *Genealogy*, a term relative to *aſcendant*, and applied to a perſon who is born or iſſued from ſome other referred to. Thus, mankind are ſaid to be *deſcendants* of Adam. The *deſcendants* from the brothers of the maid of Orleans are confirmed in their exemption from all taxes and impoſts, by a regulation of the year 1634. See DESCENT.

DESCENDENS *obliquus*, in *Anatomy*, a name given by Fabricius, and others, to the muſcle, called by Albinus *obliquus externus abdominis*.

DESCENDING, ſomething that falls, or moves, from above, downwards.

There are *aſcending* and *deſcending* ſtars; and *aſcending* and *deſcending* degrees.

There are alſo *aſcending* and *deſcending* veins ſpringing out of the *cava*; and *aſcending* and *deſcending* arteries riſing out of the *aorta*.

DESCENDING *latitude*, is the latitude of a planet in its return from the nodes to the equator.

DESCENSION, in *Aſtronomy*, is either *right* or *oblique*.

DESCENSION, *Right*, *of a ſtar*, or *ſign*, is a point, or arch, of the equator, which *deſcends* with the ſtar, or ſign, below the horizon, in a right ſphere.

DESCENSION, *Oblique*, is a point, or arch, of the equator, which *deſcends* at the ſame time with a ſtar, or ſign, below the horizon, in an oblique ſphere.

Deſcenſions, both *right* and *oblique*, are accounted from the firſt point of Aries, or the vernal interſection, according to the order of the ſigns; that is, from weſt to eaſt. And, as they are unequal, when it happens that they anſwer to equal arches of the ecliptic, as, e. gr. to the twelve ſigns of the zodiac, it follows, that ſometimes a greater part of the equator riſes, or *deſcends*, with a ſign, in which caſe the ſign is ſaid to aſcend, or *deſcend*, rightly: and ſometimes again, a leſs part of the equator riſes, or ſets, with the ſame ſign; in which caſe it is ſaid to aſcend and *deſcend* obliquely. See ASCENSION.

DESCENSION, *Refraction of the*. See REFRACTION.

DESCENSIONAL *difference*, is the difference between the right and oblique deſcenſion of the ſame ſtar, or point of the heavens, &c.

DESCENT, in *Chemiſtry*. The ſeparating mercury from its ore by *deſcent*, is performed in the following manner: take two earthen pots, with orifices of equal diameter; adapt an iron plate to the oriſice of one of the two pots, in ſuch a manner that it may reſt upon the brink of it, but not jut out too much all round: let this have ſeveral holes bored here and there in it, but not near its bottom; pour into this pure water, to about two inches high, then ſhut it with the iron plate; put upon this plate a ſmaller veſſel, containing the ore of mercury; then cloſe theſe veſſels, with the ſecond pot inverted, ſtopping the joint well with lute; bury the inferior pot in aſhes, and put about the whole a moderate fire, continue it till the upper veſſel is ſlightly red hot, and the mercury will be driven into the lower, in fumes, which will be condenſed by the water into running quickſilver. Cramer's Art of Aſſaying, p. 352.

DESCENT *into a ditch*, in *Fortification*, is a deep trench, or ſap cut through the eſplanade, and under the covert-way; covered above with planks and hurdles, and loaded with earth againſt artificial fires. See MOAT.

In wet ditches the *deſcent* is made even to the ſurface of the water: in dry ditches, it is carried to the bottom of the moat, where traverſes are made to lodge and ſecure the miners.

DESCENT, in *Genealogy* and *Heraldry*, the order, or ſucceſſion, of *deſcendants* in a line, or family.

We ſay, one *deſcent*, two *deſcents*, &c. A gentleman is of perfect blood who has four *deſcents* of gentility, both by his father's and mother's ſide, i. e. whoſe great grandfather, grandfather, and father, on both ſides, were all gentlemen.

DESCENT is alſo uſed, in *Heraldry*, to expreſs the coming down of any thing from above.

Thus, a *lion en deſcent* is a lion with his head towards one of the baſe points, and his heels towards one of the corners of the chief; as if he were leaping from ſome high place.

DESCENT, or DISCENT, in *Law*, the order, or manner, wherein lands and tenements are derived to any man from his anceſtors: and this is by cuſtom, ſtatute, or common law. By cuſtom, as in GAVELKIND or BOROUGH *Engliſh*; by ſtatute, as in FEE-TAIL; and by common law, when a perſon has lands of inheritance in fee-ſimple, and dies without diſpoſing them; in which caſe the land deſcends in courſe to the eldeſt ſon and heir.

Thus, to *make his deſcent* from his anceſtors, is to ſhew how, and by what particular degrees, the land in queſtion came to a perſon from his anceſtors. See CONSANGUINITY.

Deſcent, in common law, is either *lineal*, or *collateral*.

DESCENT, *Lineal*, is that conveyed down, in a right line, from the grandfather to the father, and from the father to the ſon, from the ſon to the grandſon, &c.

DESCENT,

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DESCENT, *Collateral*, is that ſpringing out of the ſide of the line, or blood; as from a man to his brother, nephew, or the like.

Judge Blackſtone has collected and illuſtrated the following rules or canons of inheritance, according to which eſtates are tranſmitted from the anceſtor to the heir. "Inheritances ſhall lineally deſcend to the iſſue of the "perſon laſt actually ſeiſed *in infinitum*; but ſhall never "lineally aſcend." The affirmative part of this rule has been almoſt univerſally adopted by all nations: but the negative part, whereby parents and all lineal anceſtors are excluded from ſucceeding to the inheritance of their offſpring, is peculiar to our laws, and thoſe of the ſame original: for, by the Jewiſh law, on failure of iſſue the father ſucceeded to the ſon, in excluſion of brethren, unleſs one of them married the widow, and raiſed up ſeed to his brother. And, by the laws of Rome, the children or lineal deſcendants were firſt preferred; and, on failure of theſe, the father and mother or lineal aſcendants ſucceeded together with the brethren and ſiſters; though by the law of the Twelve Tables, the mother was originally excluded, on account of her ſex. This rule was introduced into our law at the ſame time with, and in conſequence of, feodal tenures: and though the right of ſucceſſion in the aſcending line was reſtored by Henry I. it was ſoon diſuſed; for it was laid down as an eſtabliſhed law in Glanvil's time, under Henry II. *hæreditas nunquam aſcendit*; and this maxim has been invariable ever ſince. Another rule of inheritance is, "that the male iſſue ſhall be admitted before the female." This preference of males to females is entirely agreeable to the law of ſucceſſion among the Jews, and alſo among the ſtates of Greece, or at leaſt among the Athenians; but was totally unknown to the laws of Rome, now extant, which allow brethren and ſiſters to ſucceed to equal portions of the inheritance. It was derived to us from the feodal law, and admitted on the principle, that no female could ſucceed to a proper feud, becauſe they were incapable of military ſervice. However, according to our law, though daughters are excluded by ſons, they ſucceed before any collateral relations. A third rule of *deſcent* is, "that where there are two or more males in "equal degree, the eldeſt only ſhall inherit; but the fe-"males all together." The Greeks, Romans, Britons, Saxons, and even originally the feudiſts, divided the lands equally; but when the emperors began to create honorary feuds, or titles of nobility, it was found neceſſary to make them impartible, or *feuda individua*, and deſcendible to the eldeſt ſon alone: in conſequence of which, the eldeſt male began univerſally to ſucceed to the whole of the lands in all military tenures; and in this condition the feodal conſtitution was eſtabliſhed in England by William the Conqueror. The fourth rule of *deſcent* is, "that the lineal deſcendants, *in infinitum*, "of any perſon deceaſed, ſhall repreſent their anceſtor, "or ſtand in the ſame place as the perſon himſelf would "have done, had he been living." Thus the child, grand-child, or great-grand-child, male or female, of the eldeſt ſon ſucceeds before the younger ſon, and ſo *in infinitum*; and theſe repreſentatives ſhall take neither more nor leſs, but juſt ſo much as their principals would have done. This is called a ſucceſſion *in ſtirpes*, according to the roots; ſince all the branches inherit the ſame ſhare that their root, whom they repreſent, would have done. The Jewiſh ſucceſſion was directed in the ſame manner; but the Roman ſomewhat different. This rule was indiſputably ſettled in the time of king Henry III. and has continued ever ſince. A fifth rule is, "that, on failure "of lineal deſcendants, or iſſue, of the perſon laſt ſeiſed, "the inheritance ſhall deſcend to the blood of the firſt "purchaſer; ſubject to the preceding rules." This rule was entirely unknown among the Jews, Greeks, and Romans; but the law of Normandy is the ſame with ours in this reſpect; both being derived from the ſame feodal origin. The ſixth rule is, "that the collateral "heir of the perſon laſt ſeiſed muſt be his next collateral "kinſman of the *whole* BLOOD." The laſt rule of *deſcent* is, "that in collateral inheritances the male ſtocks ſhall "be preferred to the female; that is, kindred derived "from the blood of the male anceſtors ſhall be admitted "before thoſe from the blood of the female; unleſs "where the lands have, in fact, deſcended from a fe-"male." This is warranted by the examples of the Hebrew, Athenian, and Roman laws; and alſo of the cuſtomary law of Normandy. See farther on this ſubject Blackſt. Com. vol. ii. chap. 14, paſſim.

If one dies ſeiſed of land, wherein another has a right to enter, and it *deſcends* to his heir; ſuch *deſcent* ſhall take away the other's right of entry, and put him to his action for recovery thereof. Stat. 32 Hen. VIII.

DESCENT, *fall*, in *Mechanics*, &c. is the motion, or tendency, of a body towards the center of the earth, either directly or obliquely.

It is to be here obſerved, firſt, that a body cannot *deſcend*, unleſs it can divide and ſeparate the medium; which it cannot do, unleſs it be ſpecifically heavier than the medium. For ſince bodies cannot penetrate each other, one muſt give way before the other can move: and again, though a medium, e. gr. water, be diviſible, yet, if it be ſpecifically heavier than another, e. gr. wood, it is only heavier as it contains more particles of matter in the ſame bulk, all which have an impulſe downwards; and, conſequently, in water there is a greater impulſe than in the ſame bulk of wood.

Secondly, The *deſcending* body loſes as much of its weight, as is the weight of the medium, with the force of its coheſion.

And, therefore, a body ſpecifically heavier *deſcends* in a fluid medium ſpecifically lighter (e. gr. the air) with a force equal to the exceſs of the weight of the body above an equal bulk of the medium: for a body only *deſcends* in a medium with the force remaining, after a part has been ſpent in overcoming the reſiſtance of the medium; and this reſiſtance is equal to the weight of an equal bulk of the medium; conſequently, the body only falls with the exceſs of its weight above that of an equal bulk of the medium.

Hence, the power that ſuſtains a body in a ſpecifically lighter medium, is equal to the exceſs of the abſolute weight of the body above an equal bulk of the medium. Thus, $47\frac{1}{3}$ pounds of copper in water loſe $5\frac{1}{3}$ of their weight. A power, therefore, of 42 pounds is able to ſuſtain them.

Thirdly, If two bodies have the ſame ſpecific gravity, the leſs the bulk of the *deſcending* body is, the more of its gravity does it loſe, and the ſlower does it *deſcend*, in the ſame medium. For, though the proportion of the ſpecific gravity of the body to that of the fluid be ſtill the ſame in a greater or leſſer bulk, yet the leſs the body, the more the ſurface, in proportion to the maſs; and the more the ſurface, the more the friction of reſiſtance.

Fourthly, If the ſpecific gravities of two bodies are different, that which has the greateſt ſpecific gravity will *deſcend* with greater velocity in the air or other reſiſting medium, than the other. Thus a ball of lead *deſcends* ſwifter than a feather, becauſe it loſes leſs of its weight, though in vacuo they both fall with equal velocity.

The cauſe of this *deſcent*, or tendency downwards, has been greatly controverted. There are two oppoſite hypotheſes advanced; the one holding it to proceed from an internal, and the other from an external principle: the firſt maintained by the PERIPATETICS and EPICUREANS, and by the NEWTONIANS; and the latter by the CARTESIANS and GASSENDISTS. See alſo ACCELERATION.

Laws of the DESCENT *of bodies.* 1. Heavy bodies, in an unreſiſting medium, fall with an uniformly accelerated motion. See the *laws of uniformly accelerated motion*, under the articles ACCELERATION and MOTION.

In ſuppoſing heavy bodies to *deſcend* in an unreſiſting medium, we conceive them free of all external impediments, from what cauſe ſoever. So that we even ſet aſide that oblique impulſe, given to bodies while in falling, by the rotation of the earth, though this produces no ſenſible irregularity in a little diſtance. Galileo, who firſt diſcovered the *law of the deſcent* of heavy bodies by reaſoning, afterwards confirmed the ſame by experiments; the reſult of which, repeated often both by him and ſince his time, was, that the ſpaces of *deſcent* were as the ſquares of the times.

Grimaldi and Riccioli made experiments to the ſame effect, though in a different manner, by letting fall a number of balls, weighing eight ounces a-piece, from the tops of ſeveral towers, and meaſuring the times of falling by a pendulum. Ricciol. Almag. Nov. tom. i. lib. ii. cap. 21. prop. 4. Theſe experiments are exhibited in the following table.

Vibrations of the Pendulum.	Time.		Space at the end of the Time.	Space deſcended each Time.
	″	‴	Rom. Foot.	Rom. Foot.
5	0	50	10	10
10	1	40	40	30
15	2	30	90	50
20	3	20	160	70
25	4	10	250	90
6	1	0	15	15
12	2	0	60	45
18	3	0	135	75
24	4	0	240	105

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Since, then, the experiments of Riccioli, made in ſuch conſiderable diſtances, agree ſo well with the theory, it is ſcarce worth taking notice of what is urged to the contrary by Dechales, in his Mund. Math. who writes, that he had found by experiment, that heavy bodies, in half a ſecond of time, *deſcend* $4\frac{1}{4}$ feet; in two, $16\frac{1}{2}$; in three, 36; in four, 60; in five, 90; in ſix, 123. It is ſufficient, that he deduces the irregularity from the reſiſtance of the air, which we ſuppoſe out of the queſtion.

2. If a heavy body *deſcend*, in an unreſiſting medium, through an interval not over-large, the ſpace it deſcribes, is the ſubduple of that which it would deſcribe, in the ſame time with the velocity acquired at the end of the fall.

3. The time wherein a body falls from a given height being given, to determine the ſpaces it fell in the ſeveral parts of that time.

Suppoſe the given altitude $= a$, the time $= t$, and the ſpace it fell in one part of time x: then

$$\frac{1 : x = t^2 : a}{t^2 x = a}$$
$$x = \frac{a}{t^2}.$$

Therefore the ſpace paſſed over in the firſt part of time is $\frac{a}{t^2}$; conſequently, that paſſed over in the ſecond time $= \frac{3a}{t^2}$; that in the third $= \frac{5a}{t^2}$, &c. See ACCELERATION, *art.* 3.

E. gr. In the experiments of Riccioli, above delivered, the ball fell 240 feet in four ſeconds. Therefore the ſpace fallen the firſt ſecond was $= 240 \div 16 = 15$. The ſpace in the ſecond was $= 15 \times 3 = 45$. That in the third $= 15 \times 5 = 75$. And that in the fourth $15 \times 7 = 105$.

4. The time wherein a body falls through a given ſpace being given; to determine the time wherein it will fall through any other given ſpace, in the ſame medium.

Since the ſpaces are as the ſquares of the times, to the ſpace which the body falls in the given time, the ſpace in the queſtion, and the ſquare of the given time, find a fourth proportional, which will be the ſquare of the time ſought. The ſquare root, therefore, being extracted therefrom, the problem is ſolved.

For example; one of Riccioli's balls, in four minutes time, falling 240 feet, it is inquired in what time it would fall 135 feet? The anſwer will be found $= \sqrt{(135 \times 16 \div 240)} = \sqrt{(135 \div 15)} = \sqrt{9} = 3$.

5. The ſpace a body falls in a given time being given; to determine the ſpace through which it will fall in any other given time.

To the ſquare of the time wherein the body falls through the given ſpace, the ſquare of the time wherein it ſhould fall through the ſpace required, and the given ſpace, ſeek a fourth proportional; this will be the ſpace required.

For inſtance, Riccioli's ball falling 60 feet in 2 ſeconds, it is aſked what ſpace it will fall through in 4 ſeconds? The anſwer is, $16 \times 60 \div 4 = 4 \times 60 = 240$. Wolf. Elem. Math. tom. ii. p. 14, &c.

For the *Laws of the* DESCENT *of bodies on inclined planes*, ſee *Inclined* PLANE.

For the *Laws of* DESCENT *in cycloids*, ſee CYCLOID, and PENDULUM.

DESCENT, *Line of ſwifteſt*, is that which a body falling by the action of gravity, deſcribes in the ſhorteſt time; which is proved by geometricians to be the cycloid.

DESCRIBENT, is a term in *Geometry*, expreſſing ſome line or ſurface, which by its motion produces a plane figure, or a ſolid.

DESCRIPTION, in *Logic*, an imperfect, or inaccurate definition of a thing, giving a ſort of knowlege thereof from ſome accidents and circumſtances peculiar to it, which determine it enough to give an idea that may diſtinguiſh it from other things; but without explaining its nature or eſſence.

Grammarians content themſelves with *deſcriptions*: philoſophers require definitions of things. See DEFINITION.

A *deſcription* is an enumeration of divers attributes of a thing, moſt of which are only accidental: as, when a perſon is *deſcribed* by his deeds, his ſayings, his writings, his honours, &c. A *deſcription*, as to its outward appearance, reſembles a *definition*, and is even convertible with the thing deſcribed; but does not explain it. For, inſtead of bringing ſeveral things eſſential to the thing deſcribed, it only brings a number of accidents belonging thereto. E. gr. Peter is the tall young man who lives on the green, wears black cloaths, frequents the college, courts N——, &c. where it is evident, we do not give any explication of Peter, as not bringing things that are in Peter, but only circumſtances of things about him, tall, young, living, wearing, frequenting, courting, &c. A *deſcription*, therefore, is no proper anſwer to the queſtion, *quid eſt*, what is he? but to that, *quis eſt*, who is he?

Deſcriptions, in effect, are principally uſed for ſingulars, or individuals; for things of the ſame ſpecies do not differ in eſſence, but only as to *hic*, and *ille*, which difference contains nothing very notable, or diſtinguiſhable. But individuals, of the ſame kind, differ much in accidents; e. gr. George is a king, and William a citizen; Charles is a male, and Anne a female; Henry is wiſe, and John a blockhead, &c. Thus, a *deſcription* is an accumulation of accidents, whereby things are notably diſtinguiſhed from each other, though they ſcarce differ at all in eſſence.

Some authors call a *deſcription* a quaſi-definition, as, body is a thing diviſible, moveable, ſolid, extended, &c. which only falls ſhort of a definition in this, that, inſtead of the form or eſſence of a thing, it gives one or more properties ariſing from the form or eſſence.

DESCRIPTION, in *Geometry*. To *deſcribe* a circle, ellipſis, parabola, &c. is to conſtruct, or form thoſe figures, with rules, compaſſes, &c.

DESCRIPTION, in *Poetry* and *Rhetoric*, is a figure, which, by the aid of imagery and argument, exhibits ſuch a ſtrong and lively repreſentation of a ſubject, as gives a diſtinct view and ſatisfactory notion of it to the reader or hearer; and whilſt it convinces the mind, it moves and ſways the paſſions. This figure is principally uſed by poets, not only with a deſign to move the paſſions, but to pleaſe the fancy. Hiſtorians alſo *deſcribe* things, places and perſons; and orators produce the greateſt effect by *deſcription*. The *deſcription* of a perſon is called a character.

DESERTER, from *deſero*, *I forſake*, in *War*, a ſoldier on the muſter-roll, who quits the ſervice without leave, or liſts himſelf under another officer, into a different regiment.

All ſoldiers found half a league from a garriſon, or army, going towards an enemy's country, or quarter, without a paſs, are deemed and treated as *deſerters*.

A *deſerter* is, by the articles of war, puniſhable by death, and after conviction is hanged at the head of the regiment he formerly belonged to, with his crime written on his breaſt; and is ſuffered to hang until the army leave that camp, for a terror to others.

For the manner of puniſhing *deſerters* among the ancients, ſee TRANSFUGA.

The ancient church excommunicated *deſerters*, as having violated their oath.

By the ancient laws of this kingdom, *deſertion* was deemed felony; but it is now puniſhed by courts martial, under the annual acts againſt mutiny and *deſertion*.

DESHABILLE, a French term, naturalized of late. It properly ſignifies a night-gown, and other neceſſaries, made uſe of in dreſſing or undreſſing. Mr. —— is not to be ſpoken with, he is yet in his *deſhabille*, i. e. undreſſed, or in his night-gown.

The word is compounded of the privative *de*, and *s'habiller*, *to dreſs one's ſelf*.

DESHACHE', Fr. from *de*, and *hacher*, *to cut*, in *Heraldry*, is when a beaſt has its limbs ſeparated from the body, ſo as they ſtill remain on the eſcutcheon, with only a ſmall ſeparation from their natural places.

DESIDERATUM, from *deſidero*, *I deſire*, is uſed to ſignify deſirable improvements in any art or ſcience, as yet unattained. Thus, it is a *deſideratum* with the blackſmith, to render iron fuſible, by a gentle heat, and yet preſerve it hard enough for ordinary uſes; with the glaſs-man and looking-glaſs-maker, to render glaſs malleable; with the clock-maker, to bring pendulums to be uſeful where there are irregular motions; with the braſier and copperſmith, to make malleable ſolder; with the ſhipwright, to build veſſels that will ſail under water; with the diver, to procure manageable inſtruments for conveying freſh air to the bottom of the ſea ſufficient for reſpiration, and the burning of lights; with the aſſaymaſter, to melt or copel ores, or metals, immediately without the uſe of bellows or furnace; and with the carvers and joiners, to faſhion wood in moulds like plaiſter of Paris, or burnt alabaſter, &c. And though, as Mr. Boyle obſerves, the obtaining of theſe *deſiderata* may be thought chimerical, yet it is proper they ſhould be propoſed; for although perfection may not be attainable, yet approaches to it may be made, and arts thereby improved. Vide Boyle's Works abr. vol. i. p. 129, 136.

In ſhort, all arts and ſciences have their defects, and it is not at firſt to be gueſſed, for how many of theſe remedies may be found, by means of chemical and philoſophical reſearches properly directed.

If a proper number of perſons duly qualified for making experiments, and improving from them, would ſet about each his particular ſhare of the neceſſary experiments, and communicate the reſult of all their proceſſes to one another,

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another, the buſineſs of chemical and philoſophical experiments would be much better directed in regard to future ſtudents, and many of the *deſiderata* in the art probably ſupplied.

DESIGN, from *deſigno, I mark out*, the plan, or repreſentation, of the order, general diſtribution, and conſtruction, of a painting, poem, book, building, or the like.

The painter has ſhewn the firſt *deſign* of his piece, in which the figures are well diſpoſed. The *deſign* of that poem, or book, is artfully laid. Claudian never ſees his whole *deſign* together: when he compoſes a part, he thinks of nothing elſe, and works up every member, as if it were ſeparate from all the reſt.

In building, we uſe the term ICHNOGRAPHY, when by *deſign* is only meant the plan of a building, or a flat figure drawn on paper. ORTHOGRAPHY, when ſome face, or ſide, of the building is raiſed from the ground. And SCENOGRAPHY, when both front and ſides are ſeen in perſpective.

DESIGN, in *Weaving Manufactories*, expreſſes the figures wherewith the workman enriches his ſtuff, or ſilk; and which he copies after ſome painter or draughtſman.

In undertaking ſuch kinds of figured ſtuffs, it is neceſſary, that, before the firſt ſtroke of the ſhuttle, the whole *deſign* be repreſented on the threads of the warp; we do not mean in colours, but with an infinite number of little packthreads, which, being diſpoſed ſo as to raiſe the threads of the warp, let the workman ſee, from time to time, what kind of ſilk is to be put in the eye of the ſhuttle, for woof.

This method of preparing the work, is called *reading the deſign*, or reading the figure, which is performed after the following manner. A paper is provided, conſiderably broader than the ſtuff, and of a length proportionate to that which is intended to be repreſented thereon. This they divide lengthwiſe, by as many black lines as there are intended to be threads in the warp; and croſs theſe lines by others drawn breadthwiſe, which, with the former, make little equal ſquares. On the paper thus ſquared, the painter *deſigns* his figures, and heightens them with colours, as he thinks fit. When the *deſign* is finiſhed, a workman reads it, while another lays it on the ſimblot.

Now, to read the *deſign*, is to tell the perſon who manages the loom, the number of ſquares, or threads, compriſed in the ſpace he is reading; intimating, at the ſame time, whether it is ground or figure.

To put what is read on the ſimblot, is to faſten little ſtrings to the ſeveral packthreads which are to raiſe the threads named. And thus they continue to do till the whole *deſign* is read.

Every piece being compoſed of ſeveral repetitions of the ſame *deſign*, when the whole *deſign* is drawn, the drawer, to re-begin, as I may ſay, the *deſign* afreſh, has nothing to do, but to raiſe the little ſtrings, with ſlip-knots, to the top of the ſimblot, which he had let down to the bottom; and this he is to repeat as often as is neceſſary, till the whole be manufactured.

The ribband-weavers have likewiſe a *deſign*, but much more ſimple than that now deſcribed: it is drawn on paper, with lines and ſquares, repreſenting the threads of the warp, and woof. But in lieu of lines, whereof the figures of the former conſiſt, theſe only conſiſt of points or dots, placed in certain of the little ſquares formed by the interſection of the lines; theſe points mark the threads of the warp that are to be raiſed, and the ſpaces left blank denote the threads that are to keep their ſituation. The reſt is managed as in the former.

DESIGN is particularly uſed, in *Painting*, for the firſt idea of a large work, drawn roughly, and in little, with intention to be executed, and finiſhed in large.

In this ſenſe, the *deſign* is the ſimple contour, or outlines, of the figures, or things intended to be repreſented, or the lines that terminate and circumſcribe them.

Such a *deſign* is ſometimes drawn in crayons, or ink, without any ſhadows at all: ſometimes it is hatched, that is, the ſhadows are expreſſed by ſenſible lines, uſually drawn acroſs each other with the pen, crayon, or graver. Sometimes, again, the ſhadows are done with the crayon rubbed, ſo that there do not appear any lines; ſometimes the grain, or ſtrokes of the crayon, appear, as not being rubbed; ſometimes the *deſign* is waſhed, that is, the ſhadows are done with a pencil in Indian ink, or ſome other liquor; and ſometimes the *deſign* is coloured, that is, colours are laid on much like thoſe intended for the grand work.

The qualities, or conditions, required in a *deſign*, are correctneſs, good taſte, elegance, character, diverſity, expreſſion, and perſpective.

Correctneſs depends principally on the juſtneſs of the proportions, and a knowlege of anatomy. Taſte is an idea or manner of deſigning, which ariſes either from the complexion, and natural diſpoſition, or from education, one's maſter, ſtudies, &c. Elegance gives the figures a kind of delicacy which ſtrikes people of judgment, and a certain agreeableneſs, which pleaſes every body. The character, is what is peculiar to each thing, in which there muſt be a diverſity; inaſmuch as every thing has its peculiar character to diſtinguiſh it. The expreſſion, is the repreſentation of an object according to its character, and the ſeveral circumſtances it is ſuppoſed to be in. The perſpective, is the repreſentation of the parts of a painting, or figure, according to the ſituation they are in, with reſpect to the point of ſight.

The *deſign*, or draught, is a part of the greateſt import and extent in painting: it is acquired chiefly by habit and application, rules being of leſs avail here than in any of the other branches of the art, as colouring, clair-obſcure, expreſſion, &c.

The principal rules that regard the *deſign* are, that novices accuſtom themſelves to copy good originals at firſt ſight; not to uſe ſquares in drawing, for fear of ſtinting and confining their judgment; to ſtay till they can *deſign* well after the life, before they begin the practice of perſpective rules; in *deſigning* after the life, to learn to adjuſt the bigneſs of their figures to the viſual angle, and the diſtance of the eye from the model, or object; to mark out all the parts of the *deſign*, before they begin to ſhadow; to make their contours in great pieces, without taking notice of the little muſcles, and other breaks; to make themſelves maſters of the rules of perſpective; to obſerve every ſtroke, as to its perpendicular, parallel, and diſtance; and particularly ſo to compare, and oppoſe the parts that meet upon and traverſe the perpendicular, as to form a kind of ſquare in the mind, which is the great, and almoſt the only rule of *deſigning* juſtly; to have a regard, not only to the model, but alſo to the part already deſigned, there being no ſuch thing as *deſigning* with ſtrict juſtneſs, but by comparing and proportioning every part to the firſt.

The reſt relates to perſpective: as, that thoſe objects be ſeen at one view, whoſe rays meet in a point; that the eye and object be always conceived as immoveable; that the ſpace, or medium between them, be conceived tranſparent; and that the eye, object, and picture, be at a juſt diſtance, which is uſually double the bigneſs of the ſubject, or picture. See DESIGNING, and PERSPECTIVE.

DESIGNATION, the act of marking or indicating, and making a thing known. The *deſignation* of ſuch an eſtate is made by the tenants, butments, and boundings. Among the Romans, there were *deſignations* of the conſuls and other magiſtrates, ſome time before their election.

DESIGNATOR, a Roman officer, who aſſigned and marked each perſon his place and rank in public ceremonies, ſhews, proceſſions, &c.

The word is formed from the verb *deſignare, to deſign.*

The *deſignator* was a kind of marſhal, or maſter of the ceremonies, who regulated the ſeats, march, order, &c. There were *deſignators* at funeral ſolemnities, and at the games, theatres, and ſhews, who not only aſſigned every one his place, but alſo led him to it; as appears from the prologue to the Pœnulus of Plautus.

Much of the ſame nature were the *agonothetæ* of the Greeks.

DESIGNING, the art of delineating, or drawing the appearance of natural objects, by lines, on a plain.

To deſign, according to the rules of mathematics, makes the object of perſpective.

To deſign by the *camera obſcura*; ſee CAMERA *obſcura*.

Mechanical method of DESIGNING *objects.* Provide a ſquare piece of glaſs, fitted into a frame, A B D C (*Tab. Perſpective, fig.* 1.); and waſh and ſmear it over with water, wherein a little gum has been diſſolved. When it is well dried again, turn it towards the object or objects to be deſigned, ſo as that the whole thereof may be ſeen through a dioptra, or ſight G H, fixed thereto: then proceed to work, and, applying the eye to the ſight, with a pen and ink draw every thing on the glaſs, as you ſee it appear thereon: or the outlines of the objects may be drawn with black colour in drying oil. Having finiſhed the draught, lay a fair moiſt paper thereon; and, preſſing it pretty tight down, the whole will be transferred from the glaſs to the paper. This method is very good, eaſy, and exact, and deſerves to be more uſed by painters. Some have uſed a piece of tiffany or fine lawn; and others, paper made tranſparent by means of oil of turpentine, inſtead of the glaſs: and the outlines of the object are traced out by a crayon, formed of white or red chalk, charcoal, or any proper ſubſtance. If tiffany or lawn be uſed, they muſt be carefully laid on paper or vellum, and ſtruck in every part with ſome flat body; by which means, the matter of the crayon will

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will be transferred from the old to the new ground; and the impreſſion ſhould be overtraced with a black lead pencil. The ſketch on tranſparent paper may be tranſmitted to any ground, by puncturing it with holes near each other in the lines of the drawing, then fixing it on the ground, and duſting over it black lead, or any other coloured matter finely powdered, and tied up in a fine linen cloth. This duſt will mark the ſketch on the new ground, ſo that it may be over-traced by any kind of pencil or crayon.

The eye may be aſſiſted in *deſigning* from nature by means of a plane divided into ſquares, which is formed by drawing croſs lines parallel to each other on a tiffany or lawn framed; or on tranſparent paper or glaſs. This may be done with common writing ink, or in any other way that will render the lines viſible; and the divided plane muſt be placed before the ſight-board, as already directed. The ground, on which the ſketch is to be taken, muſt be alſo formed into an equal number of ſquares; and the objects, thus ſeen through the ſquares of the tranſparent plane, will be eaſily diſpoſed in their proper ſituation; and formed of a juſt magnitude, by placing them in the correſpondent ſquare of the ground: or, a frame may be prepared of a proper ſize, and the area of it divided into ſquares, by threads of a moderate thickneſs. A portable machine may be eaſily contrived for ſupporting the frame of the tranſparent plane, and the ſight-board: this machine may be conſtructed by joining three legs together, in the manner of the ſurveyor's inſtruments, in a block; and fixing the frame, by means of a ſliding foot into the ſame box, that it may be raiſed higher or lower. The ſight-board muſt have a foot likewiſe, by which it may be raiſed higher or lower; though this muſt not be fixed into the block, but into a ſliding piece, which muſt paſs through the block horizontally; ſo that the foot of the ſight-board being fixed into it at right angles, the board may be brought nearer to, or drawn farther from the tranſparent plane at pleaſure.

The following apparatus was uſed by Sir Chriſtopher Wren for the purpoſe of *deſigning*. A is a ſmall ſight with a ſhort arm B (ſee *Tab. Perſpective*, *fig.* 2.) which may be turned round about, and moved up and down on the ſmall cylinder C D which is ſcrewed into E D at D: this piece E D moving round about the center E, by which means the ſight may be removed either towards E or F. E F is a ruler faſtened on the two rulers G G, which rulers ſerve both to keep the ſquare frame S S S S perpendicular, and, by ſliding through the ſquare holes T T, to ſtay the ſight, either nearer to or farther from the ſaid frame; on which frame is ſtuck on with a little wax the paper O O O O, on which the picture is to be drawn by the pen I. This pen I is ſo fixed, by a ſmall braſs handle V, to the ruler H H, that the point I may be kept very firm, ſo as always to touch the paper. H H is a ruler, that is always moved horizontally, or parallel to itſelf, by means of the ſmall ſtrings *a a a*, *b b b*; at the end of this ruler is ſtuck a ſmall pin, whoſe head P is the ſight, which is to be moved up and down on the outlines of any object. The two ſtrings *a a a*, *b b b*, are exactly of an equal length. Two ends of them are faſtened into a ſmall leaden weight which is moved in a ſocket on the back-ſide of the frame, and ſerves exactly to counterpoiſe the ruler H H: the other two ends are faſtened to two ſmall pins H H, after they have rolled about the ſmall pullies M M, L L, K K; by means of which pullies, if the pen I be taken hold of and moved up and down the paper, the ſtrings moving very eaſily, the ruler will always remain in an horizontal poſition. When the inſtrument is uſed, it is ſet upon a table, and the ſight A is fixed at any height above the table, and at any diſtance from the frame S S S S, at pleaſure. Then the deſigner, looking through the ſight A, and holding the pen I in his hand, moves the head of the pin P up and down over the outlines of the object, and the point I will deſcribe, on the paper O O O O, the ſhape of the object ſo traced.

DESION, in *Chronology*, the Macedonian name of the Athenian month Antheſterion. See ANTHESTERION.

DE SON TORT *demeſne*, in our *Law*, words of form, uſed in an action of treſpaſs by way of reply to the defendant's plea. Thus, if A. ſues B. in ſuch an action; B. anſwers for himſelf, that he did that which it calls a treſpaſs by the command of C. his maſter. A. replies that B. did it *de ſon tort demeſne*, *ſans ce que C. luy commande modo et forma*; that is, B. did it of his own wrong, without C.'s commanding him in ſuch manner and form.

DESPOT, a title or quality given to the princes of Walachia, Servia, and ſome of the neighbouring countries.

The word, in its firſt origin, ſignified the ſame with the Latin *herus*, and the Engliſh *maſter*: but, in time, it underwent the ſame fate on medals, as, among the Latins, Cæſar did with regard to Auguſtus; BACIΛEΥC anſwering to Auguſtus, and ΔECΠOTHC, *deſpotes*, to Cæſar. See CÆSAR.

Thus, Nicephorus, having ordered his ſon Stauracius to be crowned, the ſon, out of reſpect, would only take the name ΔECΠOTHC, leaving to his father that of BACIΛEΥC. For it is to be noted, that it was juſt about the time that the emperors began to ceaſe to uſe Latin inſcriptions.

This delicacy, however, did not laſt long; for the following emperors preferred the quality of ΔECΠOTHC, to that of BACIΛEΥC, particularly Conſtantine, Michael Ducas, Nicephorus Botoniates, Romanus Diogenes, the Comneni, and ſome others.

In imitation of the princes, the princeſſes likewiſe aſſumed the title of ΔECΠOINA.

It was the emperor Alexius, ſurnamed the Angel, that created the dignity of *deſpot*, and made it the firſt after that of emperor, above that of Auguſtus, or Sebaſtocrator, and Cæſar. See AUGUST.

The *deſpots* were uſually the emperors ſons, or ſons in law, and their colleagues, or copartners in the empire, as well as their preſumptive heirs. The *deſpots*, that were ſons of the emperors, had more privileges and authority than thoſe that were only ſons-in-law. Codin. p. 38. deſcribes the habit and ornaments of the *deſpot*. See the notes of father Goar on that author.

Under the ſucceſſors of Conſtantine the Great, the title *deſpot of Sparta* was given to the emperor's ſon, or brother, who had the city of Sparta, or Lacedæmon, by way of apannage.

DESPOTISM, or DESPOTIC *government*, a form of government wherein the prince is abſolute and arbitrary, doing whatever he liſts, without being checked by any other power. Such are moſt of the eaſtern governments; as thoſe of the mogul, grand ſignior, ſophi of Perſia, &c.

DESPOUILLE, Fr. in *Heraldry*, is the whole caſe, ſkin, or ſlough of a beaſt, with the head, feet, tail, and all appurtenances, ſo that being filled, or ſtuffed, it looks like the entire creature.

DESPUMATION, of *de*, priv. and *ſpuma*, *froth*, the clarification of any liquor, by throwing up its foulneſs in a froth, and taking that off.

DESQUAMATION, from *de*, and *ſquamo*, *I ſcale*, expreſſes the flaking or ſcaling of carious bones. See EXFOLIATION.

DESSERT, or DESART, Fr. the laſt ſervice brought on the tables of people of quality, when the meats are all taken off. The *deſſert* conſiſts of fruits, paſtry-works, confections, &c.

DESSICATIVE, or DESICCATIVE, from *deſicco*, *I dry up*, in *Medicine*, a remedy that has the virtue of drying up ſuperfluous moiſture; uſed to ſkin over old ſores, &c. We ſay, a *deſiccative* unguent, &c.

Pimpinella is held deterſive, *deſiccative*, and vulnerary. Lemery.

DESTILLATION, or DISTILLATION, in *Chemiſtry*. See DISTILLATION.

DESTINIES, in *Mythology*. See PARCÆ.

DESTINY, from *deſtino*, *I order*, the order, diſpoſition, or chain of ſecond cauſes appointed by Providence; and importing, or carrying with it, a neceſſity of event.

According to many of the heathen philoſophers, *deſtiny* was a ſecret and inviſible power, or virtue, which, with incomprehenſible wiſdom, conducted what to us appears irregular and fortuitous. This amounts to what we call God.

The Stoics, by *deſtiny*, underſtood a certain concatenation of things, which, from all eternity follow each other of abſolute neceſſity, there being no power able to interrupt their connexion. This anſwers, in a great degree, to our idea of Providence.

But the Stoics made even the gods themſelves ſubject to the neceſſity of this *deſtiny*. The truth is, the Stoics rather define what the word *deſtiny* ſhould ſignify, than what it did ſignify in common language; for they had no diſtinct idea of this power, to which they attributed thoſe events. They had only a vague, confuſed idea of I know not what chimera, or unknown cauſe, to which they referred that invariable diſpoſition, and the eternal concatenation of all things. There is no real being that the name *deſtiny* can agree to. The heathen philoſophers, who had framed a notion thereof, ſuppoſed it to exiſt, without knowing preciſely what they meant by it. But men, not daring on the one ſide to impute to Providence the evils and misfortunes that befel them, as they imagined, undeſervedly; and, on the other ſide, not being willing to allow that it was their own fault, formed this phantom of *deſtiny*, to bear the weight of all the evil.

DESTRUCTION, paſſively taken, is the corruption or anni-

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annihilation of ſomething before exiſting. Se CORRUPTION.

A thing paſſes from *eſſe* to *non eſſe*, either by corruption, when nothing of the ſubſtance is loſt, but only the accidents, viz. the diſpoſition of parts; or, by annihilation, when both ſubſtance and accidents are loſt.

DESUDATION, from *deſudo*, *I ſweat much*, expreſſes a profuſe and inordinate ſweating, followed by the irruption of SUDAMINA, or heat-pimples.

DESULTOR, from *deſilio*, *I vault*, in *Antiquity*, a vaulter, or leaper, who jumped off one horſe upon another.

Among the Scythians, Indians, and Numidians, the cavaliers, or horſemen, who ſerved in the wars, were very expert *deſultores*; that is, they always carried with them at leaſt two horſes, and when that they were mounted on grew weary, or wanted breath, they leaped, with great agility and addreſs, upon the other which they led in their hand.

The Greeks and Romans borrowed the ſame practice from thoſe barbarous nations; but they only uſed it in their games, races, and funeral ſolemnities; and never, that we read of, in war. The *deſultores*, therefore, were, among the people of Aſia and Africa, ſoldiers; but, among the Romans, &c. they were no more than tumblers and poſture-maſters. Euſtathius, on Homer's Iliad, lib. iv. aſſures us, that, inſtead of two, they had ſometimes four or ſix horſes, all a-breaſt, and would jump from the firſt to the fourth, or ſixth, which was the maſter-piece of their art.

DETACHED *Pieces*, in *Fortification*, are demi-lunes, ravelins, horn and crown-works, and even baſtions, when ſeparated, or at a diſtance from the body of the place.

In *Painting*, the figures are ſaid to be well *detached*, or looſened, when they ſtand free, and diſengaged from each other, are no where confounded together, but ſtand out with a ſtrong relievo from the ground, and from each other.

DETACHMENT, from the French *detacher*, *to part from*, a military term, ſignifying a certain number of ſoldiers, taken out of ſeveral regiments or companies equally, to be employed in ſome particular enterprize; as, to form a kind of flying camp, to relieve a party already engaged in battle, to join a ſeparate army, to aſſiſt at the ſiege of a place, or to enter into ſome garriſon. The number depends on the dignity of the officer in command; thus, two thouſand or three thouſand men form a *detachment* for a general officer, eight hundred for a colonel, five hundred for a lieutenant-colonel, two or three hundred for a major, eighty or a hundred for a captain, forty for a lieutenant or enſign, twelve for a ſerjeant, and ſix for a corporal.

DETACHMENT *of a fleet or ſquadron*, a certain number of ſhips choſen by an admiral or commodore from the reſt of the fleet, and charged to execute ſome particular ſervice.

DETAINER, in *Law*. See FORCIBLE *entry*.

DETENTION, from *detineo*, *I detain*, the poſſeſſion, or holding, of lands, or the like, from ſome other claimant.

The word is chiefly uſed in an ill ſenſe, for an unjuſt with-holding, &c.

The canons condemn a perſon who has intruded into a benefice, to make reſtitution of all the fruits thereof, during the time of his unjuſt *detention*.

DETENTS, in a clock, are thoſe ſtops which, by being lifted up or let fall down, lock and unlock the CLOCK in ſtriking.

DETENT-*wheel*, or HOOP-*wheel*, in a clock, that wheel which has a hoop almoſt round it, wherein there is a vacancy, at which the CLOCK locks.

DETERGENT, from *detergo*, *I cleanſe*, in *Medicine*, is applied to remedies that cleanſe, and carry off viſcid and glutinous humours.

The plant buckthorn deterges, and conſolidates wounds. Rhaponticum is aperitive, and good againſt the gravel and ſtone; it alſo deterges, and expels poiſon.

Detergents are not only ſoftening and adheſive, but alſo, by a peculiar activity, or diſpoſition to motion, joined with a ſuitable configuration of parts, are apt to abrade, and carry along with them, ſuch particles as they lay hold of in their paſſage. All medicines of this intention are ſuppoſed to cleanſe and heal, that is, incarnate, or fill up with new fleſh, all ulcerations and foulneſſes occaſioned thereby, whether internal or external. To do this, in all internal caſes eſpecially, the medicine muſt be ſuppoſed to maintain its primary properties, until it arrives at the place of action; and there it does what entitles it to the appellation of a *detergent*, and a vulnerary: firſt, by its adheſive quality, which conſiſts in the comparative largeneſs of ſurface, and flexibility of its component parts, by which it readily falls into contact with, and adheres to, the ſlough of ulcerous exſudations, which, by their looſe ſituations, are eaſily carried along with the medicine; and when ſuch matter is ſo carried away, which is the cleanſing and deterging part, what was inſtrumental in this office, will afterwards ſtick and adhere to the cutaneous filaments, until, by their addition, and the protruſion of proper nouriſhment, *ab interno*, to the ſame place, the waſte is made up, that is, the ulcer is healed. Quincy.

After the like manner is the operation of *detergents* to be accounted for in external application. By the warmth of their parts they rarefy, and by their adheſive quality they join with, and take off along with them, in every dreſſing, what is thrown upon the place to which they are applied, until a more convenient matter is brought thither by the circulating juices, which they aſſiſt in adhering to, and incarnating the eroded cavities. Only this may be taken notice of, that internally, whatſoever of this kind is mixed with the animal fluids, by the known laws of circulation, will be firſt ſeparated, and left behind; for all thoſe parts which are ſpecifically heavieſt, will move neareſt the axis of the canals, becauſe their moments are the greateſt, and will carry them, as near as can be, in ſtrait lines; but the lighter parts will always be driven to the ſides, where they ſooneſt meet with outlets to get quite off, or are ſtruck into ſuch cavities as we are here ſpeaking of, in which they adhere, and make part of the ſubſtance.

This is underſtood of the milder ſort of *detergents*; and it is eaſy to conceive from hence, how an increaſe of thoſe qualities of activity and adheſion conjointly, may make a medicine ariſe to the greateſt efficacy in this reſpect. And it is upon this foot that all thoſe medicines operate which are given to cleanſe obſtructions, or foulneſſes, in any of the *viſcera*, or paſſages; and which may be increaſed in efficacy ſo far, as to fetch off even the membranes, and part of the capillary veſſels.

Many *detergents* are of the genus of balſamics; and ſome only differ in their degree of ſubtilty and efficacy, from what are called vulneraries.

The principal ſimples in this claſs are the leaves of wormwood, garlic, leeks, capers, ſcurvygraſs, fumitory, liverwort, tanſy, and vervain; bitter almonds, figs, jujebs, raiſins, dates, juniper-berries; gum ammoniac, balſam of Capivi, balm of Gilead, tacamahaca; turpentines; barberries, liquorice, turmeric, madder, ſpermaceti, mummy, ſulphur, ſalt, mercury, and native cinnabar. Theſe the reader will find particularly deſcribed under their proper articles.

The pectoral *detergents* are the beſt of all medicines in the decline of an hæmorrhage by the mouth, in which blood has been voided clear from the lungs: in this caſe they never fail to reſolve any grumes that may remain in the part; and at the ſame time, wonderfully reſtore the due tone of the *viſcera*. The moſt proper on this occaſion are decoctions of daiſy-leaves, ground-ivy, ſpeedwell, and the ſmall nettle, with powders of nitre, and dried goat's blood, and a mixture of an ounce of crab's eyes in a pint of white wine.

They are given in conſumptions in many caſes, and the moſt proper on this occaſion are the ſaline ones, with the common abſorbents, ſaturated with acids.

DETERIORATION, an act whereby a thing is impaired or rendered worſe.

When the *deterioration* of a commodity, ſeized by an officer, ariſes from the fault of the keeper, he is anſwerable for the ſame.

J. Frederic Mayer, profeſſor at Leipſic, printed a treatiſe of *deterioration*, in the year 1695, under the title of Tractatus de Deterioratione.

DETERMINATE *Number*. See NUMBER.

DETERMINATE *Problem*, is that which has but one, or at leaſt but a certain number of ſolutions, in contradiſtinction to an indeterminate problem, which admits of infinite ſolutions.

Such, e. gr. is the problem, To deſcribe an iſoſceles triangle on a given line, whoſe angles at the baſe ſhall be double that at the vertex: which has only one ſolution; as that which follows has two, viz. To find an iſoſceles triangle, whoſe area and perimeter are given.

A *determinate* problem may either be ſimple or linear, plane, ſolid or ſurſolid.

DETERMINATION, in *Phyſics*, the diſpoſition or tendency of a body towards one way, rather than another.

Heavy bodies have a *determination* towards the center of the earth.

DETERMINATION is alſo uſed for the action whereby a cauſe or agent is limited, or reſtrained, to act, or not act, in this or in that manner.

Determinations, ſay the ſchoolmen, proceed either from an efficient cauſe; in which caſe the *determination* is called effective; as, when an artiſt determines an inſtrument to a certain action; or from the form, as that determines

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termines the indifferency of the matter; and thus our ſenſes are ſaid to be *determinations* to have ideas upon the preſence of external objects.

Or the *determination* is from the matter or ſubject that receives the action; and thus the heating of fire upon clay *determines* it to harden, upon wax to ſoften, &c. Or it is from the object; as when we ſay, colour *determines* the viſual power: or, laſtly, it is from the end, as the end *determines* the deſire.

Determinations, again, are either moral or phyſical. A *moral determination* is that proceeding from a cauſe which operates morally, i. e. by commanding, perſuading, or adviſing, ſome effect. This is the only kind of influence or *determination*, which is conſiſtent with man's free, *moral* agency; or indeed with any agency at all.

Phyſical determination, is an act whereby God excites and applies a ſecond cauſe to act, antecedently to all operation of the creature. Such a *determination* the Thomiſts and Dominicans maintain neceſſary to all the actions of every creature. The Jeſuits, on the contrary, deny that God thus *determines* even ſecond cauſes; and hold, that God exerts no influence on ſecond cauſes, but only with the ſecond cauſe on the action. And thus they exclude a phyſical *determination*, both from natural cauſes, as ſuppoſing them already *determined* by nature to act; ſo that there needs no other external *determination* from God to the ſeveral actions; and from free cauſes, as ſuppoſing ſuch a predetermination contrary to our natural liberty.

A *determination* to be pleaſed with certain forms, or ideas, an ingenious author calls an *internal ſenſe*; and a *determination* to be pleaſed with virtuous actions, characters, manners, &c. a *moral* SENSE.

DETERMINATIVE *Propoſition*, in *Logic*. See COMPLEX *Propoſition*.

DETERRATION, from *de*, and *terra*, is uſed to ſignify a removal of the earth, ſand, &c. from the mountains and higher grounds, down into the valleys and lower parts. This is occaſioned by rains, which waſh the earthy matter down by degrees; but this cannot be very conſiderable, or much raiſe the ſurface of the earth, as ſome have imagined, becauſe a good part of it is ſunk into the clefts and caverns of the rocks and mountains, a great quantity is borne down into rivers, and thence into the ſea, and the richer and finer part helps to compoſe the bodies of plants and vegetables.

DETERSIVES, in *Medicine*, the ſame with DETERGENT.

A clyſter is a *deterſive* medicine, which cleanſes the lower venter. *Deterſive* unguents are alſo called *mundificatives*. The leaves and ſummits of the ſtrawberry are *deterſive* and aſtringent.

DETERSOR, from *detergo*, *I clear away*, in *Antiquity*, a ſervant whoſe buſineſs it was to attend at dinner, and wipe the table. Pitiſc.

DETERSORUM, in *Antiquity*, a name given to the common waſh, which was bean-meal, called *lomentum*, or the meal of a ſort of pulſe called *lupines*: this laſt they called *ſmegma*.

The ancients, when they bathed, uſed various waſhes for cleanſing the ſkin; but *natrum*, and this thin froth, called in Greek *aphronitron*, were moſt common.

DETINUE, a writ which lies againſt a man who, having goods, or chattels, delivered to keep, refuſes to redeliver them.

Detinue anſwers, in great meaſure, to the *actio depoſiti* of the civilians. He takes his *action of detinue*, to recover the thing *detained*; not the damages ſuſtained by the *detinue*. For this reaſon this action is ſeldom brought: actions of trover and converſion being uſed inſtead of actions of *detinue*.

DETINUE *of charters*. A man may have *detinue* for deeds and charters concerning land: but if they concern the freehold, it muſt be in C. B. and no other court. Action of *detinue* lies for charters which make the title of lands: and the heir may have *detinue* of charters, although he hath not the land. If my father be diſſeiſed, and dieth, I ſhall have *detinue* for the charters, notwithſtanding I have not the land: but the executors ſhall not have the action for them. New Nat. Br. 308.

DETINUE *of goods in frank marriage*, is on a divorce betwixt a man and his wife; after which the wife ſhall have this writ of *detinue* for the goods given with her in marriage. Mich. 35 Eliz. 1. New Nat. Br. 308.

DETONATION, in *Chemiſtry*, the noiſe which ſome minerals, and other bodies, make, when they begin to heat in crucibles; by the volatile parts ruſhing out with impetuoſity, and the humidity eſcaping.

The word is formed of *de*, and *tono*, *I thunder*.

Detonation is much the ſame with *decrepitation*; only its action is more forcible, and the noiſe is greater. Such are the exploſions of gunpowder, fulminating gold, and fulminating powder: but as nitre is the cauſe of moſt exploſions, the word *detonation* has been appropriated to the inflammation of the acid of this ſalt with bodies containing phlogiſton; and it is frequently given to thoſe inflammations of nitrous acid with ſulphur, coals, and metals, which are not accompanied with exploſion.

Detonation takes away the impure volatile ſulphur from bodies.

DETONATION denotes the act, or operation, of expelling the impure, volatile, and ſulphureous part, out of antimony; and leaving behind the fixed and internal parts. This is chiefly performed by means of ſaltpetre, &c. See ANTIMONY.

DETONATION *of nitre*, conſiſts in the inſtantaneous inflammation and decompoſition of the acid of nitre, when it immediately touches combuſtible bodies, the phlogiſton of which is ignited, or when the acid is ignited. This is effected by applying the nitre to a red-hot combuſtible body, or by making the acid itſelf red-hot, and applying a combuſtible body to it in that ſtate. During the *detonation*, a conſiderable ſmoke ariſes, containing no acid. See CLYSSUS *of nitre*. What remains in the crucible, after the nitrous acid is thus burnt, is the fixed alkali, which was the baſis of the nitre. Mr. Macquer conjectures that the *detonation* of nitre cannot take place, unleſs a combination be previouſly formed betwixt its acid and the phlogiſton of the combuſtible ſubſtance uſed in the operation; that this combination is entirely ſimilar to that of vitriolic acid with phlogiſton, when ſulphur is formed; and that, in the preſent inſtance, a nitrous ſulphur is formed, infinitely more combuſtible than the vitriolic ſulphur, and even ſo combuſtible, that it cannot exiſt an inſtant without being entirely burnt; and on this account, it is inflamed with extreme rapidity and violence as ſoon as it is formed. He alleges a number of facts to eſtabliſh this conjecture; from which he alſo infers, that nitrous acid, whilſt diſengaged from any baſis, is incapable of *detonation*; and that the ſtrength or weakneſs of the *detonation* depends on the greater or leſs adheſion of the nitrous acid with its baſis. He obſerves that there is a very conſiderable difference in the phenomena of their combuſtion, between the vitriolic and nitrous ſulphur: the former burns very weakly; produces a flame which is very little luminous; requires for the continuance of its burning a conſtant ſupply of new air; and its acid undergoes no change by this combuſtion. Nitrous ſulphur, on the contrary, appears incapable of exiſting an inſtant without burning: its vivid, dazzling flame, accompanied with noiſe, reſembles the flame of a fire ſtrongly actuated by a blaſt of air; it needs not the contact of external air; it burns with the ſame violence and rapidity in cloſe veſſels; no obſtacle is capable of containing it; and if it be confined, it burſts with a terrible noiſe the ſides of the containing veſſels; and after its combuſtion no trace is to be found of its acid. In order to account for this difference, he adopts the opinion of Stahl, who conſiders the nitrous acid as compoſed of a watery and an earthy principle, as well as all other acids; and beſides theſe, of a third principle, which is phlogiſton, in ſuch a quantity as to aſſume all the properties, and particularly the inflammability, eſſential to its nature. Thus he accounts for the deſtruction or total decompoſition of the acid in nitrous ſulphur when it is inflamed. The exploſion accompanying the *detonation* of nitre proceeds from a great and ſudden dilatation of ſome very expanſible body: this body Stahl and Macquer ſuppoſe to be the water of the nitre, or rather of its acid; which acquires in the operation the properties of air. But others, with greater reaſon, maintain, that this elaſtic fluid is not the water of the nitre rarefied and converted into air; becauſe the water of the nitre is only rarefied by the heat of the deflagration, and is afterwards condenſed by cold, forming the water called CLYSSUS *of nitre*. Beſides, the elaſtic fluid thus produced is permanent, and not condenſible into a liquid. Mr. Robins found, by accurate experiments, that the fluid produced by firing gunpowder, when confined within a ſpace equal to that of the gunpowder which was fired, and reduced to the heat of the atmoſphere, was capable of ſuſtaining a preſſure equal to 244 times the preſſure of the atmoſphere; and that the elaſtic force of the fluid was increaſed probably about four times by the heat produced by the firing of the powder; and conſequently, that it is thereby rendered capable, at the inſtant of exploſion, of ſuſtaining a preſſure nearly equal to a thouſand times the preſſure of the atmoſphere. Dr. Prieſtley conteſts the opinion advanced by Stahl, and adopted by Macquer and other chemiſts, that the nitrous acid is deſtroyed and utterly decompoſed, in the proceſs of *detonation*: he ſuppoſes, that, though the common properties of the acid, as combined with water, diſappear, it is only in conſequence of its combination with ſome earthy or inflammable matter, with which it forms ſome of the many ſpecies of air, into the compoſition of which this wonderful acid enters. Dict. of Chemiſtry. Robins's

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New Principles of Gunnery, prop. 4 and 6, in his Tracts, vol. i. p. 68—72. Prieſtley's Exper. &c. on Air, vol. ii. p. 61.

DETRAHENS *quadratus*, in *Anatomy*, a name given by ſome authors, particularly Spigelius, to a muſcle, called by the generality of anatomiſts the *platyſma myodes*; and, by Albinus, *latiſſimus colli*. Douglas calls it alſo *quadratus genæ*.

DETRANCHE', among the *French Heralds*, ſignifies a line bendwiſe, which does not come from the very dexter angle, but either from ſome part of the upper edge, and thence falling athwart, or diagonally; or from part of the dexter ſide. They ſay, *tranché*, *detranché*, and *retranché*; to denote, that there are two diagonal lines, making two partitions in the eſcutcheon, and coming from the angles, and a third from ſome of the other parts above mentioned. See TRANCHE'.

DEVASTAVIT, or DEVASTAVERUNT *bona teſtatoris*, is a writ that lies againſt executors or adminiſtrators, for paying debts upon ſimple contract, and legacies, before debts on bonds and ſpecialties, &c. for in this caſe they are as liable to action, as if they had ſquandered away the goods of the deceaſed, or converted them to their own uſe; and are compellable to pay ſuch debts by ſpecialty out of their own goods, to the value of what they ſo paid illegally. Dyer, 232. But if an executor pays debts upon ſimple contract, before he hath any notice of bonds, it is no *devaſtavit*; and regularly this notice is by an action commenced againſt him: for the law doth not oblige him to take notice of it himſelf, nor of a judgment againſt his teſtator; becauſe he is not privy to acts done either by or againſt him. 1 Mod. 175. 3 Lev. 115.

DEUCALION, in *Mythology*, was the ſon of Prometheus, who married Pyrrha, the daughter of Epimetheus. Some have ſuppoſed that *Deucalion*, whom the Greeks have repreſented under a variety of characters, and concerning whom their poets have given many fabulous accounts, was the ſame with the patriarch Noah; and that *Deucalion's* flood in Theſſaly, as well as that of Ogyges in Attica, and of Prometheus in Egypt, were the ſame with that of Noah, recorded in Scripture. Diodorus Siculus expreſsly ſays, that in the deluge which happened in the time of *Deucalion*, almoſt all fleſh died. Apollodorus having mentioned *Deucalion* εν-λαρνακι, *conſigned to an ark*, takes notice, upon his quitting it, of his offering up an immediate ſacrifice, Δι ̈ι φυξιω, *to the God who delivered him*. As he was the father of all mankind, the ancients have given him great dignity and univerſal monarchy; though ſometimes he is reduced to a petty king of Theſſaly. Apollonius Rhodius makes him a native of Greece, and the ſon of Prometheus. We may learn, however, from their confuſed hiſtory, that the perſon repreſented was the firſt of men, through whom religious rites were renewed, cities built, and civil polity eſtabliſhed in the world: none of which circumſtances are applicable to any king of Greece. Philo aſſures us, that the Grecians call the perſon *Deucalion*, but the Chaldæans ſtyle him Noe, in whoſe time there happened the great eruption of waters. But as Lucian has given us the moſt particular hiſtory of the deluge, and that which comes neareſt to the account given by Moſes; and as he was a native of Samoſata, a city of Commagene upon the Euphrates, a part of the world where memorials of the deluge were particularly preſerved, and where an obvious reference to that hiſtory may be obſerved in the rites and worſhip of the country, we ſhall terminate this article with an extract of what he ſays on the ſubject.

Having deſcribed Noah under the name of *Deucalion*, he ſays, that the preſent race of mankind are different from thoſe who firſt exiſted; for thoſe of the antediluvian world were all deſtroyed. The preſent world is peopled from the ſons of *Deucalion*; having increaſed to ſo great a number from one perſon. In reſpect to the former brood, they were men of violence, and lawleſs in their dealings. They regarded not oaths, nor obſerved the rites of hoſpitality, nor ſhewed mercy to thoſe who ſued for it. On this account they were doomed to deſtruction; and for this purpoſe there was a mighty eruption of waters from the earth, attended with heavy ſhowers from above; ſo that the rivers ſwelled, and the ſea overflowed, till the whole earth was covered with a flood, and all fleſh drowned. *Deucalion* alone was preſerved to repeople the world. This mercy was ſhewn to him on account of his juſtice and piety. His preſervation was effected in this manner: he put all his family, both his ſons and their wives, into a vaſt ark which he had provided, and he went into it himſelf. At the ſame time animals of every ſpecies, boars, horſes, lions, ſerpents, whatever lived upon the face of the earth, followed him by pairs; all which he received into the ark, and experienced no evil from them; for there prevailed a wonderful harmony throughout by the immediate influence of the Deity. Thus were they wafted with him, as long as the flood endured.

After this he proceeds to mention that, upon the diſappearing of the waters, *Deucalion* went forth from the ark, and raiſed an altar to God. Diod. Sic. lib. i. p. 10. Apollod. lib. i. p. 20. Apollon. Rhod. lib. iii. v. 1085. Philo Jud. de Præmio & Pœna, vol. ii. p. 412. Lucian de Deâ Syriâ, vol. ii. p. 882.

Dr. Bryant produces a variety of monuments, that bear an obvious reference to the deluge, in the gentile hiſtory, beſides this account of *Deucalion* and his flood. Analyſis of Ancient Mythology, vol. ii. p. 193—250.

DEVENERUNT, a writ anciently directed to the eſcheator, on the death of the heir of a tenant of the king holding *in capite*, within age, and in the king's cuſtody; commanding the eſcheator to enquire, upon the oaths of good and lawful men, what lands and tenements, by the death of the tenant, come to the king. This writ is now diſuſed.

DEVEST, *Deveſtire*, in *Feudal Writers*, is uſed for the oppoſite to inveſting. *Inveſtire* ſignifies *poſſeſſionem feudi tradere*. On the contrary, *diveſtire* is *poſſeſſionem auferre*. Feud. lib. i. c. 7. Cowel.

DEVIATION, in the *Old Aſtronomy*, a motion of the deferent, or eccentric, whereby it advances to, or recedes from, the ecliptic. See DEFERENT.

The greateſt *deviation* of a planet is equal to the inclination of its orbit to the plane of the ecliptic. See INCLINATION *of a planet*.

DEVICE, in *Painting*. See DEVISE.

DEVIL, *Diabolus*, an evil angel; one of thoſe celeſtial ſpirits caſt down from heaven, for pretending to equal himſelf with God.

The word is formed from the French *diable*, of the Latin *diabolus*, which comes from the Greek διαβολος, *accuſer*, or *calumniator*; or from the ancient Britiſh *diafol*.

The Ethiopians paint the *devil* white, to be even with the Europeans, who paint him black. Ludolph.

We find no mention of the word *devil* in the Old Teſtament; but only of Satan: nor do we meet with the word *devil*, in any heathen authors, in the ſignification attached to it among Chriſtians; that is, as a creature revolted from God: their theology went no farther than to evil genii, or dæmons, who haraſſed and perſecuted mankind. Thus the Chaldæans believed both a good principle, and an evil principle, which was an enemy of mankind. See DÆMONS, and DÆMONIACS.

The relations we have of the religion of the Americans, aſſure us of ſome idolatrous nations, who worſhip the *devil*; but the term *devil* muſt not be here taken in the common ſenſe: thoſe people have an idea of two collateral independent beings; one whereof is good, and the other evil. And they place the earth under the guidance and direction of that evil being, which our authors, with ſome impropriety, call the *devil*.

DEVIL, *Sea*, *Diabolus marinus*, in *Ichthyology*, the name of an ugly and ſtrangely ill-ſhaped fiſh, of the ray kind. Its noſe or ſnout is bifid, and runs out into two horns; and its ſides are both terminated by thin fins: its ſkin toward the head is variegated with duſky ſpots. It grows to a very conſiderable ſize, being ſometimes caught of ſix or ſeven feet long. Ray's Ichthyogr. Append. p. 5. See *Tab. of Fiſh*, N° 6.

DEVIL *in a buſh*, in *Botany*, *Nigella*. See FENNEL-*flower*.

DEVIL's *bit*. See SCABIOUS.

DEVIL's *bit*, *Yellow*, *Leontodon*. See DANDELION.

DEVINCTION, *Devinctio*, in *Antiquity*, was uſed to ſignify a love-charm or incantation to gain the affection of a perſon beloved.

It was done by tying knots, and differed little from what was called *obligatio* or *cataděſmus*. Virgil, in his eighth Eclogue, deſcribes it thus:

Nectę tribus nodis ternos, Amarylli, colores:
Nectę, Amarylli, modo; & Veneris, dic, vincula nectо.

DEVISE, or DEVICE, in *Heraldry*, a name common to all figures, ciphers, characters, rebuſes, mottoes, &c. which, by their alluſion to the names of perſons, or families, denote their qualities, nobility, or the like.

Deviſe, in this ſenſe, is of a much older ſtanding than heraldry itſelf; being that which gave the firſt riſe to armories. Thus, the eagle was the *deviſe* of the Roman empire; S. P. Q. R. was the *deviſe* of the Roman people, and ſtill continues to be what they call *the eſcutcheon of the city of Rome*.

The firſt *deviſes* were mere letters diſtributed on the borders of the liveries, houſings, and banners, and at length on the ſhields. Thus the K was the *deviſe* of the French kings of the name of Charles, from Charles V. to Charles IX.

There were alſo *deviſes* by rebuſes, equivocals, or alluſions, both to names and arms. The dukes of Guiſe

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took for their *deviſe* an A in an O, to ſignify, *chacun A ſon tour*, every one in his turn: and the houſe of Seneſai, *in virtute & honore ſeneſces:* ſome, that had towers in their arms, *turris mea Deus*, &c.

There are alſo enigmatical *deviſes:* as that of the Golden Fleece, with *Autre n'aurai*; intimating, that Philip the Good, who inſtituted that order, renounced every other woman, but Iſabella of Portugal, whom he then married. *Deviſes* ſometimes contain entire proverbs: as that of Cæſar Borgia, *aut Cæſar, aut nihil.*

The word *deviſe* is formed from the Latin *dividere*, and was applied to the things juſt mentioned, as well as thoſe hereafter mentioned; becauſe they ſerved to divide, ſeparate, and diſtinguiſh perſons, parties, &c. Father Menetrier obſerves, that there are as many different kinds of *deviſes*, as there are different manners of diſtinguiſhing one another, or as there are ſimple figures, or words, capable of expreſſing qualities, offices, virtues, actions, &c. of perſons; and of notifying, or diſtinguiſhing them from others.

DEVISE is now taken, in a more reſtrained ſenſe, for an emblem; or a repreſentation of ſome natural body, with a motto, or ſentence, applied in a figurative ſenſe to the advantage of ſome perſon.

Father Bouhours gives an accurate explication of the word *deviſe*, in an extract inſerted in the Memoires de Trevoux. A *deviſe*, ſays he, is a compoſition, or aſſemblage, of figures drawn from nature and art, called the *body*; and of a few words adapted to the figure, called the *ſoul:* ſuch a compound, adds he, we make uſe of to denote our thought, or intention, by compariſon: for the eſſence of the *deviſe* conſiſts in a compariſon taken from nature, or art, and founded on a metaphor.

This he illuſtrates in the following inſtance: a young nobleman, of great courage and ambition, bore, for his *deviſe*, in the laſt carouſal at the court of France, a rocket mounted in the air, with this Italian motto, *poco duri, purche m'inalzi*; *may I laſt but a ſhort time, provided I mount high:* which may be explained thus; as the rocket riſes a great pitch, though it only endures a little while, ſo it does not concern me to live long, provided I attain to glory and eminence; which is a juſt compariſon.

On this footing, a *deviſe*, to define it rightly, is, a painted metaphor; or, rather, an enigma inverted: for, whereas enigmas repreſent nature, or art, by the events of hiſtory, and the adventures of fables; a *deviſe* is, a repreſentation of human qualities by natural, or artificial bodies.

Thus, to expreſs the character of Louis XIV. a ſun was painted; which yet, luminous as it is, has more power than luſtre: and the better to determine the ſenſe of the painting to this ſignification, the Caſtilian motto is added; *Mas virtud que luz.* The perſonal merit of Mary, queen of Scots, was repreſented by a pomgranate, with theſe words; *Mon prix n'eſt pas de ma couronne:* and the talent of an apoſtolical perſon, who became all things to all men, by a looking-glaſs, with thoſe words of St. Paul, *Omnibus omnia.*

Deviſes are uſed on coins, counters, ſeals, ſhields, triumphal arches, artificial fire-works, and other ſolemnities. They are a ſort of images, very pertinently and artfully repreſenting the enterpriſes and intrigues of war, love, piety, ſtudy, fortune, &c.

The French have diſtinguiſhed themſelves in this way, eſpecially ſince the time of cardinal Mazarin, who had a wonderful fancy for *deviſes*.

The Italians have reduced the making of *deviſes* into an art, and laid down laws and rules for this purpoſe. Some of the principal are, 1. That there be nothing monſtrous, or extravagant, in the figures; and nothing contrary to the nature of things, or to the common opinion of mankind. 2. That figures be not joined which have no affinity, or relation, to each other; the metaphor being to be founded on ſomething real, and not on hazard, or imagination, excepting ſome whimſical combinations eſtabliſhed in mythology, which cuſtom, and the authority of the poets, have made paſs for natural. 3. That the human body be never taken into *deviſes*; as this would be to compare a man with himſelf. 4. That there be a ſort of unity in the figures which compoſe the body: we do not mean, that there muſt only be a ſimple figure; but that, if there be ſeveral, they muſt have a relation and ſubordination to each other, ſo that there be one principal figure whereon all the reſt depend: though ſtill the fewer figures there are in the body of the *deviſe*, and the leſs they are confuſed, the more perfect and elegant is the *deviſe*. 5. The motto, which is to animate the figure, muſt agree ſo accurately thereto, as that it could not ſerve for any other. 6. Nothing is to be named that appears to the eye, and which the bare inſpection might notify. 7. The motto is not to have a complete ſenſe of itſelf; for, being to make a compound with the figure, it muſt only be a part, and, conſequently, muſt not ſignify the whole. If the words alone have a complete ſignification, you have a full and diſtinct notion independently of the figure; whereas the ſignification ſhould reſult from both. 8. The ſhorter the motto, the more beautiful; and a ſuſpenſion of the ſenſe, which leaves ſomewhat to gueſs, is one of the principal graces of the *deviſe*. Laſtly, It is accounted a happineſs, where the words of a poet are applied in a ſenſe which he never dreamed of, and yet ſo pertinently, that it ſhould ſeem they had been intended for the ſame.

DEVISE, or DIVISE, in *Common Law*, the act whereby a teſtator gives, or bequeaths, his lands, or goods, by his laſt will, in writing. Though, in ſtrictneſs, a *deviſe* of goods is more properly termed a bequeſt.

He who makes the *deviſe*, is called the *deviſor*; and he, to whom it is made, the *deviſee*.

The words of a will the law interprets in a larger, and more favourable ſenſe, than thoſe of a deed: for if land be *deviſed* to a man to have to him for ever, or to have to him, and his aſſigns; in thoſe caſes, the *deviſee* ſhall have a fee-ſimple: yet if given in the ſame manner by feoffment, he ſhall have but an eſtate for life.

So, if one *deviſe* land to an infant in his mother's belly, it is a good and valid *deviſe*; though it is otherwiſe by feoffment, grant, or gift. For, in thoſe caſes, there ought to be one of ability to receive preſently; otherwiſe it is void. See DEED, and WILL.

DEVISE, *Executory*. See EXECUTORY *deviſe*.

DEUNX, a diviſion of the Roman libra, or pound, containing eleven ounces; or eleven twelfths of any thing. See AS.

DEVOIRS *of Calais*, in our *Old Statutes*, cuſtoms due to the king for merchandize brought to, or carried out of Calais, when our ſtaple was there. 34 Edw. III. c. 18. and 2 Rich. II. ſtat. 1. c. 3.

Devoir is French, ſignifying *duty*.

DEVOLVED, ſomething acquired by right of *devolution*.

Such a right is *devolved* to the crown: ſuch an eſtate *devolved* on M—— by the death of N——.

The word is alſo uſed for a right, acquired by a ſuperior, of conferring a benefice, when the inferior, and ordinary collator, has neglected to confer, or has conferred it on an unqualified perſon.

If a patron neglects to preſent to a benefice in ſix months, the preſentation lapſes, or *devolves*, upon the biſhop, from thence to the primate, and from thence to the king.

DEVOLUTION, in the *French Law*, a right acquired by deſcent, or ſucceſſion, from degree to degree.

Devolution, in general, is an impediment provided by the cuſtoms of ſeveral provinces, whereby the huſband who ſurvives his wife, or the wife ſurviving her huſband, is prohibited to alienate the real and immoveable effects of the deceaſed, and obliged to preſerve them for the children iſſued from that marriage; ſo that they may ſucceed thereto in excluſion of thoſe born of a ſecond marriage.

DEVOTION, of *devoto*, from *devoveo*, *I conſecrate*, a ſincere, ardent worſhip of God.

Monſ. Jurieu defines *devotion*, a ſoftening and yielding heart, with an inward conſolation, which the ſouls of believers feel in the exerciſes of piety.

Under the name of *devotions* are uſually underſtood certain religious practices, which a perſon makes it a rule to diſcharge regularly: and with reaſon, if this exactitude be founded on ſolid piety; otherwiſe it is vanity, or ſuperſtition.

DEVOTION, among the Romans, was a ſort of ſacrifice, or ceremony, whereby they conſecrated themſelves to the ſervice of ſome perſon.

The ancients had a notion, that the life of one might be redeemed by the death of another: and hence were thoſe *devotions* ſo frequent for the lives of the emperors.

The *devotion* of Decius, who, after devoting himſelf to his country, threw himſelf into the hands of his enemies, and was killed, is ſaid to have gained the Romans the victory.

But *devotion* to any particular perſon was not known till Auguſtus. The day after the title Auguſtus had been given Octavius, Pacuvius, a tribune of the people, began to ſay, he would devote and conſecrate himſelf to him, as was practiſed among the barbarous nations, to obey him even at the expence of life, if he were commanded. His example was immediately followed by all the reſt; and it came at length to be eſtabliſhed into a cuſtom, never to go to ſalute the emperor, without declaring, they were devoted to him. Auguſtus, though ſeeming to oppoſe this vile and infamous flattery, yet rewarded the author.

Cornelius Nepos uſes the word *devotion* for a kind of puniſhment, conſiſting of direful curſes and marks of infamy. See ACCURSED, and EXECRATION.

DEVOURING, in *Heraldry*. When fiſhes are borne in an

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an escutcheon, in a feeding posture, the heralds denominate it *devouring*; because fishes swallow all their food whole.

DEUTEROCANONICAL, in the *School Theology*, an appellation given to certain books of Holy Scripture, which were added to the canon after the rest; either because they were not wrote till after the compilation of the canon, or because of some disputes as to their canonical authority.

The word is Greek; being compounded of δευτερος, *second*, and κανονικος, *canonical*.

The Jews, it is certain, acknowlege several books in their canon, which were put there later than the rest. They say, that, under Ezra, a great assembly of their doctors, which they call, by way of eminence, the *great synagogue*, made the collection of the sacred books, which we now have in the Hebrew Old Testament: and they agree, that they put books therein which had not been so before the Babylonish captivity. Such are those of Daniel, Ezekiel, Haggai, &c. and those of Ezra and Nehemiah.

And the Romish church has since added others to the canon, that were not, nor could be, in the canon of the Jews; because some of them were not composed till after that canon was formed. Such is the book of Ecclesiasticus; with several of the apocryphal books, as that of the Maccabees, Wisdom, &c. Others were added still later, because their canonical authority had not been yet examined; and, till such examen, and judgment, they might be set aside, at pleasure.

But since that church has pronounced as to the canonical authority of these books, there is no more room now for her members to doubt of them, than there was for the Jews to doubt of those of the canon of Ezra: and the *deuterocanonical* books are, with them, as canonical as the protocanonical; the only difference between them consisting in this, that the canonical authority of the one was not generally known, examined, and settled, so soon as that of the others.

The *deuterocanonical* books, in the modern canon, are, the book of Esther, either the whole, or at least the seven last chapters of it; the epistle to the Hebrews; that of James; and that of Jude; the second of St. Peter; the second and third of St. John; and the Revelation. The *deuterocanonical* parts of books are, the hymn of the three children; the prayer of Azariah; the histories of Susanna, of Bel, and the dragon; the last chapter of St. Mark; the bloody sweat, and the appearance of the angel, related in St. Luke, chap. xxii. and the history of the adulterous woman in St. John, chap. viii. See CANON.

DEUTERONOMY, one of the sacred books of the Old Testament; being the fifth book of the LAW, and the last of those written by Moses; closing, according to the computation of Usher, the history of 2552½ years, from the beginning of the world to the death of Moses.

The word is Greek; compounded of δευτερος, *second*, and νομος, *law*.

It does not appear that Moses made any division of what he wrote, into books; or that he gave different names and titles to the different parts of his work; nor do the Jews, even at this day, distinguish them in the copies they use in the synagogues, but write them all running as one single work, without any other distinction beside that of little and great parasches. It is true, in the other copies, used by private persons, they are divided into five parts, as among us; but they give them no other name, but the first word wherewith each division begins; much as we do in quoting a decree, or chapter, of the canon law.

Thus, the first part of Moses's work they call בראשית *Bereschit*, because beginning with that word; the second they call ואלה שמות *Veelleh Schemoth*; the third, ויקרא *Vajickra*; the fourth, וידבר *Vajiedabber*; and the fifth, הדברים אלה *Elleh Haddebarim*; which is one of the first words thereof. This custom is very ancient among the rabbins, as appears from the ancient commentaries on those books, called בראשית רבה *Bereschit Rabba*, ואלח שמות ראה *Veelleh Schemoth Rabba*, &c. and from the *Prologus galeatus* of St. Jerom. The Greeks, when they first translated the law, gave the five parts, into which it was divided, the names of Genesis, Exodus, Leviticus, Numbers, and *Deuteronomy*. Accordingly, the names are Greek, excepting that of Leviticus, which is Hebrew; and they express what is contained in those books, or at least the most remarkable things contained therein: which is the usual Greek manner of giving titles.

The book of *Deuteronomy* was so called, because this last part of the work of Moses comprehends a repetition, or recapitulation, which that legislator made to the Israelites, before his death, of the law he had before delivered to them at large: and hence *Deuteronomy* is still called, by the rabbins, משנה *Mischneh*, *repetition*; משנה תורה *Repetition of the law*, *second law*: they likewise call it ספר־תוכחות *the Books of Reprimands*; on account of the twenty-eighth chapter, which is full of blessings, promised to such as keep the law; and of curses, threatened to such as transgress it.

The book of *Deuteronomy* was written in the fortieth year after the delivery from Egypt, in the country of the Moabites beyond Jordan; Moses being then in the 120th year of his age. It contains, in Hebrew, eleven parasches, though only ten in the editions of the rabbins at Venice; twenty chapters, and 955 verses. In the Greek, Latin, and other versions, it contains thirty-four chapters: the last was not written by Moses. Some say, it was added by Joshua, immediately after Moses's death: others will have it added by Ezra, which is the most probable opinion; who likewise made some interpolations in the book itself, as chap. ii. ver. 12. chap. iii. 11, and 14.

DEUTEROPOTMI, Δευτεροποτμοι, from δευτερος, *secundus*, and ποτμος, *fortuna*, or *mors*, among the Athenians, a designation given to such who had been thought dead, and, after the celebration of the funeral rites, unexpectedly recovered. It was unlawful for the *deuteropotmi* to enter into the temple of the Eumenides, or to be admitted to the holy rites, till after they were purified by being let through the lap of a woman's gown, that they might seem to be new born. Pott. Archæol. Græc. tom. i. lib. ii. cap. 4. p. 223.

DEUTEROSIS, the Greek name by which the Jews called their MISCHNAH, or second law. *Deuterosis* in Greek has the same signification almost as *mischnah* in Hebrew; both signify an iteration. Eusebius accuses the Jews with corrupting the true sense of Scripture with the trifling explanations of their *deuteroses*. Calmet, Dict. Bibl. in voc.

DEVUIDER, in the *Manege*, is applied to a horse, that upon working upon *volts* makes his shoulders go too fast for the croupe to follow; so that instead of going upon two treads, as he ought, he endeavours to go only upon one. This comes from the resistance he makes in defending against the heels; or from the fault of the horseman, who is too hasty with his hand. See HASTE.

DEW, *ros*, a thin, light, insensible mist, or rain, ascending with a slow motion, and falling while the sun is below the horizon.

Causabon derives the word from the Greek δευω, *I moisten*.

Naturalists usually rank *dew* among the number of meteors of the watery kind. Some define it a vapour liquified, and let fall in drops; others, a vapour having a like relation to frost, as rain has to snow, &c. Among the dissertations of Monsr. Huet, is a letter to shew that *dew* does not fall, but rises. M. Gersten likewise adopted the same opinion. To us, *dew* appears only to differ from rain as more, and less. Its origin, and matter, no doubt, is from the vapours, and exhalations of the earth and water, raised as shewn under the article EVAPORATION, where the theory of its ascent and precipitation is particularly explained.

M. du Fay made several experiments, first with glasses, and then with pieces of cloth, fastened to two ladders, joined at top, and spreading wide at bottom, and reaching about thirty-two feet high, in order to evince the ascent of *dew*; and he found that the lower bodies, with their under surfaces, were wetted before those that were placed higher, or their upper surfaces. Both M. du Fay, and M. Muschenbroek, exposed several different substances to the same *dew*, and found that they received and charged themselves with it in a very different manner; some more, others less, and some even not at all. The drops affixed themselves, by a kind of election, to glass and crystals, but not to metals. Mercury was exposed in a china plate; and the *dew* run in streams on the edges of the plate, while the least drop did not appear on the mercury. Muschenbroek has observed, that bodies of different colours attract the *dew* differently, and that this difference of attractive force depends on the structure and size of the coloured bodies. Mem. Acad. Sc. 1736. and Muschenbroek, &c. ubi infra.

From the principles proposed and illustrated, under the article EVAPORATION, the several phænomena of *dews* are easily accounted for. Hence, e. gr. it is, that *dews* are more copious in the spring, than in the other seasons; there being then a greater stock of vapour in readiness, through the small expence thereof in the winter's cold and frost, than at other times. Hence, what Pliny relates of Egypt, that it abounds in *dews* throughout all the heats of summer; for the air there being too hot to constipate the vapours in the day-time, they never gather into clouds, and hence they have no rain; but we know,

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that in climates where the days are exceſſive hot, the nights are remarkably cold; ſo that the vapours raiſed after ſun-ſet are readily condenſed into *dews*.

The quantity and quality of the aſcending *dew* in particular places depends on a variety of circumſtances, as the ſituation, the nature of the ſoil, the ſtate of the air, and the ſeaſon of the year. Chemiſts, in analyſing it, have found that it is a kind of chaos of various ſubſtances: ſome *dew* has afforded a liquor, by diſtillation, which ſtruck the colours of the rainbow on glaſs, ſo ſtrong, as not to be effected by friction, alkaline lixiviums, or aqua regia: it alſo burnt like ſpirits of wine. Other diſtilled *dew*, having been digeſted with a gentle heat for eight days, and then rectified ſix times over, till it was exceeding ſubtile, is ſaid to have broke three glaſſes ſucceſſively; though it ſtill remained perfectly inſipid. It is natural to conclude, from the different ſubſtances which are combined with *dew*, that it muſt be either ſalutary or injurious both to plants and animals.

It is not eaſy to aſcertain the quantity of *dew* that ariſes every night, or in the whole year, becauſe of the winds which diſperſe it, the rains which carry it down, and other inconveniencies: but it riſes in greater abundance after rain than after dry weather, and in warm countries than in cold. There are ſome places in which *dew* is obſerved only to aſcend, and not to fall; and others in which it is carried upwards in greater plenty than downwards, being diſperſed by the winds.

Dr. Hales made ſome experiments, in order to determine the quantity of *dew* that falls in the night: for this purpoſe, Aug. 15. 7. P.M. he filled two glazed earthen pans, three inches deep and twelve inches diameter in ſurface, with moiſt earth: and he obſerves, that the moiſter the earth, the more *dew* falls on it in a night; and that more than a double quantity of *dew* falls on a ſurface of water, than on an equal ſurface of moiſt earth. Theſe pans increaſed in weight by the night's *dew*, 180 grains; and decreaſed in weight by the evaporation of the day, 1 ounce, 282 grains: ſo that 540 grains more are evaporated from the earth every 24 hours in ſummer, than the *dew* that falls in the night; i. e. in 21 days near 26 ounces from a circular area of a foot diameter. If 180 grains of *dew*, falling in a night on ſuch an area, which is equal to 113 ſquare inches, be equally ſpread on the ſurface, its depth will be $\frac{1}{159}$th part of an inch, $= \frac{180}{113 \times 254}$. He likewiſe found the depth of *dew* in a winter's night to be the $\frac{1}{90}$th part of an inch. If therefore we allow 159 nights for the extent of the ſummer's *dew*, it will in that time ariſe to one inch depth; and reckoning the remaining 206 nights for the extent of the winter's *dew*, it will produce 2,28 inches depth; and the *dew* of the whole year will amount to 3,28 inches depth. But the quantity, which evaporated in a fair ſummer's day from the ſame ſurface, being 1 ounce and 282 grains, gives $\frac{1}{40}$th part of an inch depth for evaporation, which is four times as much as fell at night. Dr. Hales obſerves that the evaporation of a winter's day is nearly the ſame as in a ſummer's day; the earth's greater moiſture in winter anſwering to the ſun's greater heat in ſummer. Hales's Vegetable Statics, vol. i. p. 52, &c. ed. 4th. See EVAPORATION.

Signior Beccaria made ſeveral experiments to demonſtrate the exiſtence of the electricity that is produced by *dew*. He obſerves in general, that ſuch electricity took place in clear and dry weather, during which no ſtrong wind prevailed; and that it depends on the quantity of the *dew*, as the electricity of the rain depends on the quantity of rain. He has ſometimes found it to begin before ſun-ſet; at other times not till eleven o'clock at night. Artificial Electricity, Eng. ed. Appendix, Letter iii. p. 466.

The *dew* of plants is probably only the moiſture that continually exhales through the orifices of their veſſels, and not a vapour collected by their leaves: for this *dew* is expired by each plant, according to the peculiar ſtructure of its veſſels, and the ſituation of their orifices. Plants likewiſe that have been ſhut up in veſſels, and covered by glaſſes, have collected a greater quantity of *dew* in the night, than thoſe that ſtood in the open air; and farther, the drops are gathered in thoſe parts, where the orifices of the veſſels are manifeſtly open, and not all over the leaves, and not in the upper or lower leaves only, which would be the caſe if they aroſe from ambient vapour, but in all the leaves, without diſtinction. The oily or honey *dew*, which is ſometimes exhaled in ſummer by trees and herbs, and which has been found to ſettle on the oak, aſh, &c. is of this kind. Muſchenbroek Introd. ad Philoſ. Nat. vol. ii. p. 987. 995. ed. 1772. See *Perſpiration of* PLANTS.

Subſtances of a very different kind from the uſual and natural manner of the *dew*, have ſometimes fallen in that form. Our Philoſophical Tranſactions give an account, that in the year 1695, there fell in Ireland, in ſeveral parts of the provinces of Leinſter and Munſter, for a conſiderable part of the winter and ſpring, a fatty ſubſtance, reſembling butter inſtead of the common *dew*; it was of a clammy texture, and dark yellow colour; and was, from its great reſemblance, generally called *dew-butter* by the country people. It always fell in the night, and chiefly in the mooriſh low grounds, and was found hanging on the tops of the graſs, and on the thatch of the houſes of the poor people. It was ſeldom obſerved to fall twice in the ſame place, and uſually wherever it fell it lay a fortnight upon the ground before it changed colour, but after that it gradually dried up, and became black. The cattle fed in the fields where it lay, as well as in others, and received no hurt from it: it fell in pieces of the bigneſs of ones finger-end, but they were diſperſed ſcatteringly about, and it had an offenſive ſmell, like that of a church-yard. There were in the ſame places very ſtinking fogs during the winter, and ſome people ſuppoſed this no other than a ſediment or collection of the heavier matter of thoſe fogs. It would not keep very long, but it never bred worms. The country people willing to have ſome good of it, tried it on their children's ſore heads, and it always cured them. Phil. Tranſ. N° 220. p. 222.

DEWS, *cryſtalline*, a term uſed by ſome modern writers, to expreſs certain *dews*, or ſteams; which, in their fall upon the earth, become, as they ſay, cryſtal.

Whatever the cryſtals are, which authors ſeem to ſuppoſe to have been generated in this manner, it is very certain, that they have in reality another origin; and theſe are only the accounts of ignorant and inconſiderate people. Phil. Tranſ. N° 129.

DEW, *May*. The dew that falls in the beginning of ſummer, particularly in this month, has great virtues attributed to it by many authors, when newly gathered and clean filtered. It is not of a watery appearance, or colourleſs, but is yellowiſh, and much reſembles the urine of a healthful perſon. It is uſed for whitening linen and wax. The common methods of putrifying water have no effect on *dew*. Several quantities of it have been placed in digeſtion with different degrees of heat, from that of dung to that of a ſand-furnace, but no putrefaction was brought on it, though continued two months together; the heat, in whatever degree, ſerving to purify it, not to hurt it. The ſummer-ſun, for all the hot months together, has no more effect on it. It only ſends out a green vegetable matter of the conferva kind, which floats on the ſurface, and adheres to the ſides of the veſſel, and the whole quantity of the liquor remains as pure as before.

Though theſe common methods of putrefaction do not take place in this fluid, a much more ſimple proceſs will. If a quantity of it be put into an open wooden veſſel, and ſet in a cool ſhady place, with a canvas ſtretched over it to keep out duſt and inſects, it will in three or four weeks putrify and ſtink, and depoſite a large quantity of a black and thick mud. The manner of the formation of this ſediment is this: a ſmall quantity of a foul matter firſt ſeparates itſelf from the liquor, and floats at the top in form of a ſkin or film; this ſoon after precipitates itſelf to the bottom, and another ſucceeds in its place at the top, which is ſoon after precipitated in the ſame manner. Thus the mud is a congeries of theſe films one on another. If a quantity of *dew* be put into a long and narrow glaſs-veſſel, theſe films, inſtead of ſinking as ſoon as formed, will combine one with another at the top, and form a thick ſcum, which may be taken off with a ſpoon, and is very different from the black mud, ſeparated to the bottom in the former experiment, being a white and thick ſlime: if a quantity of this be put into a drinking-glaſs, or other ſuch veſſel, and the water drained from it, it will ſomewhat ſhrink in twelve hours ſtanding, and will become ſo ſolid as to take the form of the glaſs, and may be ſhook out; it then reſembles a lump of boiled white ſtarch, but is ſomewhat more tranſparent.

We have, in the Philoſophical Tranſactions, very odd accounts of productions of the animal kingdom, in the ſame *dew*; which might puzzle any one not verſed in experiments of this kind with other fluids. In one of the veſſels of this *dew* were found millipedes, differing from the common kind in ſome particulars; theſe were the common water millipedes: and in another, a quantity of green matter, probably a conferva, with numerous eulæ of inſects inhabiting it; for in a few days there were produced from this a vaſt number of flies. Another quantity of the *dew*, ſet in an open glaſs, was found after ſome days filled with the eulæ of the common gnat, and the flies were hatched from theſe. Phil. Tranſ. N° 3.

It is eaſy for a bad philoſopher to infer from theſe accounts

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counts the equivocal generation of these creatures in the water; but the insight we have had into the wonders of nature in the insect world are such, that at present we know their generation to be in many species, particularly in the gnat and fly kinds, from the eggs of their parents deposited in water, or any watery fluids, and that common ditch-water will at any time do what the *dew* does in this experiment.

There is a spirit drawn from *May dew*, which has wonderful virtues attributed to it. The method of collecting and preparing it is prescribed by Hanneman, physician at Kiel. The *dew* is to be gathered in clean linen cloths, exposed to the sun in close phials; then distilled, and the spirit thrown upon the caput mortuum; this is to be repeated till the earth unite with the spirit, and become liquid; which happens about the seventh or eighth cohobation, or distillation. By such means you gain a very red odoriferous spirit. Stolterfoht, a physician of Lubec, thinks *May dew* should be gathered in glass-plates, especially in still weather, and before sun-rise. And Etmuller is of the same opinion. It might likewise be collected with a glass funnel, exposed to the air, having a crooked neck to bring the *dew* into a phial in a chamber. See Phil. Trans. N° 3. Hoffman, and others. It is apparently from the preparation of this *dew*, that the brothers of the Rosycross took their denomination.

DEW, in *Chemistry*, a name formerly given to the phlegm, that rose first in the distillation of several substances. Thus, the *dew* of vitriol, and the *dew* of honey, were watery liquors, which rose first when these substances were distilled.

DEW, *orange*. See ORANGE.

DEW, *sun*. See SUN-*dew*.

DEW, *earth of*. See EARTH.

DEW-*born*, in the *Management of Cattle*, an excessive swelling of the body, proceeding from the greediness of a beast to feed, when put into rank pasture.

This swelling is often so great that the creature runs the utmost hazard of bursting; in which case it should be made to stir much, and purge well; but the proper cure is to bleed the creature in the tail, then putting a nutmeg into an egg, to thrust it down the creature's throat, shell and all; after which, by walking him up and down, he will soon recover.

DEW-*lap*, the flesh that hangs down from the throat of oxen.

DEWBERRY-*bush*. See RASPBERRY.

DEX, a name used by many Greek writers, for a worm or maggot, hatched of the egg of a beetle, and remarkable for its eroding wood. It is also called thrips and enxylon. The old Greeks used the pieces of wood eroded by it in various directions as seals. See THRIPS.

DEXTANS, in *Antiquity*. See As.

DEXTER, in *Heraldry*, is applied to the *right* side, as *sinister* is to the *left*.

DEXTER-*base*, is the right side of the base.

DEXTER-*chief*, the angle on the right hand of the chief.

DEXTER-*point*. See POINT.

The word is pure Latin, signifying right-handed; whence the word *dexterity* for address and ability in the performing of any thing.

DEXTRARIUS, is understood of one who takes the right-hand of another; and the word *dextrarii* has been used for light horses, or horses for the great saddle; from the French *destrier*, a horse for service.

DEXTROCHERE, or DESTROCHERE, in *Heraldry*, is applied to the right-arm, painted in a shield, sometimes naked, sometimes cloathed, or adorned with a bracelet, and sometimes armed, or holding some moveable, or member used in the arms.

The word is formed from the Latin *dextrocherium*, which signifies a bracelet worn on the right wrist, mentioned in the Acts of the Martyrdom of St. Agnes, and the Life of the emperor Maximus.

The *dextrochere* is sometimes placed as the crest.

DEY, the title of the sovereign of Algiers, under the protection of the grand seignor. A prince under this title was appointed by the sultan, at the request of the Turkish soldiers, in the year 1710. The term *dey*, in the Turkish language, signifies *an uncle* by the mother's side; and the reason of the denomination is this: that the Turkish military consider the grand seignior as their father, the republic as their mother, by which they are nourished and maintained, and the *dey* as the brother of the republic, and consequently the uncle of all who are under his dominion. Besides the age, experience, and valour, which are necessary qualifications of a person to be elected, he must also be a native Turk, and have made the voyage to Mecca. He has no guards, nor considerable retinue; he presides at the divan, and is most distinguished by the respect and submission which are paid him.

DIA, Δια, the beginning of divers terms in medicine, chirurgery, pharmacy, &c. Where these three letters commence the name of a remedy, unguent, plaster, cataplasm, &c. they signify composition and mixture; as in *diapasma*, *diachylon*, &c.

DIA is likewise the beginning of many terms in the other arts; as, *diameter*, *dialogue*, &c. on all which occasions, *dia*, which is an inseparable particle, or preposition, is borrowed from the Greek δια, *ex*, or *cum*; which begins the same words in the Greek.

Indeed we have words wherein *dia* is no preposition borrowed from a foreign language; though it is possible, the words themselves may: as in *diamant*, *dial*, &c.

DIA, in *Mythology*, a goddess among the Romans, probably the same with CYBELE.

DIABATHRA, in *Antiquity*, a kind of shoe worn by the Grecian women. Pitisc. Lex. Ant. in voc.

DIABE, in *Zoology*, the name of a prickly sea-fish of the orbis or globe-fish kind, and in all things resembling the histrix or porcupine-fish, except that its spines or prickles are all fixed into its skin by three insertions.

DIABETES, διαβητης, in *Medicine*, a hasty and profuse evacuation of the drink by the urinary passages; accompanied with an ardent thirst, and leanness of the whole body.

The word is derived from the Greek διαβαινειν, *to pervade*, or *pass quick*.

The drink, thus discharged, is usually a little altered from what it was when taken down, and turned chylous, and milky; but sometimes not at all.

The *diabetes* seems owing to a too great laxity of the fibres of the arteries of the kidneys; or too great a quantity of sharp salts in the blood, which dissolve the mass of blood, or disunite the parts thereof; so that the serosity is easily separated from the thicker parts.

According to Quincy, the evident, and most common cause of the *diabetes* is the too great use of spirituous liquors, wherewith the serum becomes so impregnated, that it will not attract, and join with the cruor, or globules of the blood, but runs off through the kidneys sweet, or insipid.

It happens most frequently to those who, without due exercise, indulge themselves with drinking vinous liquors, and then quench their thirst arising from thence by too great a quantity of such as are cooling.

In this disease the urine is thin and pellucid, and has no sediment, and is of a sweetish taste; though cases have occurred, in which it has not had this taste; the quantity voided is always very great; and if the patients endeavour to retain it, they are afflicted with swellings about the loins, and a sensation of weight and pressure in the hypochondria. It is attended with thirst, a hectic heat, a weak but quick pulse, and a gradual wasting of the flesh.

Persons subject to the diabetes. It is a very rare disease, and seems to have been so in other ages as well as in later times. Galen expressly says, that he never met with more than two persons who had it; the people affected with it are usually such as have disorders of the viscera in general; and it is often but a symptomatic affection, arising from an improper treatment of persons in fevers.

Prognostics in it. It is always a very terrible disease, but the longer standing it is of, the more difficult it is to be cured; it is not, however, suddenly of fatal consequence, but the people usually live some time with it, though they in the end generally die tabid, after having been afflicted with it for a length of time.

Method of cure. The infarctions of the viscera, which are the occasion of this, are first to be regarded, and are to be attacked with such aperients as are not strongly diuretic; of this kind are decoctions of the roots of dandelion, succory, polypody, and the like, and of the capillary herbs. Pills also are to be taken, made of ammoniacum, and the other resolvent gums, with the bitter extracts; and interchangeably with these the digestive neutral salts, such as tartarum vitriolatum, and the like. During this course, the febrile heat, which always attends this distemper, is to be taken off by the vegetable acids, such as sorrel and purslain, and tincture of roses made in the usual way. Some recommend the testaceous powders, in general; and others are peculiarly lavish in the praises of craw-fish, reduced to powder whole, after baking them in an oven. The great discharge of urine is to be lessened, in the mean time, by gentle laxatives now and then given, such as infusions of senna, rhubarb, and the like; and finally, if the disease goes off, or remits considerably of its violence, the chalybeates, and other restoratives, are to be given, to restore the parts to their due state. It is a common error to give astringents in a *diabetes*; for, if they take effect, they too violently constringe the viscera, and bring on pains and swellings in the loins, and not rarely an ascites and death itself in the end.

Persons subject to this disease should be extremely careful

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ful of themſelves in their regimen; they ſhould avoid all hot things, and beware of themſelves that they do not fall into violent paſſions; they ſhould feed principally on emulſive and gelatinous diet, to make up for the waſte of fleſh that always attends this diſeaſe. Junker's Conſp. Med. p. 540.

The bark, lime-water, Briſtol-water, and antimonials combined with the *tinctura thebaica*, have been recommended and uſed for the cure of this diſorder. Moderate exerciſe, and friction of the body, are uſeful.

Dr. Morgan thinks the tincture of cantharides may almoſt be abſolutely depended on for ſtopping the immediate flow of urine in the *diabetes*. The way he prepares his tincture is, by infuſing half an ounce of cantharides upon a pound of the elixir vitrioli; of which tincture, from fifteen to thirty or forty drops, may be given twice or thrice a day in Briſtol hot-well water. Mechan. Pract. of Phyſ. p. 114.

Dr. Jurin found the chalybeate waters acidulated with the oil of ſulphur, very ſucceſsful in this diſtemper. Med. Eſſ. Edinb. abr. vol. ii. p. 469.

Alum-poſſet drink is alſo ſaid to be an effectual cure for a *diabetes*. Ibid.

According to Dr. Mead, the *diabetes* is a diſeaſe of the liver, and not of the ſecretory veſſels of the kidneys, as has been generally thought. See Monit. & Pract. Medic. cap. ix. ſect. 2. and Mechanic Account of Poiſons, Eſſay 1. ed. 4.

The doctor recommends the following medicine as efficacious in this diſtemper: take four pints of milk, boil it a little, and turn it with three drachms of alum; four ounces of this ſhould be taken three times a day at leaſt.

Dr. Brockleſby attributes great efficacy, in a caſe where he was concerned, to alum whey, made by boiling from fifty to thirty grains of powdered roche alum, in a ſufficient quantity of new milk from the cow, to afford a full pint of whey; half of which was drunk by the patient every night and morning, for ſix weeks. Med. Obſ. vol. iii. p. 279.

Dr. Dobſon of Liverpool made ſeveral experiments, in order to aſcertain the nature of this diſeaſe; and he conſiders it as a ſpecies of imperfect digeſtion or aſſimilation, and to be more a diſeaſe of the ſyſtem in general, than either of the liver or kidneys. On this ſyſtem he accounts for the different taſte of the urine in different ſubjects, the emaciating effects of this diſeaſe, the acid ſweats, and the ſenſation of hunger that attend it. From hence he infers, that the obvious indications of cure are, to ſtrengthen the digeſtive powers, to promote a due ſanguification, and to eſtabliſh a perfect aſſimilation through the whole œconomy. Med. Obſ. vol. v. art. 27.

There is another kind of *diabetes*, wherein the perſon affected renders a great deal more by urine than he drinks, nay, ſometimes more than he both eats and drinks. Some phyſicians attribute this exceſſive quantity of liquor to the air he reſpires, which, they ſuppoſe, becomes converted into water; or, at leaſt, the water in the air reſpired is here abſorbed, and collected. But others, with more probability, attribute it to a colliquation of the blood, fat, and even the ſolid parts of the body.

DIABETES, in *Hydraulics*, is applied to a ſiphon, the two legs or branches whereof are incloſed in one another; as in the glaſs deſcribed by Hero, which runs itſelf quite empty, without being inverted, as ſoon as the water is arrived at the height of the upper branch of the ſiphon.

DIABOLUS *marinus*. See *Sea* DEVIL.

DIABOTANUM, from δια and βοτανη, *herb*, in *Pharmacy* and *Chirurgery*, denotes a plaſter of herbs, wherewith wens, &c. are reſolved and diſcuſſed. The *diabotanum* is ſovereign for the hydatides.

DIABROSIS, in *Medicine*, a ſolution of the continuity of a part, cauſed by ſharp, corroſive humours, gnawing and devouring the ſame.

The word is Greek, compounded of δια, *per*, *through*; and βρωσκειν, *to eat*.

DIACARTHAMI, in *Pharmacy*, an electary, compoſed of turbith, manna, ſcammony, hermodactyls, and other purgatives; with the addition of the pulp of the ſeed of the *carthamus*, which gives it the denomination.

Diacarthami chiefly purges *pituita*. It was formerly preſcribed in diſeaſes of the brain, and frequently mixed in medicines along with other purgatives, but is now wholly out of uſe.

DIACARYON, or DIANUCUM, in *Pharmacy*. See DIANUCUM.

The word is formed from δια, and καρυα, *walnut*.

Galen is ſaid to have prepared his *diacaryon* with the juice of walnuts, mixed with as much honey as ſufficed to render it an agreeable compoſition.

DIACAUSTIC *curve*, or *cauſtic* by REFRACTION, is a ſpecies of cauſtic curves, whoſe geneſis may be thus conceived.

Imagine an infinite number of rays, as BA, BM, BD, &c. (*Tab. Geom. fig.* 20.) iſſuing from the ſame luminous point, B, to be refracted from, or to the perpendicular MC, in the curve AMD; and ſo, as that CE, the ſines of the angles of incidence CME be always to CG, the ſines of the refracted angles CMG, in a given ratio: then the curve line, which touches all the refracted rays, is called the *diacauſtic*.

DIACELTATESSON, in *Chemiſtry*, a name given by Van Helmont, to a purging preparation, procured from the fixed flowers of antimony, in the following manner: take eighteen grains of the fixed diaphoretic flowers of antimony, ſixteen grains of roſin of ſcammony, and ſeven grains of cream of tartar, make all together into a powder. Or take nine grains of the fixed antimony, nine grains of roſin of ſcammony, and three grains of cream of tartar; make them into a fine powder. The former is the largeſt doſe for a grown perſon, and the latter the leaſt; they are to be taken without any acid; and if they operate too violently, the violence may be ſtopped by taking any thing acid: it is to be given in intermittents, ſo as to finiſh its operation immediately before the coming on of the fit: it is ſaid by the author always to cure quartans before the fourth doſe, and all intermittent and continued fevers.

Boerhaave obſerves, that he had often given it with good effects, but never with that great ſucceſs which the author aſcribes to it; who ſays, that it radically cures the gout and fevers, heals ulcers of the larynx, œſophagus, and bladder, and purges the body when in perfect health, but not otherwiſe. This candid writer obſerves, that Helmont ſeems always to have carried the virtues of his medicines by a ſubtilty of reaſoning, beyond what will be found warrantable of them from experience. Boerh. Chem. part ii. p. 338.

DIACENTROS, from δια, *through*, and κεντρον, *center*, is uſed by Kepler to ſignify the ſhorteſt diameter of the elliptical orbit of any planet; probably becauſe it paſſed through the center, and not through the focus, which diſtinguiſhes it from the longer diameter.

DIACHALASIS, from διαχαλαω, *to be relaxed*, in the *Medicinal Works of the Ancients*, a term uſed to expreſs a ſolution of continuity in the bones of the cranium at the ſutures; that is, when the bones recede from their mutual indentation, an accident that frequently happens from large wounds in the head.

DIACHALCITIS, in *Chirurgery* and *Pharmacy*, a plaſter which formerly uſed to be applied after the amputation of a cancer, and on many other occaſions.

The *emplaſtrum diachalcitidis* is compoſed of oil, axungia, and chalcitis; from the laſt of which drugs it derives its name.

DIACHRISTA, from δια and χριω, *I anoint*, a name given by the ancient writers in medicine to certain compoſitions, whoſe uſe was to be applied to the fauces, uvula, palate, and tongue, for the abſterſion of phlegm.

DIACHYLON, in *Pharmacy*, a name given to divers plaſters, on account of the mucilages mixed therein, which are viſcid juices, called by the Greeks χυλοι, drawn from certain plants. See MUCILAGE.

DIACHYLON, *white*, or *ſimple*, ſhould be compounded of common oil, litharge of gold, and mucilages drawn from marſhmallow roots, fenugreek, and aniſe-ſeeds. It is proper to ſoften, digeſt, ripen, and reſolve.

The *diachylon*, called *ireatum*, has for its baſis the common white *diachylon*, with a pound of which, an ounce of powder of iris is mixed. This plaſter digeſts, incides, and ripens with more force than the ſimple *diachylon*.

There is alſo the *great diachylon*, *diachylon magnum*, compoſed of litharge of gold, oils of orris, camomile, and dill, turpentine, reſin of the pine, yellow wax, and mucilages of line and fenugreek, with new figs, raiſins of Damaſcus, ichthyocolla, juices of orris, ſquills, and hyſſop.

This *diachylon* ſoftens ſchirrhuſes, and reſolves and diſſipates tumours. It is called *the great*, not only on account of its extraordinary virtues, but alſo becauſe compounded of a greater number of ingredients than the reſt.

The DIACHYLON *gummatum*, or *diachylon cum gummi*, is the *great diachylon*, with the addition of gum ammoniac, galbanum, and ſagapenum, diſſolved with wine, and boiled to the conſiſtence of honey. This plaſter is the moſt powerful of all for digeſting, ripening, and reſolving.

DIACODIUM, in *Pharmacy*, a ſyrup prepared from poppy-heads; called alſo the *ſyrupus de meconio*.

The word is formed from the Greek δια, *per*, and κωδεια, *poppy-heads*.

The ancients had two kinds: *ſimple*, and *compound*.

DIACODIUM, *the ſimple*, was a kind of opiate, made of the juice expreſſed from the heads of white poppies, and boiled up with ſugar. See OPIATE.

It was preſcribed to ſoften ſharp, ſerous humours, to appeaſe

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peaſe-coughs, and to provoke ſleep. This preparation was of great uſe among the ancients; but it is now laid aſide, ſince it has been found, that the ſyrup made of an infuſion of white poppy-heads, which is what we now call *diacodium*, produces the ſame effect.

DIACODIUM, *compound*, was made of the *ſimple*, with the addition of the troches of hamec, hypocyſtis, myrrh, ſaffron, and balauſtines. It was uſed to ſtop and ſoften catarrhs, hæmorrhoids, and fluxes of the belly.

DIACODUS, in *Natural Hiſtory*, a name given by ſome to the *diadochos*, a kind of beryl or ſapphire, of which many fabulous things are aſſerted.

DIACOLOCYNTHUS, in *Pharmacy*, διὰ κολοκυνθίδων, from κολοκυνθὶς, *colocynth*; a remedy, of which colocynth is a principal ingredient. See COLOCYNTH.

DIACONICON, *Sacriſty*, a place adjoining to the ancient churches, where the ſacred veſtments, with the veſſels, relics, and other ornaments of the altar, were preſerved, anſwering to our veſtry.

The word is Greek, formed from διακονεω, *I ſerve, I miniſter*, becauſe here was kept every thing belonging to divine ſervice. It was alſo called ἀσπαστικον, and in Latin *ſalutatorium*; becauſe it was here that the biſhop received and ſaluted ſtrangers. Sometimes, too, it was called μητατωριον, or μιτατωριον, *menſa*, on account of the tables kept therein, for diſpoſing the ſacred ornaments on; or rather from μητατον, a ſort of inn, or houſe, for the lodging of ſoldiers.

DIACONISSA, and DIACONATE. See DEACON, and DEACONRY.

DIACOPE, Διακοπη, from διὰ and κοπτω, *I cut off*, in *Grammar*, the ſame with what is otherwiſe called TMESIS.

DIACOPE, in *Surgery*, denotes a deep cut or wound; or the act of cutting off any part.

DIACORALLIUM, in *Medicine*, a preparation of coral in the London diſpenſatory.

DIACOUSTICS, or DIAPHONICS, the conſideration of the properties of ſound refracted in paſſing through different mediums; that is, out of a denſer into a more ſubtile, or out of a more ſubtile into a denſer medium. See SOUND.

The word is formed from the Greek διὰ, *per, through*, which intimates a paſſage; and ακουω, *I hear*, q. d. the conſideration of the paſſage of the ſounds we hear.

DIACRII, in *Antiquity*, was the name of a party or faction at Athens.

That city, we read, was divided into two parties: the one favourers of an oligarchy, who would only have a few perſons employed in the government. The other conſiſted of ſuch as were for a democratical, or popular government, wherein the whole people ſhould have a ſhare. The firſt were called *diacrii*, and the latter *pediaci*; the latter inhabiting the lower, and the former the ακρον, or upper quarter, or part of the city.

The laws of Solon imported, that Piſiſtratus ſhould be chief of the *diacrii*; though the ſcholiaſt, on Ariſtophanes's comedy, The Waſps, affirms, that Pandion diſtributed the quarter of the *diacrii* among his ſons, and put Lycus at their head.

DIACTORE, in *Mythology*, a ſurname of Mercury; derived from διαγω, *I attend*, becauſe Mercury was the meſſenger of the gods.

DIACYDONITES, in *Pharmacy*, is applied to things and remedies, wherein quinces are a principal ingredient.

The word comes from διὰ, and κυδωνιον, *quince*.

Confectio diacydonites, or *diacydonium*, is marmalade, a confection of quinces, or wherein quinces have a chief ſhare.

DIADELPHIA, in *Botany*, the ſeventeenth claſs of plants with hermaphrodite flowers, whoſe ſtamina, by the conjunction of their filaments, are formed into two bodies, the one ſtanding above the piſtil, and the other ſurrounding it. The lower part of this laſt is membranaceous, of a cylindric figure, and ſplit lengthwiſe on its oppoſite ſide; but the upper half terminates in nine ſubulate, or awl-ſhaped parts, of which the intermediate are alternately longer and ſhorter by pairs. The upper filament is awl-ſhaped, and like a briſtle, and covers the ſlit of the cylindraceous filament incumbent on it. The antheræ are ten; the piſtil is ſingle; the germen oblong and roundiſh; the ſtyle ſubulate and filiform; the ſtigma downy, of the length of the ſtyle, and placed immediately under the antheræ; the calyx is a monophyllous, campanulate, and withering perianthium; the papilionaceous corolla unequal, and its petals have diſtinct names, as *vexillum*, the ſtandard, covering the reſt; *alæ*, the wings, which are two equal petals, one at each ſide of the flower, under the *vexillum*; and *carina*, the keel, which is the loweſt petal, often bipartite, placed under the *vexillum* and between the *alæ*; the pericarpium is an oblong, compreſſed, bivalve legumen, with a longitudinal ſuture both above and below; the ſeeds are few, roundiſh, ſmooth, fleſhy, and pendulous, in a ſmall, ſhort, proper receptacle, thinner towards the baſe, and obtuſe at the diſk that faſtens them.

The word is formed of the Greek δὶς, *twice*, and ἀδελφος, *brother*. Among the plants of this claſs are the fumitory, milk-wort, broom, &c. See *Tab. of Botany*, *Claſs* 17.

This is a perfect natural claſs of plants, and is the moſt remarkable of all others in the ſtructure of the flower. The common ſituation of the flower is an obliquely pendulous direction, or in an acute angle from a perpendicular line. The former ſyſtematiſts in botany, as Linnæus obſerves, took great notice of the pod in this claſs of plants, and thought it the principal ſubject of diſtinction; but he very judiciouſly makes it but of very little conſequence, and will not allow it ſufficient to diſtinguiſh the genera one from another: but the cup, which had always before his time been diſregarded, he eſteems a very eſſential part of the plant, and ſufficiently certain to erect the different genera upon in many caſes. Some of the old writers had been uſed to take the leaves into their marks, by which to diſtinguiſh genera of this claſs; but Linnæus wholly excludes this part of a plant from this office. Magnol has obſerved, that the carina of the *diadelphia*, or papilionaceous flowers, is dipetalous, and is compoſed of two diſtinct oblong petals; the lower edges of which join ſo nicely and cloſely together, that they ſeem only one; and are not joined in their ſubſtance, but only in their ſituation. Linnæus has ſtrictly examined this, and finds that the author is ſo far right, that this is really the caſe in many of the papilionaceous flowers, but not in all: ſome not only appearing to have, but really and certainly having a carina compoſed of only one petal.

The conſideration of the ſtigma is of more conſequence in this than in moſt other flowers, and even more than that of any other part of the fructification in this. The ſeeds of all the plants of this claſs are eatable, excepting in a very few particulars; their leaves alſo are a grateful food to cattle. Lin. Gen. Plant. p. 377.

Of this claſs there are four orders, viz. the *pentandria*, comprehending one genus; the *hexandria*, two; the *octandria*, two; and the *decandria*, forty-nine.

DIADEM, Διαδημα, in *Antiquity*, a head-band, or fillet, worn by kings as a badge of their royalty; while the crown was left to the gods.

The word comes from the Latin *diadema*, of the Greek διαδημα, *a little band encompaſſing the head*, of the verb διαδεω, *cingo, I gird*.

The *diadem* was a ſort of ribbon, or fillet, woven of ſilk, thread, or wool, more or leſs broad. It was tied round the temples, and forehead; the two ends being knotted behind, and let fall on the neck.

It was uſually white, and quite plain, though ſometimes embroidered with gold, and ſet with pearls, and precious ſtones. In later times it likewiſe came to be twiſted round crowns, laurels, &c. and even appears to have been worn on divers parts of the body: thus Phavorinus obſerves, that Pompey was ſuſpected of aſpiring to the royalty, becauſe of his wearing a white garter, which was no other than a ligature for an ulcer he had on his leg, but which the people miſtook for a *diadem*.

Pliny, lib. vii. cap. 5. obſerves, that Bacchus was the firſt inventor of the *diadem*. Athenæus aſſures us, that the topers, and good fellows, firſt made uſe of it, to preſerve themſelves from the fumes of wine, by tying it tight round their heads; and that it long afterwards came to be a royal ornament.

The *diadem* remained a long time the peculiar badge of kings; at length it was aſſumed by the Roman emperors, as the mark of imperial dignity.

Authors are not agreed about the time when the Roman emperors firſt aſſumed the *diadem*. Some refer it to Caligula, others to Aurelian, and others to Conſtantine the Great. The younger Victor ſays, poſitively, that Aurelian took the *diadem*, which no emperor had dared to do before him. For though it ſhould ſeem from the ſame writer, that Caligula had done the like, yet Suetonius aſſures us, he had it only in view, and that he never executed it. Heliogabalus, indeed, took a *diadem*; but it was only in the palace he wore it, and never appeared with it in public. Jornandes even goes as low as Dioclefian for the introduction of the *diadem*; but it is certain, there is a medal of Aurelian, with a crown like one of our ducal crowns, which is ſuſtained by a border of pearls, that bears a very great affinity to a *diadem*. And the authors, who have explained that medal, are all agreed that it is one. Mr. Spanheim alſo allows Aurelian to have taken it: his ſucceſſors imitated him therein; and yet the ornament did not become common till the time of Conſtantine. After him the empreſſes were allowed

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lowed to wear it; accordingly we find them repreſente therewith on medals; though till that time we have no inſtance either of crown, or *diadem*, on a woman's head, in all the Roman empire.

An author of the fifth century, quoted by Bollandus, pretends that Conſtantine firſt wore the *diadem*, and that he only took it to bind his hair, and keep it in order. But this is not very probable; and it is certain, that at leaſt ſome emperors had worn it before him, as Aurelian, and Carinus.

Euſebius gives it to Conſtantius Chlorus, when only Cæſar; which is confirmed by one of his medals, wherein he is repreſented with a *diadem*, adorned with rays; though even after Conſtantine, when the *diadem* was become the uſual ornament of the Auguſti, it was not always given to the Cæſars. Indeed, we ſee it on ſome of the medals of Julian, while only Cæſar; though it is pretty certain, he did not wear it till he became Auguſtus. Du-Cange will not aſſert, that Conſtantine firſt took the *diadem*; but only, that he firſt made it into a kind of caſk, or cloſe crown, as is ſeen in ſome of his medals, and thoſe of his ſucceſſors.

DIADEM, in *Heraldry*, is applied to certain circles, or rims, ſerving to bind or incloſe the crowns of ſovereign princes; and to bear the globe, and croſs, or the fleurs-de-lys, for their creſt.

The crowns of ſovereigns differ in this, that ſome are bound with a greater, and ſome with a leſs, number of *diadems*.

Prelates likewiſe appear to have anciently worn a ſort of *diadem:* thus Baronius writes, that St. James the apoſtle wore a gold plate on his forehead, as a mark of his epiſcopal dignity.

In blazoning, the bandage about the heads of Moors, on ſhields, is ſometimes alſo called *diadem*.

DIADOCHUS, in *Natural Hiſtory*, the name given by the ancients to a gem, approaching to the nature of the beryl, or aqua-marina, probably a pale ſapphire; for they had no peculiar generical name for that gem, but called the beautiful deep-coloured ones only ſky blue beryls, berylli aeroides. The writers of the middle age have given ſtrange accounts of the magical virtues of this ſtone, ſuch as its calling up ſpirits, and many other the like things, on being thrown into water: they ſaid, however, that if it happened by any accident to touch a dead body it loſt all its virtue.

DIADROME, from διὰ and δρομος, *curſus*, is ſometimes uſed for the vibration, motion, or ſwing of a pendulum.

DIÆRESIS, in *Surgery*, the operation of dividing and ſeparating parts, whoſe union and continuity were an obſtacle to the cure; or which were joined and conglutinated contrary to the order of nature.

The word, in its original Greek, διαρεσις, ſignifies *diviſion*.

There are five ways of performing the *diæreſis*, viz. by cutting, pricking, tearing, drawing, and burning.

DIÆRESIS is alſo uſed, in *Medicine*, for the deſtroying or conſuming of the veſſels, or canals, of an animal body; when, from ſome cutting, or corroding humour, certain paſſages are made, which naturally ought not to have been; or certain natural paſſages are dilated beyond their ordinary dimenſions; ſo that the juices, which ſhould have been contained therein, extravaſate, or run out.

DIÆRESIS, in *Grammar*, is a figure whereby a diphthong is divided into two ſyllables: as *aulæ* into *aulai*, *pictæ* into *pictai*, *aquæ* into *aquai*.

DIÆRESIS is alſo uſed, in a general ſenſe, for any diviſion of one ſyllable into two: as in that verſe of Tibullus, *Stamina non ulli diſſolüenda deo*, for *diſſolvenda*.

This is uſually noted by two points placed over a letter, to ſhew that it is to be ſounded by itſelf, and not joined with any other ſo as to make it a diphthong: thus *aëra*, by the points over the *e*, is diſtinguiſhed from *æra*.

It is alſo a kind of metaplaſm, or addition to a word, by dividing one ſyllable into two: as *aulae*, by a *diæreſis*, is a word of three ſyllables, inſtead of *aulæ*. See TMESIS.

DIÆTETÆ, Διαιτηται, from διαιταω, *I arbitrate*, among the Athenians, were of two ſorts, the cleroti and dialacterii. The former were a kind of public arbitrators, choſen by lot, to determine all cauſes exceeding ten drachms within their own tribe. Their office was annual, at the expiration of which they were obliged to give up their accounts; and if it was proved, that they refuſed to give judgment, or to have been corrupted, they were puniſhed with infamy. Their ſentence, however, was not final, an appeal lying from it to the ſuperior courts.

The *dialacterii*, on the contrary, were private arbitrators, from whoſe ſentence there lay no appeal; and accordingly they always took an oath to adminiſter juſtice without partiality, which the *cleroti* did not. Potter's Archæol. Græc. lib. i. cap. 22. tom. i. p. 122, ſeq.

DIAGLAUCIUM, a name given by the old writers on medicine to a ſort of collyrium, in which the juice of the glaucium, or yellow poppy, was a principal ingredient. It was uſed for beginning lippitudes and ophthalmies.

DIAGLYPHICE, from διαγλυφω, *I engrave*, the art of ENGRAVING, cutting, or otherwiſe working, hollow or concave figures, in metals; ſuch as ſeals, intaglios, matrices, or coins for medals, &c. See SCULPTURE.

DIAGNOSTIC, in *Medicine*, a term applied to thoſe ſigns, or ſymptoms, which indicate, or diſcover, the preſent ſtate of a diſeaſe, its nature, and cauſe.

The word is compounded of the Greek διὰ, *per*, *through*, or *by*; and γινωσκω, *I know*.

The phyſicians have *diagnoſtic*, as well as *prognoſtic* ſigns; the firſt, with regard to the preſent ſtate of the diſeaſe, and the patient; and the ſecond to the future.

DIAGONAL, in *Geometry*, a right line drawn acroſs a parallelogram, or other quadrilateral figure, from the vertex of one angle to that of another.

Such is the line PN (*Tab. Geometry*, *fig.* 21.) drawn from the angle P, to N.

Some authors call it *diameter*, and others the *diametral* of the figure.

It is demonſtrated, 1. That every *diagonal* divides a parallelogram into two equal parts. 2. Two *diagonals*, drawn in any parallelogram, biſect each other. 3. The *diagonal* of a ſquare is incommenſurable with one of its ſides.

Add, 4. A very noble theorem in elementary geometry, firſt demonſtrated by Mr. Lagny, in the Memoires de l'Academie Royale de Sciences, an. 1706, is, that the ſum of the ſquares of the two *diagonals* of every parallelogram is equal to the ſum of the ſquares of the four ſides.

It is evident, at firſt ſight, that the famed 47th propoſition of Euclid, ſo richly worth the hecatomb it coſt the author, is only a particular caſe of this propoſition: for if the parallelogram be rectangled, it follows of courſe, that the two *diagonals* are equal; and, of conſequence, that the ſquare of a *diagonal*, or, which is the ſame thing, the ſquare of the hypothenuſe of a right angle, is equal to the ſquares of the two ſides. If a parallelogram be oblique-angled, and, of conſequence, the two *diagonals* unequal, as is the more uſual caſe, the propoſition becomes of more extenſive uſe.

The demonſtration, in oblique-angled parallelograms, is thus: ſuppoſe the oblique-angled parallelogram ABCD (*Tab. Geometry*, *fig.* 22.) whereof BD is the greater *diagonal*, and AC the leſſer: from the point A, of the obtuſe angle DAB, let fall a perpendicular AE, to the ſide CD; and from the point B another perpendicular BF to the ſide DC. Then are the triangles ADE, BCF equal, and ſimilar, as AD is equal to BC, and the angle ADE, BCF, as well as AED, BFC, are alſo equal; conſequently, DE is equal to CF. Now, by Euclid, prop. 12. lib. ii. in the obtuſe-angled triangle BDC, the ſquare of the ſide BD is equal to the ſum of the ſquares of BC, and CD, together with double the rectangle of CF by CD; and by the 13th, lib. ii. in the triangle DAC, the ſquare of the ſide AC is equal to the ſum of the ſquares of AD, and CD, abating double the rectangle of the ſame CD, by DE, equal to CF. Conſequently, the former exceſs preciſely compenſating this defect, the ſum of the ſquares of the two *diagonals* is equal to the ſum of the ſquares of the four ſides. Q. E. D.

Hence, in every rhombus, or lozenge, knowing one ſide, and a *diagonal*; the other *diagonal* will likewiſe be known: for, as the four ſides are equal, ſubtracting the ſquare of the given *diagonal* from quadruple the ſquare of the given ſide, the remainder is the ſquare of the *diagonal* required.

The propoſition is likewiſe of great uſe in the theory of compound motions; for, in an oblique-angled parallelogram, the greater *diagonal* being the ſubtenſe of an obtuſe, and the leſſer of an acute angle, which is the complement of the former, the greater will be the greater, and the leſs the leſs, as the obtuſe angle is the greater; ſo that if the obtuſe angle be conceived to increaſe till it be infinitely great, with regard to the acute one; or, which amounts to the ſame thing, if the two contiguous ſides of the parallelogram be extended directly, end to end, in a right line, the great *diagonal* becomes the ſum of the two ſides, and the leſſer one, nothing. Now, two contiguous ſides of a parallelogram being known, together with the angle they include, it is eaſy to find the ſubtenſe of that angle, i. e. one of the *diagonals* of the parallelogram, in numbers; which done, Mr. de Lagny's propoſition gives the other. Which ſecond *diagonal*, thus found, is the line that would be deſcribed by a body impelled at the ſame time by two forces, which ſhould have the ſame ratio to each other as the contiguous ſides have,

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have, and act in thoſe two directions; which *diagonal* the body would deſcribe in the ſame time, as it would have deſcribed either of the contiguous ſides in, if only impelled by the force correſponding thereto. This is one of the great uſes of the propoſition; for the ratio of two forces, and the angle they make, being given, it is frequently neceſſary to determine, in numbers, the line a body, impelled by two forces, would deſcribe in a certain time. See COMPOSITION *of Motion*.

All the ſides of a rectilinear figure, as AB, BC, CD, DE, EA (*fig.* 23.) and the angles O, and Y, being given, to find the *diagonals*.

In the triangle ABE, the ſides AB, and AE, being given, and the angle O, the angle A is eaſily found by trigonometry; and, from this, the *diagonal* BE. And, after the like manner, the triangle BCD is reſolved, and the *diagonal* BD found.

Since ICHNOGRAPHIES, or plans, are beſt taken, by having all the ſides and *diagonals*, the uſe of this problem, in planimetry, is of ſome importance; eſpecially to ſuch as are willing to have their work accurate, though at the expence of calculation.

DIAGONAL *ſcale*. See PLOTTING-*ſcale*, and SCALE.

DIAGRAM, from διαγραφω, *I deſcribe*, in *Geometry*, &c. a ſcheme for the explanation, or demonſtration, of any figure, or the properties thereto belonging.

DIAGRAM, or DIAGRAMMA, in the *Ancient Muſic*, was what we call the *ſcale*, or GAMMUT, in the modern.

The extent of the *diagramma*, which they alſo called *ſyſtema perfectum*, was a diſdiapaſon, or two octaves in the ratio 1:4. In that ſpace they had eighteen chords, though theſe had not all different ſounds.

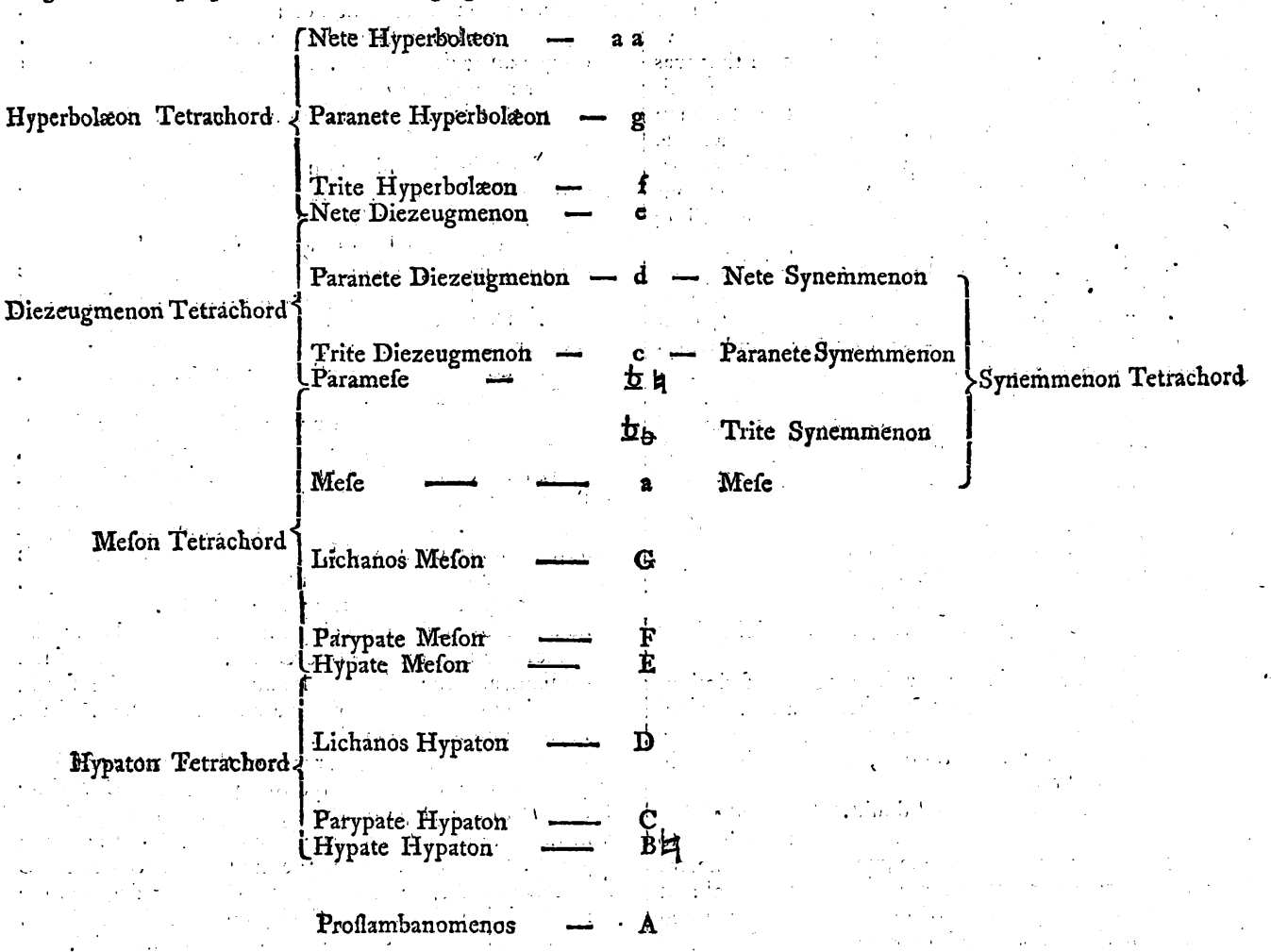
To explain it, they repreſent to us eighteen chords, or ſtrings, of an inſtrument, as the lyre, ſuppoſed to be tuned according to the proportions in any of the genera; viz. DIATONIC, ENHARMONIC, or CHROMATIC.

As the lyre was improved, and more chords added to it, ſo was the *diagramma:* by ſuch means it came from 4 chords to 7, then 8, then 10, then 14, and at laſt 18. See Malcolm's Treatiſe on Muſic, p. 519.

Guido Aretine improved this ſcale, or *diagram*, very greatly: finding it of too ſmall extent, he added five more chords, or notes, to it; laid them all down on a ſtaff of five lines; and, inſtead of the long Greek names, named all his notes by Gregory's ſeven letters. See NOTE.

The firſt, or loweſt, note of his ſcale, he marked Γ, and called *gamma*; whence the whole ſcale came to be denominated.

We ſhall here inſert the whole *diagram*, or Greek ſcale, with the correſponding letters of our modern notation.



It is to be obſerved, that this *diagram* only repreſents the diatonic genus; and therefore, after the names *lychanos hypaton*, and *lychanos meſon*, ſome add *diatonos*, to diſtinguiſh them from the lichanoi of the chromatic or harmonic genera. Wallis, Append. ad Ptolem. Harm. p. 157. See LICHANUS.

The tetrachords in this *diagram* are conjunct or diſjunct. The conjunct have a common note, chord, or ſound. Thus the hypate meſon, which is the laſt of the hypaton tetrachord, is the firſt of the meſon. The meſe alſo is the laſt chord of the meſon, and the firſt of the ſynemmenon tetrachord. So likewiſe the nete diezeugmenon is the laſt chord of the diezeugmenon, and the firſt of the hyperbolæon tetrachord. The diſjunct tetrachords are thoſe which are ſeparated by a tone. Thus the meſon and diezeugmenon tetrachords are ſeparated by the tone between the meſe and parameſe: ſo likewiſe the ſynemmenon and hyperbolæan tetrachords are ſeparated by the tone between the nete ſynemmenon, and the nete diezeugmenon.

Some of the names of the chords in this *diagram* being placed nearer to each other than the reſt, ſignify that there is only a ſemi-tone between them. Thus, between the hypate hypaton and the parypate hypaton, or between the meſe and the trite ſynemmenon, or between the parameſe and trite diezeugmenon, the interval is no more than a ſemi-tone.

It has been obſerved by Dr. Pepuſch, that the ancients conſidered a deſcending as well as an aſcending ſcale; the former proceeding from acute to grave preciſely by the ſame intervals, as the latter did from grave to acute, and the ſame name ſerved for both. But the proſlambanomenos, and the reſt of the names, correſpond to different notes of our ſcale. An example of one octave will explain the learned author's meaning.

Aſcending		Deſcending
A — Proſlambanomenos	—	g
B — Hypate hypaton	—	f
C — Parypate hypaton	—	e
D — Lichanos hypaton	—	d
E — Hypate meſon	—	c
F — Parypate meſon	—	b
G — Lichanos meſon	—	a
a — Meſe —	—	G

The intervals here, both aſcending and deſcending, are the ſame, and in the ſame order, viz. tone, ſemi-tone, tone, tone, ſemi-tone, tone, tone. So that the one ſcale is preciſely the reverſe of the other. This diſtinction of an aſcending and a deſcending ſcale, is ſaid to be conducive to the variety and perfection of melody, though little underſtood by modern compoſers. Phil. Tranſ. N° 481. p. 369.

The eighteen names of the ſcale of the ancients do not

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ſeem to ſignify ſo many diſtinct ſounds, eſpecially in the diatonic genus, where the paranete ſynemmenon and the trite diezeugmenon, as alſo the nete ſynemmenon, and the paranete diezeugmenon, are reputed to coincide. Nor do the eighteen chords ſeem perfectly diſtinct in any of the other genera, except in the enharmonic. Wallis's Append. ad Ptolem. Harm. p. 158. See ENHARMONIC and SCALE.

DIAGRYDIUM, in *Pharmacy*, is ſcammony prepared, or corrected, for medicinal uſe.

The preparation is ordinarily performed by baking the SCAMMONY in a quince. Others make it to receive the fumes of lighted ſulphur, whence it is called, *ſulphurated*, or *diagrydium ſulphuratum*. Some incorporate it with a quantity of ſpirit of vitriol roſatum, ſufficient to make a ſort of liquid paſte, which is afterwards ſet to dry in the ſun, or by a gentle fire. And this preparation they call *diagrydium roſatum*. The end of all theſe preparations is to correct the ſcammony; but the generality of authors now are of opinion, it has nothing that needs correction, and that it may be uſed in its natural ſtate.

DIAH, or DIAT, a name given by the Arabs to the puniſhment of retaliation. By the Mahometan law, a brother, or the next relation of a murdered perſon, ought to take part againſt the murderer, and demand his blood in reparation for that which he has ſhed. Before the time of Mahomet, the Arabs had a cuſtom of putting a freeman of their priſoners to death, in lieu of every ſlave they loſt in battle, and a man for every woman that was killed. But Mahomet regulated the laws of repriſal; directing in the Alcoran, by the *diat*, that a freeman ſhould be required for a freeman, and a ſlave for a ſlave. The Turks, probably in conſequence of this law, formerly maſſacred almoſt all their priſoners of war, but they now content themſelves with enſlaving and ſelling them. Encyclop.

DIAHEXAPLA, from διὰ and ἑξάπλοος, *ſix-fold*, among *Farriers*, a drink made for horſes, denominated from the ſix ingredients it conſiſts of; viz. birth-wort, gentian-roots, juniper-berries, bay-berries, myrrh, and ivory-ſhavings. It is eſteemed a good ſtomachic, and cures bites of venomous beaſts, colds, conſumptions, &c.

DIAION, in the *Ancient Writers of Medicine*, the name of a compoſition made into the form of troches, of which violet flowers were one of the principal ingredients. The compoſition is deſcribed at large by Myrepſus.

DIAL, or *Sun*-DIAL, an inſtrument ſerving to meaſure time, by means of the ſhadow of the ſun.

The word is formed from *dies*, *day*, becauſe indicating the hour of the day. See HOUR.

The ancients alſo call it *ſciathericum*, from its doing it by the ſhadow.

DIAL is more accurately defined, a draught, or deſcription, of certain lines on a plane, or ſurface, of a body given, ſo contrived, as that the ſhadow of a ſtyle, or ray, of the ſun, paſſed through a hole therein, ſhall touch certain points at certain hours.

The antiquity of *dials* is beyond doubt. Some attribute their invention to Anaximenes Mileſius; and others to Thales. Vitruvius mentions one made by the ancient Chaldee hiſtorian Beroſus, on a reclining plane, almoſt parallel to the equinoctial. Ariſtarchus Samius invented the hemiſpherical *dial*. And there were at the ſame time ſome ſpherical ones, with a needle for a gnomon. The diſcus of Ariſtarchus was an horizontal dial, with its limb raiſed up all around, to prevent the ſhadow ſtretching too far.

But it was late before the Romans became acquainted with *dials*. The firſt ſun *dial* at Rome was ſet up by Papyrius Curſor, about the year of the city 460, before which time, ſays Pliny, there is no mention of any account of time but by the ſun's riſing and ſetting: the firſt *dial* was ſet up at or near the temple of Quirinus, but it went ill; about thirty years after, M. Valerius Meſſala being conſul, brought out of Sicily another *dial*, which he ſet up on a pillar near the roſtrum; but for want of its being made for that latitude, it could not go true. They made uſe of it ninety-nine years; till Martius Philippus ſet up another more exact.

But there ſeem to have been dials among the Jews much earlier than any of theſe. Witneſs the *dial* of Ahaz, who began to reign four hundred years before Alexander, and within twelve years of the building of Rome; mentioned by Iſaiah, chap. xxxviii. ver. 8.

The diverſity of *ſun-dials* ariſes from the different ſituation of the planes, and the different figure of the ſurfaces whereon they are deſcribed; whence they become denominated *equinoctial*, *horizontal*, *vertical*, *polar*, *direct*, *erect*, *declining*, *inclining*, *reclining*, *cylindrical*, &c. For the general principles of their conſtruction, ſee DIALLING.

Dials are ſometimes diſtinguiſhed into *primary*, and *ſecondary*.

DIALS, *primary*, are thoſe either drawn on the plane of the horizon, called *horizontal dials*; or, perpendicular thereto, on the planes either of the meridian, or prime vertical, called *vertical dials*: to which number are alſo uſually added, thoſe drawn on the polar and equinoctial planes, though neither horizontal, nor vertical.

DIAL, *equinoctial*, is that deſcribed on an equinoctial plane, or a plane repreſenting that of the equinoctial.

A plane oblique to the horizon, either hangs over towards it, and makes an acute angle with the plane of the horizon, or it falls off backwards from it, and makes an obtuſe angle therewith. This latter is called a *reclining plane*; which, if it recline back at an angle equal to the complement of the latitude of the place, then it lies in the plane of the equinoctial; and a *dial* drawn thereon, is denominated an *equinoctial dial*.

Equinoctial dials are uſually diſtinguiſhed into *upper*, which look towards the zenith; and *lower*, which reſpect the nadir.

Now, as the ſun only illumines the upper ſurface of an equinoctial plane, while he is in our hemiſphere, or on the northern ſide of the equator, an *upper equinoctial dial* will only ſhew the hour, during the ſpring and ſummer ſeaſon.

And again, as the ſun only illumines the lower ſurface of an equinoctial plane, while he is in the ſouthern hemiſphere, or on the other ſide of the equator; a *lower equinoctial dial* will only ſhew the hour in autumn and winter.

To have an *equinoctial dial*, therefore, that ſhall ſerve all the year round, the *upper* and *lower* muſt be joined together; that is, it muſt be drawn on each ſide of the plane.

And, ſince the ſun ſhines on one ſide or on the other of an equinoctial plane the whole day, ſuch a *dial* will ſhew all the hours of an artificial day.

To deſcribe an equinoctial DIAL *geometrically.*—The *equinoctial* is the firſt, eaſieſt, and moſt natural, of all *dials*: but the neceſſity of drawing it double, prevents it being much in uſe. However, as its ſtructure ſhews the reaſon of the other kinds, and as it even furniſhes a good mechanical method of drawing all the other kinds of *dials*, it ſhall be here laid down.

Firſt, then, to deſcribe an upper *equinoctial dial*: from a center C (*Tab. Dialling, fig.* 4.) deſcribe a circle ABDE, and by two diameters AD, and BE, interſecting each other at right angles, divide it into quadrants AB, BD, DE, and EA. Subdivide each quadrant into ſix equal parts, by the right lines C I, C II, C III, &c. which lines will be hour lines. Through the center C drive a ſtyle, or pin, perpendicular to the plane ABDE.

The *dial* thus deſcribed being raiſed ſo as to be in the plane of the equator, the line C XII, in the plane of the meridian, and the point A looking towards the ſouth, the ſhadow of the ſtyle will ſhew the hours both of the forenoon and afternoon.

For horary circles include arches of the equator of fifteen degrees each; conſequently, the plane ABDE being ſuppoſed in the plane of the equator, the horary circles will likewiſe include arches of 15 degrees of the circle ABDE. Wherefore, ſince the angles XII C XI, XI C X, X C IX, &c. are each here ſuppoſed 15 degrees, the lines C XII, C XI, C X, C IX, &c. are interſections of horary circles with the plane of the equinoctial.

Again, ſince the ſtyle paſſing through the center C repreſents the axis of the world; its diſtance from the center of the earth being inconſiderable, and it being the common diameter of the horary circles, its ſhadow will cover the hour-line C XII, when the ſun is in the meridian, or circle of 12 o'clock; C XI, when in the circle of 11 o'clock; C X, when in the circle of 10 o'clock, &c.

Secondly, to deſcribe a lower *equinoctial dial*: the method is the ſame as that for the *upper dial*, already deſcribed; except that no hour-lines are to be drawn beyond that of 6 o'clock.

Thirdly, to deſcribe an univerſal *equinoctial dial*: join two metal, or ivory planes, ABCD, and CDEF (*fig.* 5.) ſo as to be moveable at the joint. On the upper ſurface of the plane ABCD, deſcribe an *upper equinoctial dial*, and upon the lower a *lower*, as already directed; and through the center I drive a ſtyle. In the plane DEFC cut a box, and put a magnetical needle G therein; fit on the ſame plane a braſs quadrant nicely graduated, and paſſing through a hole cut in the plane ABCD. Now, ſince this may be ſo placed, by means of the needle, as that the line I 12 ſhall be in the plane of the meridian; and, by means of the quadrant, may be ſo raiſed, as that the angle BCF ſhall be equal to the elevation, or the equator; it well ſerve as a *dial* in any part of the world. When the ſun is in the equator, theſe *dials* can be of no uſe.

The beſt univerſal *dial* is that of Mr. Pardie, of which the following deſcription is given by Mr. Ferguſon. This

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dial consists of three principal parts: the first is called the horizontal plane A (*fig.* 6.) because in practice it must be parallel to the horizon: in this plane is fixed an upright pin, which enters into the edge of the second part BD, called the meridional plane, which is made of two pieces, the lowest whereof, B, is called the quadrant, because it contains a quarter of a circle divided into 90 degrees; in which part, near B, the pin enters. The other piece is a semicircle D, adjusted to the quadrant, and turning in it by a groove, for raising or depressing the diameter EF of the semicircle, which diameter is called the axis of the instrument. The third piece is a circle G, divided on both sides into twenty-four equal parts, which are the hours. This circle is put on the meridional plane, so that the axis EF may be perpendicular to the circle; and the point C be the common center of the circle, semicircle, and quadrant. The strait edge of the semicircle is chamfered on both sides to a sharp edge, which passes through the center of the circle. On one side of the chamfered part, the first six months of the year are laid down, according to the sun's declination for their respective days, and on the other side the last six months. And against the days on which the sun enters the signs, there are strait lines drawn upon the semicircle, with the characters of the signs marked upon them. There is a black line drawn along the middle of the upright edge of the quadrant, over which hangs a thread H, with its plummet I, for levelling the instrument. From the 23d of September to the 20th of March, the upper surface of the circle must touch both the center C of the semicircle, and the line of ♈ and ♎; and from the 20th of March to the 23d of September, the lower surface of the circle must touch that center and line. In order to find the time of the day by this *dial*, it must be set on a level place in sunshine, and adjusted by the levelling screws *k* and *l*, till the plumb-line hangs over the black line upon the edge of the quadrant, and parallel to the said edge; then move the semicircle in the quadrant, till the line of ♈ and ♎ (where the circle touches) comes to the latitude of the place in the quadrant; and turn the whole meridional plane BD, with its circle G, upon the horizontal plane A, till the edge of the shadow of the circle falls precisely on the day of the month in the semicircle; and then the meridional plane will be due north and south, the axis EF will be parallel to the axis of the world, and will cast a shadow upon the true time of the day, among the hours on the circle, which is now in the plane of the equinoctial. The upper surface of the circle will serve from the 20th of March to the 23d of September; and the lower for the rest of the year.

The months and signs are laid down on the semicircle in the following method. Draw the right line ACB (*fig.* 7.) equal to the diameter of the semicircle ADB, and cross it in the middle at right angles with the line ECD, equal in length to ADB; then EC will be the radius of the circle FCG, which is the same as that of the semicircle. Upon E, as a center, describe the circle FCG, on which set off the arcs C *h* and C *i*, each equal to $23\frac{1}{2}$ degrees, and graduate them accordingly, for the sun's declination. Then, laying the edge of a ruler over the center E, and also over the sun's declination for every fifth day of each month, as found in tables of declination, mark the points on the diameter AB of the semicircle from *a* to *g*, which are cut by the ruler; and here place the days of the months, answering to the sun's declination. Set one foot of the compasses in C, and extending the other to *a* or *g*, describe the semicircle *a b c d e f g*; divide this into six equal parts, and through the points of division draw right lines parallel to CD, for the beginning of the signs (of which one half are on one side of the semicircle, and the other half on the other) and set the characters of the signs to their proper lines. Ferguson's Lectures, &c. Lect. 10.

DIAL, *horizontal*, is that described on an horizontal plane, or a plane parallel to the horizon.

Since the sun may illumine an horizontal plane at all times of the year, while he is above the horizon; an *horizontal dial* may shew all the hours of the artificial day throughout the year: so that a more perfect *dial* than this kind cannot be required.

To describe an horizontal DIAL *geometrically.* Draw a meridian line AB (*fig.* 8.) on the given immoveable plane; or assume it, at pleasure, on a moveable one. See MERIDIAN *line.*

From a point taken at pleasure, as C, erect a perpendicular CD, and make the angle CAD equal to the elevation of the pole. In D make another angle CDE, equal likewise to the elevation of the pole, and draw the right line DE meeting AB in E. Then make EB equal to ED, and from the center B, with the radius EB, describe a quadrant EBF, which divide into six equal parts. Through E draw the right line GH, cutting AB at right angles. From the center B, through the several subdivisions of the quadrant EF, draw right lines B *a*, B *b*, B *c*, B *d*, BH, meeting the line GH, in the points *a*, *b*, *c*, *d*, H. From E upon the right line EG set off the intervals E *a*, E *b*, &c. viz. E *a* from E to *e*; E *b* from E to *f*; E *c* from E to *g*; &c. From the center A describe a little circle, and applying a little ruler to A, and the several points of division *a*, *b*, *c*, *d*, H; and *e*, *f*, *g*, *h*, G, draw the lines A XI, A X, A IX, A VIII, A VII, and A I, A II, A III, A IV, A V. Through A draw a right line VI, VI, perpendicular to AB. Continue the right line A VII, beyond the little circle to VII, A VIII to VIII, A V to V, and A IV to IV. Round the whole scheme draw a square, circle, or oval figure. And lastly, in A fix an index, making an angle DAC, with the meridian AB, equal to the elevation of the pole; or in C erect a perpendicular style equal to CD; or at AE fix a triangular plate, ADE, perpendicular to the plane of the *dial.* In this case, the lines A XI, A X, A IX, &c. are the hour-lines of the forenoon; and A I, A II, A III, &c. those of the afternoon; and the shadows of any of the gnomons, or styles, above mentioned, at the several hours, will fall on the respective hour-lines.

To describe an horizontal DIAL *trigonometrically.* In large *dials*, where the utmost accuracy is required, geometrical lines are best set aside; and, in lieu thereof, the lines of the *dial* are to be determined by trigonometrical calculation. M. Clapies, in the Memoires de l'Academie Royale des Sciences, anno 1707, has done the world good service herein; having rendered the calculation of the hour-lines, which before had been operose enough, exceedingly easy and expeditious: his canons, or analogies, we shall lay down under the respective kinds of *dials.* And, first, for an *horizontal dial*; the elevation of the pole of the place being given, to find the angles, which the hour-lines make with the meridian in the center of the *dial.* The analogy, or canon, is thus: as the whole line is to the line of the elevation of the pole of the place, so is the tangent of the sun's distance from the meridian, for the hour required, to the tangent of the angle required: that is, as the side AC (*fig.* 9.) is to DC, so is the tangent of FDC to the tangent FC, of the angle FAC. See TANGENT, &c.

To describe an horizontal DIAL *by the terrestrial globe.* Let a common globe of twelve inches diameter, upon which are usually drawn twenty-four meridian semicircles, be elevated to the latitude of any given place, and turned about until any one of these meridians cuts the horizon in the north point, where the hour of XII is supposed to be marked; the rest of the meridians will cut the horizon at the respective distances of all the other hours from XII. Let these points of distance be marked on the horizon, the globe be removed, and a flat board or plate, even with the surface of the horizon, put into its place: then strait lines drawn from the center of the board to these points will be the hour lines of an *horizontal dial* for that latitude; and the gnomon will be in the situation of the axis of the globe, or make an angle with the plane of the *dial* equal to the latitude of the place. If the globe be elevated to the complement of the latitude of the given place, and you proceed as above, you will have a *direct south dial:* observing, that the gnomon makes an angle with the *dial* plane equal to the co-latitude of the place, and that the hours on the *dial* must be set the contrary way to that on the horizontal. If the globe has more than twenty-four meridian semicircles, the process is somewhat different. Elevate the pole to the latitude 51° $\frac{1}{2}$ N. e. gr. of London, and bring the first meridian, or that of London on the English globe, to the north: set the hour index to the uppermost XII on the horary circle; then turn the globe westward, till the index points successively to I, II, III, IV, V, and VI in the afternoon; or until 15, 30, 45, 60, 75, and 90 degrees of the equator pass under the brazen meridian; and the first meridian will mark the following degrees on the horizon from the north towards the east, viz. $11\frac{2}{3}$, $24\frac{1}{4}$, $38\frac{1}{12}\frac{1}{4}$, $53\frac{1}{2}$, $71\frac{1}{15}$, and 90; which are the respective distances of the above hours from XII on the plane of the horizon.

In order to transfer these and the rest of the hours to an horizontal plane, draw the parallel right lines *a c* and *b d* (*fig.* 10.) upon that plane, at a distance equal to the thickness of the gnomon; and the space between them will be the meridian or twelve o'clock line on the *dial.* At right angles to this meridian, draw *g h*, and on *a* and *b* as centers, with the same radius of any length, describe the quadrants *g e* and *f h*, and graduate them. The center of the plane C, and the centers of these quadrants *a* and *b* are at a little distance from each other, in order to enlarge the hour distances about noon. Lay a ruler on the center *b*, and on the several distances already found, viz. $11\frac{2}{3}$, $24\frac{1}{4}$, &c. in the quadrant *f h*, and draw the respective afternoon hour lines to I, II, &c.

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&c. As the ſun riſes about four in the morning, on the longeſt days in London, continue the hour lines of IIII and V in the afternoon through the center *b* to the oppoſite ſide of the *dial*. Then lay the ruler on the center *a* through the ſame diſtances, reſpectively, in the quadrant *eg*, draw the forenoon hour lines of XI, X, &c. and as the ſun does not ſet before eight in the evening on the longeſt days, continue the hour lines of VII and VIII through the center *a* to the other ſide. Through 51½ degrees of either quadrant from its center draw the right line *ag*, which will be the hypothenuſe or axis of the gnomon *agi*; and from *g* let fall a perpendicular to the meridian *ai*; and a plate ſimilar to the triangle *agi* ſet up between *ac* and *bd* will have its hypothenuſe *ag* parallel to the axis of the world, when the *dial* is truly ſet, and will caſt a ſhadow on the hour of the day. A line of chords will ſuperſede the neceſſity of graduating the quadrants. An *erect ſouth dial* (*Tab.* II. *fig.* 15.) is conſtructed in the ſame manner, obſerving the rule already given with reſpect to the elevation of the pole, and of the gnomon, and the poſition of the hours. Ferguſon's Lect. Lect. 10.

To deſcribe an horizontal DIAL *mechanically, by the* DIALLING *ſcales.* Draw a double meridian line *ab*, *cd* (*fig.* 11.) on the horizontal plane, and croſs it at right angles by the ſix o'clock line *fe*; take the latitude of the place with the compaſſes, in the ſcale of latitudes, and ſet that extent from *c* to *e*, and from *a* to *f*, on the ſix o'clock line; then, taking the whole ſix hours between the points of the compaſſes in the ſcale of hours; with that extent ſet one foot in the point *e*, and let the other foot fall where it will upon the meridian line *cd*, and at *d*. Do the ſame from *f* to *b*, and draw the right lines *ed* and *fb*, each of which will be equal in length to the whole ſcale of hours. When this is done, ſet one foot of the compaſſes in the beginning of the ſcale at XII, and extending the other to each hour on the ſcale, lay off theſe extents from *d* to *e* for the afternoon hours, and from *b* to *f* for thoſe of the forenoon; and thus the lines *de* and *bf* will be divided in the ſame manner as the hour ſcale is divided, at 1, 2, 3, 4, 5, and 6; on which the quarters may alſo be laid down, if required. Then, laying a ruler on the point *c*, draw the firſt five hours in the afternoon from that point through the dots at the numeral figures 1, 2, 3, 4, 5, on the line *de*, and continue the lines of IIII and V through the center *c* to the other ſide of the *dial* for the like hours of the morning: then lay the ruler on the point *a*, and draw the laſt five hours in the forenoon through the dots 5, 4, 3, 2, 1, on the line *fb*; and continue the hour lines of VII and VIII through the center *a* to the other ſide, for the like hours of the evening; ſet the hours to the reſpective lines, and make the gnomon in the manner already directed for the *horizontal dial.*

An *erect ſouth dial* may be made, by taking the co-latitude of the place from the ſcale of latitudes, and proceeding in all reſpects for the hour lines, as in the *horizontal dial*; only reverſing the hours, as in *fig.* 15. and making the angle of the ſtile's height equal to the co-latitude.

An *horizontal dial* may be eaſily deſcribed with only a line of chords, or a graduated quadrant of a circle. With any opening of the compaſſes, as ZL (*fig.* 12.) deſcribe the two ſemicircles L F *k* and L Q *k*, on the centers Z and *z*, where the ſix o'clock hour line croſſes the double meridian line, and divide each ſemicircle into twelve equal parts, beginning at L; then connect the diviſions, which are equidiſtant from L, by the parallel lines KM, IN, HO, GP, and FQ. Draw VZ for the hypothenuſe of the ſtyle, making the angle VZE equal to the latitude of the place; and continue the line VZ to R. Draw the line R *r* parallel to the ſix o'clock line, and ſet off the diſtance *a*K from Z to Y, the diſtance *b*I from Z to X, *c*H from Z to W, *d*G from *z* to T, and *e*F from Z to S. Then draw the lines S *s*, T *t*, W *w*, X *x*, and Y *y*, each parallel to R *r*. Set off the diſtance *y*Y from *a* to 11, and from *f* to 1; the diſtance *x*X from *b* to 10, and from *g* to 2; *w*W from *c* to 9, and from *b* to 3; *t*T from *d* to 8, and from *i* to 4; *s*S from *e* to 7, and from *n* to 5. Then laying a ruler to the center *z*, draw the forenoon hour lines through the points 11, 10, 9, 8, 7; and laying it to the center *z*, draw the afternoon lines through the points 1, 2, 3, 4, 5; continuing the forenoon lines of VII and VIII through Z, to the oppoſite ſide of the *dial*, for the like afternoon hours; and the afternoon lines IIII and V through *z* for the like morning hours. Set the hours to the lines, and erect the ſtile, and the *dial* is complete.

A *ſouth dial* may be conſtructed in the ſame manner, by drawing the line VZ to make an angle with the meridian ZL equal to the co-latitude of the place, &c. reverſing the hours, as in *fig.* 15. Ferguſon, ubi ſupra.

DIAL, *vertical*, is that drawn on the plane of a vertical circle. See VERTICAL.

Of theſe there are ſeveral varieties, according to the vertical pitched upon. The verticals chiefly uſed, are the prime vertical, and the meridian; from which reſpectively ariſe, *ſouth*, *north*, *eaſt*, and *weſt dials.*

Dials which reſpect the cardinal points of the horizon, are particularly called *direct dials.* See DIRECT.

If any other vertical be choſen, the *dial* is ſaid to decline.

Further, if the circle, whoſe plane is uſed, be perpendicular to the horizon, as is ſuppoſed to be the caſe in all thoſe now mentioned, the *dials* are particularly denominated *erect.* E. gr. *erect ſouth*, *erect north*, &c.

Otherwiſe, the plane being oblique to the horizon, they are ſaid either to *incline*, or *recline.*

DIAL, *ſouth*, or, more particularly, an *erect direct ſouth* DIAL, is that deſcribed on the ſurface of the prime vertical circle looking towards the ſouth.

Since the ſun then illumines the plane of the prime vertical looking to the ſouth, when, in its progreſs, he paſſes from the prime vertical to the meridian, or returns back from this to that; in which he is employed ſix hours before, and ſix after noon; a *ſouth dial* ſhews the hours from ſix in the morning to ſix at night.

DIAL, *to draw a vertical ſouth.* On the plane of the prime vertical looking ſouthwards, draw a meridian line AB (*fig.* 13.) and taking the interval AC, at pleaſure, for the magnitude of the future *dial*, in C erect a perpendicular of an indefinite length CD, and making an angle CAD equal to the elevation of the equator; draw a right line AD meeting the perpendicular CD in D. Then in the point D make the angle CDE likewiſe equal to the elevation of the equator, and draw the right line DE cutting the meridian in E. Through E draw the right line GH, cutting the meridian AB at right angles. Take EB equal to ED, and with this radius deſcribe a quadrant EF. The reſt is performed as in an *horizontal dial*, except that the hours of the afternoon are to be written on the right hand, and thoſe of the forenoon on the left; as may be conceived from the figure. Laſtly, in the point A fix an oblique ſtyle, in an angle equal to the elevation of the equator; or in C erect a perpendicular ſtyle, equal to CD; or, laſtly, a triangular plate ADE, upon AE, ſo as to be perpendicular to the plane of the *dial.*

Then will the ſhadow of any of theſe indexes touch the ſeveral hour lines at their reſpective hours.

DIAL, *north*, or *erect direct north* DIAL, is that deſcribed on the ſurface of the prime vertical looking northward.

Since the ſun only illumines this ſurface while he advances from the eaſt to the prime vertical, and proceeds from the ſame vertical to the weſt; and ſince he is in the prime vertical at ſix o'clock in the morning, and at ſix in the evening; a *north dial* ſhews the hours before ſix in the morning, and thoſe after ſix in the evening. And hence, as in autumn and winter-time, the ſun does not riſe before ſix, and ſets before ſix in the evening, a *north dial* is of no uſe all that time; but this being joined with a *ſouth dial* ſupplies the defects thereof.

DIAL, *to deſcribe a vertical north.* Draw a meridian line EB, (*Tab.* II. *fig.* 14.) and from A deſcribe a little circle at pleaſure. At A make the angle DAC equal to the elevation of the equator, and from the point C, taken at pleaſure, erect a perpendicular CD, meeting AD in D. Make another angle, CDE, likewiſe equal to the elevation of the equator, and draw likewiſe a line DE, meeting AE in E; then take IB equal to ED, and through I draw GH, cutting AB at right angles; and from the center B, with the radius IB, deſcribe a quadrant, which divide into ſix equal parts: through the two extreme diviſions draw lines from the center B, viz. B *h*, and BG, meeting GH in *h* and G, and make I *d* equal to I *h*, and IH equal to IG; then applying a ruler to A and *h*, and G, and again to A and *d*, and H, draw the right lines A V, A IV, A VII, and A VIII. Laſtly, in A fix an oblique index AD, making an angle DAE, with a meridian line in the plane of the meridian, equal to the elevation of the equator; or a perpendicular index in C, equal to CD; or, inſtead of an index, a triangular plate EDA, on the meridian line EA, perpendicu- to the plane of the *dial.*

Then will A IV, A V, A VI, be the hours of the forenoon; and A VI, A VII, and A VIII, thoſe of the afternoon; and, accordingly, will be pointed out by the ſhadow of the ſeveral indexes. Or thus: in a *ſouth dial* (*fig.* 13.) if the hour lines IV and V, as alſo VII and VIII, be continued beyond the line VI A VI; and the triangle ADE turned about its pole A, till AE fall directly on A XII produced; it is evident, a *north dial* is hereby had, only obſerving what has been ſaid about writing the hours.

To draw a vertical north or *ſouth* DIAL *trigonometrically.* Theſe only differ from the *horizontal dial*, in that the angle CAB is equal to the complement of the elevation of the pole of the place; ſo that the ſame analogy ſerves as for the horizontal one; only making the ſecond term the

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complement of the elevation of the pole of the place. For the method of describing this *dial* by a globe, and by DIALLING *scales*, see *Horizontal* DIAL.

DIAL, *east*, or *erect direct east* DIAL, is that drawn on the plane of the meridian, looking to the east.

Since the sun only illumines the plane of the meridian looking eastward, before noon, an *east dial* can only shew the hours till twelve o'clock.

DIAL, *to describe an east*. On the eastern side of the plane of the meridian draw a right line AB (*Tab.* II. *fig.* 16.) parallel to the horizon, and to this join AK, making with it an angle KAB, equal to the elevation of the equator: then, with the radius DE, describe a circle, and through the center D draw EC perpendicular to AK, by which means the circle will be divided into four quadrants. Each of these quadrants subdivide into six equal parts. And from the center D through the several divisions draw the right lines D IV, D V, D VI, D VII, D VIII, D IX, D X, D XI. Lastly, in D erect a style equal to the radius DE, perpendicular to the plane; or, on two little pieces perpendicularly fixed in EC, and equal to the same radius DE, fit an iron rod, parallel to EC.

Thus will each index at the several hours project a shadow to the respective hour lines IV IV, V V, VI VI, &c.

DIAL, *west*, or *erect direct west* DIAL, is that described on the western side of the meridian.

As the sun only illumines that side of the plane of the meridian looking to the west, after noon, a *west dial* can only shew the hours from noon to night.

This, therefore, joined with an *east dial*, shews all hours of the day.

DIAL, *to draw a west*. The construction is perfectly the same as that of an *east dial*, only that its situation is inverted, and the hours are written accordingly.

DIAL, *polar*, is that described on a plane passing through the poles of the world, and the east and west points of the horizon. It is of two kinds; the first looking up towards the zenith, and called *upper*; the latter down to the nadir, called *lower*.

The *polar dial*, therefore, is inclined to the horizon in an angle equal to the elevation of the pole.

Since the polar plane POQS (*fig.* 17.) passes through the east and west points O and S, a quadrant of the equator is intercepted between it and the meridian; consequently the upper surface is illumined by the sun from six in the morning to six at night; and the lower, from the sun's rise to six in the morning, and from six in the evening to sun-set. A *lower polar dial*, therefore, shews the hour of the morning from sun-rise to six o'clock, and that of the evening, from six to sun-set; and an *upper*, the hours from six in the morning to six in the evening.

DIAL, *to draw an upper polar*. Draw a right line AB (*fig.* 18.) parallel to the horizon; and if the plane be immoveable, find the meridian line CE. Divide CE into two equal parts, and through C draw a right line FG parallel to AB. Then, from the center D, with the interval DE, describe a quadrant, which divide into six equal parts; and from the same center D, through the several points of division, draw right lines, D I, D II, D III, D IV, D V; and the intervals E I, E II, E III, E IV, E V, set off the contrary way, viz. E XI, X, IX, VIII, and VII. From the points V, IV, III, II, I, &c. raise perpendiculars meeting the line FG in the correspondent points. Lastly, in D erect a perpendicular style equal to DE, or on two equal pieces, E and C, fix a cross iron rod.

Then will XII XII, I I, II II, III III, &c. be hour-lines, to be pointed out at the proper times by the shadow of the indices.

DIAL, *an upper polar*, only differs in situation, and the manner of writing the hours, from *east* and *west dials*, joined together in the line of six o'clock.

DIAL, *a lower polar*, is had by putting out the hours of the forenoon, IX, X, and XI, and those of the afternoon I, II, and III, with the noon-hour XII itself; and only leaving the hours VII and VIII of the morning, and IV and V in the evening.

To make three DIALS *on three different planes, so that they may all shew the time of the day by one gnomon*. On the flat board ABC (*fig.* 19.) describe an horizontal *dial*, with its gnomon FGH, the edge of the shadow of which shews the time of the day. To this horizontal board join the upright board EDC, touching the edge GH of the gnomon: then making the top of the gnomon at G the center of the vertical south *dial*, describe it on the board EDC. Besides, on a circular plate IK describe an equinoctial *dial*, and by a slit *c d* in the XII o'clock line, from the edge to the center, put it on the gnomon FG as far as the slit will admit. The same gnomon will shew the same hour on each of these *dials*.

To draw all the primary DIALS *on the same block, or post*.

1. Let the plane ABCD (*fig.* 20.) in the proper position of the block, be supposed horizontal; and thereon describe an *horizontal dial*. See *Horizontal* DIAL.

2. Draw the right lines EM and FL parallel to DC, which, accordingly, in the proper position of the block, will be parallel to the horizon: then let the plane BNMC make an angle with EM, equal to the elevation of the pole CME; and thereon describe an *upper polar dial*.

3. Let the opposite plane, ADE, make with EM an angle, DEM, equal to the elevation of the equator; and on this draw an *upper equinoctial dial*.

4. Let the plane, KLHI, make with FL an angle HLF, equal to the elevation of the equator; and on this inscribe a *lower equinoctial dial*.

5. Let the opposite plane, FG, make with FL an angle GFL, equal to the elevation of the pole; and here draw a *lower polar dial*.

6. Let the plane MNKL, and the opposite one, EF, be perpendicular to FL; and on that draw a *south dial*, and on this a *north dial*.

7. On the plane EMLF describe a *west dial*; and on the opposite plane an *east dial*.

If, then, the block be so placed, as that the plane, MNKL, looks to the south, and the plane of the meridian bisect it in the line of 12 o'clock in the *horizontal dial* ABCD; and *south dial* MNKL, all the hours of the day will be indicated by several planes at once.

DIALS, *secondary*, are all those drawn on the planes of other circles, beside the horizon, prime vertical, equinoctial, and polar circles: or those which either decline, incline, recline, or deincline.

DIALS, *declining*, are erect or vertical *dials*, which decline from any of the cardinal points; or they are such as cut either the plane of the prime vertical, or of the horizon, at oblique angles.

The use of *declining dials* is very frequent; as the walls of houses, whereon *dials* are usually drawn, commonly deviate from the cardinal points.

Of *declining dials* there are several kinds, which are denominated from the cardinal points, which they seem most to respect, but from which they have a real declination; *decliners from the south*, and *from the north*, and even *from the zenith*.

To draw a vertical declining DIAL *trigonometrically*.

1. The declination of the plane, and the elevation of the pole of the place, being given; to find the angle formed in the center of the *dial*, by the meridian and substyle.

Canon. As the whole sine is to the tangent of the complement of the height of the pole of the place GF (*fig.* 21.) so is the sine of the angle of the declination of the plane GFD, to the tangent GD, of the angle required GAD.

2. The declination of the plane being given, and the elevation of the pole of the place, to find the angle formed in the center of a *vertical declining dial*, by the substyle and axis.

Canon. As the whole sine is to the sine of the complement of the elevation of the pole GF; so is the sine of the complement of the declination of the plane DGF, to the side DF, the sine of the angle DAB required.

3. The declination of the plane, and the elevation of the pole, given; to find the difference of longitudes, that is, the arch of the equator, comprehended between the meridian of the place, and the meridian of the plane.

Canon. As the whole sine is to the sine of the height of the pole of the place, so is the tangent of the complement of the declination of the plane, to the tangent of the complement of the difference of longitudes.

4. The angle of the difference of longitudes, and that of the axis, with the substyle, being given; to find the angles formed in the center of a *vertical declining dial*, between the substyle and hour-lines.

This problem admits of three cases; for the hour-lines, whose angles are sought, may be either, 1. Between the meridian and substyle; or, 2. Beyond the substyle; or, 3. On that side the meridian where the substyle is not. In the two first cases, the difference is to be taken between the sun's distance from the meridian that hour, and the angle of the difference of longitudes found by the last problem; and in the third case, the sum of those two angles is to be taken, and the following canon used.

Canon. As the whole sine is to the sine of the angle between the axis and substyle, so is the tangent of the difference of the sun's distance from the meridian, and the difference of longitudes, or of the sum of those two angles, to the tangent of the angle required.

5. The angle formed by the substyle, with the hour-lines, and that of the substyle, with the meridian, given; to find the angles formed between the meridian and hour-lines in the center of *vertical declining dials*.

1. The angles of the hour-lines between the meridian and substyle are found by subtracting the angle formed by the substyle, with the hour-line, from the angle formed by the substyle, with the meridian.

2. The angles beyond the substyle, and on the side opposite

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poſite to that of the meridian, are found by adding thoſe two angles.

3. Thoſe on the other ſide the meridian are found by taking their difference.

To deſcribe a vertical DIAL, *declining from the ſouth to the eaſt* or *weſt, geometrically.* Find the declination of the plane, as already taught, under the article DECLINATOR. Then draw upon a paper an *horizontal dial*, ſuppoſing the line of contingency of the horizontal with the equinoctial plane to be GH (*fig.* 22.) through the point E, wherein the meridian line AE cuts the ſame, draw a right line IK, making with GH an angle HEK, equal to the declination of the given plane. Thus, as GH repreſents the interſection of the prime vertical with the horizon, IK will be the interſection of the inclining plane, and the horizon; whence we alſo conceive, that the part IE muſt be raiſed above GE, in caſe the given plane decline to the weſt; or it muſt be depreſſed below the ſame GE, in caſe it decline to the eaſt. Draw a right line parallel to the horizon on the given plane, or wall, to anſwer to IK; and, aſſuming a point therein anſwering to E, ſet off from the right line IK on the paper the ſeveral horary diſtances E 1, E 2, E 3, &c. Then from the point E erect a perpendicular EC, equal to the diſtance of the center of the *horizontal dial*, from its line of contingency. Draw lines thence to the ſeveral points of the hour-lines E 1, E 2, E 3, &c. let fall a perpendicular AD, from the center of the *horizontal dial* A, to the line of contingency IK; and transfer the diſtance ED, from the point E upon the wall: then will CD be the ſubſtylar line.

Wherefore joining AD and DC at right angles, the hypothenuſe AC will be an oblique index, to be faſtened on the wall in the point C, according to the angle DCA.

To conſtruct a vertical DIAL, *declining from the ſouth towards the eaſt or weſt, by the globe.* Elevate the pole to the latitude of the place, and ſcrew the quadrant of altitude to the zenith. If the *dial* declines towards the eaſt, count the degrees of declination in the horizon from the eaſt point towards the north, and bring the lower end of the quadrant to that degree of declination, at which the reckoning ends. Then bring any meridian, (e. gr. the firſt meridian) directly under the graduated edge of the upper part of the braſen meridian, and ſet the hour index to XII at noon. Turn the globe eaſtward on its axis, the quadrant of altitude being kept to the degree of declination in the horizon, and obſerve the degrees cut by the firſt meridian in the quadrant of altitude, counted from the zenith, as the hour index comes to XI, X, IX, &c. in the forenoon; and the degrees, then cut in the quadrant by the firſt meridian, are the reſpective diſtances of the forenoon hours from XII on the plane of the *dial*. For the afternoon hours, turn the quadrant of altitude round the zenith till it comes to the degree in the horizon oppoſite to that where it was placed before, or as far from the weſt point towards the ſouth, as it was at firſt from the eaſt towards the north; and turn the globe weſtward on its axis, till the firſt meridian comes to the brazen meridian, and the hour index to XII; then turning the globe weſtward to the afternoon hours I, II, III, &c. the firſt meridian will cut the quadrant of altitude in the reſpective number of degrees from the zenith, that each of theſe hours is from XII on the *dial*; and the limit of this *dial* will be determined by the hour index, when the firſt meridian goes off the quadrant at the horizon, both in the forenoon and afternoon. Lay down theſe hour diſtances on the *dial* plane, either by dividing a ſemicircle into two quadrants, beginning at the hour-line of XII, or by the line of chords, as directed under *horizontal* DIAL. As the SUBSTYLE makes an angle with the meridian line in this kind of *dials*, falling among the forenoon hour-lines in an eaſt decliner, and among thoſe of the afternoon in a *dial* declining towards the weſt, its diſtance may be found in the former, by counting the degrees of the declination of the *dial* in the horizon from the eaſt point towards the north, and bringing the lower end of the quadrant of altitude to that degree of declination where the reckoning ends; then turn the globe till the firſt meridian cuts the horizon in the like number of degrees, counted from the ſouth point toward the eaſt; and the quadrant and firſt meridian will croſs one another at right angles, and the number of degrees of the quadrant, intercepted between the firſt meridian and the zenith, is equal to the diſtance of the ſubſtyle line from the 12 o'clock line; and the number of degrees of the firſt meridian, which are intercepted between the quadrant and the north pole, is equal to the elevation of the ſtyle above the plane of the *dial*. If the *dial* declines weſtward from the ſouth, count that declination from the eaſt point of the horizon towards the ſouth, and bring the quadrant of altitude to the degree in the horizon at which the reckoning ends; both for finding the forenoon hours, and diſtance of the ſubſtyle from the meridian; and for the afternoon hours bring the quadrant to the oppoſite degree in the horizon, as far from the weſt towards the north; and then proceed as above. A north *dial* declining eaſt or weſt by the ſame number of degrees may be eaſily had from the former, by only extending the hour-lines, ſtyle, and ſubſtyle, quite through the center; for thus the ſouth-eaſt decliner will produce the north-weſt decliner, and the ſouth-weſt decliner the north-eaſt decliner. Ferguſon, lib. cit.

To draw a vertical DIAL, *declining from the north towards the eaſt and weſt.* Take the declination of the plane, as already taught: then, as *north dials* are only *ſouth dials* inverted, draw a *vertical dial* declining from the ſouth, and invert it in ſuch a manner, as that the center C looks to the horizon, and the point E to the zenith; and the hours on the right hand ſet off towards the left, and contrarywiſe, omitting all hour-lines, which in ſuch a plane cannot be ſhewn.

For the practice the beſt way is, after drawing a ſouth decliner upon paper, to prick the ſeveral points thereof through with a pin; then applying the face of the paper to the wall, the back-ſide thereof will ſhew you all the points neceſſary for the *north declining dial.*

DIALS, *inclined*, are thoſe drawn on planes not erect, but inclining, or leaning forward towards the ſouth, or ſouthern ſide of the horizon, in an angle, either greater or leſs than the equinoctial plane.

Such an inclined plane may be conceived by ſuppoſing one part of the plane of the equator lifted up towards the zenith, and the other depreſſed toward the nadir; and thus to revolve upon a line drawn from the eaſt to the weſt points of the horizon.

DIAL, *to draw an inclined.* 1. The inclination of the plane, as DC (*fig.* 23.) being found by a declinator, as taught under DECLINATOR; if it fall between the equinoctial plane CE, and the vertical one CB, in ſuch manner, as that the angle of inclination DCA is greater than the elevation of the equator ECA; on the upper ſide draw a *north dial*, and on the lower a *ſouth dial*, to an elevation of the equator, which is equal to the aggregate of the elevation of the equator of the given place, and the complement of the inclination to a quadrant.

2. If the inclined plane CF fall between the horizontal one CA, and the equinoctial CE, ſo as that the angle of inclination FCA, is leſs than the elevation of the equator ECA, deſcribe an *horizontal dial* to an elevation of the pole, equal to the aggregate of the elevation of the pole of the given place, and the inclination of the plane. *Dials*, thus inclined, are drawn after the ſame manner as *primary dials*; except, that the index in the former caſe muſt be fitted under the angle ADC, and in the latter, under the angle DFC; and that the diſtance of the center of the *dial* from the line of contingency, in the former caſe is DC, and in the latter FC.

DIALS, *reclining*, are thoſe drawn on planes not erect, but reclined, or leaning backwards from the zenith towards the north, in an angle greater or leſſer than the polar plane. A *reclined* plane may be conceived by ſuppoſing one part of the polar plane raiſed towards the zenith, and the other depreſſed towards the nadir; and thus revolving about a line drawn from eaſt to weſt. To find the reclination of a plane, ſee RECLINATION.

DIAL, *to draw a reclining.* 1. If the *reclined* plane HC fall between the vertical plane BC, and the polar plane IC, ſo as that the angle of reclination BCH is leſs than the diſtance of the pole from the zenith BCI, deſcribe two vertical *ſouth* and *north dials* to an elevation of the equator, equal to the difference between the elevation of the equator of the given place, and the angle of reclination.

2. If the reclined plane, as KC, fall between the polar plane IC, and the horizontal one CL, ſo as that the angle of reclination BCK is greater than the diſtance of the pole from the zenith ICB, deſcribe an *horizontal dial* thereon to an elevation of the pole, equal to the difference between the angle of reclination, and the elevation of the equator of the given place.

To draw inclining and reclining DIALS *trigonometrically.* The inclination or reclination of the plane, and the elevation of the pole, being known, to find the angles made in the center of an *inclining* or *reclining dial*, by the meridian and hour-lines.

Such *dial* is properly an *horizontal dial*, for a latitude equal to the particular elevation of the pole on the plane of the *dial*. Its angles, therefore, are found by the canon laid down for *horizontal dials*.

As to the elevation of the pole on the *dial* plane, it is thus found: the plane being inclined, either its inclination is greater than the elevation of the pole of the place, or leſs; or it is equal thereto. In the two firſt caſes, for upper *ſouth*, or lower *north dials*, the particular elevation of the pole on the plane is had by taking the difference between the elevation of the pole of the place, and the inclina-

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inclination of the plane; and in the latter caſe, the *dial* is a *polar dial*, wherein the hour-lines will be parallel, by reaſon that the plane being placed on the axis of the world, neither of the poles can be repreſented thereon.

For upper *north* and lower *ſouth dials*. 1. If the inclination be greater than the complement of the elevation, the complement of the inclination muſt be added to the complement of the elevation. 2. If it be leſs, the inclination muſt be added to the elevation. 3. If it be equal, the *dial* will be an *equinoctial dial*, wherein the angles at the center will be equal to the ſun's diſtance from the meridian.

DIALS, *deinclined*, are thoſe which both *decline* and *incline*, or *recline*. See DECLINERS.

The uſe of *inclined*, *reclined*, and eſpecially *deinclined dials*, is very rare; the geometrical and trigonometrical conſtruction of theſe laſt, therefore, as being ſomewhat intricate, we here chooſe to omit, and refer ſuch as may have a fancy for ſuch a *dial*, to an univerſal mechanical method of drawing all kinds of *dials* here ſubjoined.

An eaſy method to deſcribe a DIAL *on any kind of plane, by means of an equinoctial* DIAL, *or circle.* Suppoſe, e. gr. a *dial* required on an horizontal plane: if the plane be immoveable, as ABDC (*Tab.* II. *fig.* 24.) find a meridian line GF; or, if moveable, aſſume the meridian at pleaſure. Then, by means of the triangle EKF, whoſe baſe is applied on the meridian line, raiſe the equinoctial *dial* H, till the index GI becomes parallel to the axis of the world (which is had, if the angle KEF be equal to the elevation of the pole), and the 12 o'clock line on the *dial* hang over the meridian line of the plane, or the baſe of the triangle. If, then, in the night-time, a lighted candle be ſucceſſively applied to the axis GI, ſo as the ſhadow of the index, or ſtyle GI, fall upon one hour-line after another; the ſame ſhadow will mark out the ſeveral hour-lines on the plane ABCD.

Noting the points, therefore, on the ſhadow, draw lines through them to G; then an index being fixed in G, according to the angle IGF, its ſhadow will point out the ſeveral hours by the light of the ſun.

If a *dial* were required on a vertical plane, having raiſed the equinoctial circle, as above directed, puſh forward the index GI, till the tip thereof, I, touch the plane.

If the plane be *inclined* to the horizon, the elevation of the pole ſhould be found on the ſame; and the angle of the triangle KEF ſhould be made equal thereto.

See a new method of conſtructing ſun-*dials*, for any given latitude, without the aſſiſtance of dialling ſcales, or logarithmic calculations, by Mr. Ferguſon, in the Phil. Tranſ. vol. lvii. for 1767. art. 36. and in his Select Exerciſes, p. 95.

Note, Beſide the ſeveral ſpecies of *dials* above mentioned, which are ſaid to be *with centers*, there are others, called *dials without centers*. See CENTER *of a Dial*.

DIALS *without centers*, are thoſe whoſe hour-lines do really converge, but ſo ſlowly, that the center towards which they converge cannot be expreſſed on the given plane.

DIALS, *horizontal*, *without centers* are to be made for places, the elevation of whoſe pole is either very ſmall, or very great.

DIALS, *vertical*, *without centers*, are for places, the elevation of whoſe pole is very great.

DIALS, *for the furniture of*. See FURNITURE.

DIAL, *quadrantal*. See *Horodictical* QUADRANT.

DIAL, *reflecting*. See REFLECTING *Dial*.

DIAL, *cylindric*, is repreſented in *Tab.* III. *fig.* 27. This *dial* may be delineated on paper, and then paſted round a cylinder of wood, and it will ſhew the time of the day, the ſun's place in the ecliptic, and his altitude at any time of obſervation. Draw the right line *a* AB (*fig.* 28.) parallel to the top of the paper, and with any opening of the compaſſes on the center *a* deſcribe the quadrant AE, and graduate it. Draw the right line AC at right angles to *a* AB, and touching the quadrant AE at the point A. From the center *a* draw right lines through as many degrees of the quadrant as are equal to the ſun's altitude at noon, on the longeſt day of the year, at the place for which the *dial* is to ſerve; which altitude at London is nearly 62 degrees; continue theſe right lines till they meet the tangent line AC; and from the points of concourſe, draw ſtrait lines acroſs the paper, parallel to the firſt right line AB, and theſe will be the parallels of the ſun's altitude, in whole degrees, from ſun-riſe to ſun-ſet, on all the days of the year. Theſe parallels of altitude muſt be drawn out to the right line BD, which muſt be parallel to AC, and as far from it as is equal to the intended circumference of the cylinder on which the paper is to be paſted. Divide the ſpace between the right lines AC and BD, at top and bottom, into twelve equal parts, for the twelve ſigns of the ecliptic; and from one mark to the oppoſite one, draw right lines parallel to AC and BD; and place the characters of the twelve ſigns in the twelve ſpaces, at the bottom, beginning with ♑ Capricorn, and ending with ♓ Piſces. Theſe ſpaces ſhould likewiſe be divided by parallel lines into halves and quarters. At the top of the *dial* make a ſcale of the months and days of the year, ſo that the days may ſtand over the ſun's place, found in an Ephemeris, for each of them in the ſigns of the ecliptic. Compute the ſun's altitude for every hour, in the latitude of your place, or take it from a table, ſuch as that ſubjoined, when he is in the beginning, middle, and end of each ſign of the ecliptic; and in the upright parallel lines, at the beginning and middle of each ſign, make marks for theſe altitudes among the horizontal parallels, reckoning downward in the order of the numeral figures at the right hand, anſwering to the like diviſions of the quadrant at the left. Through theſe marks draw the curve hour-lines, and ſet the hours to them, as in the figure, reckoning the forenoon hours downward, and the afternoon hours upward. The ſun's altitude may alſo be taken and laid down for the half hours and quarters. Then cut off the paper at the left-hand, on which the quadrant was drawn, cloſe by the right line AC, and all the paper at the right-hand cloſe by the right line BD, and cut it alſo cloſe by the top and bottom horizontal lines, and it will be fit for paſſing round the cylinder. This cylinder (*fig.* 27.) is hollow, for holding the ſtyle DE, when it is not uſed. The ſtyle muſt ſtand out, perpendicular to the ſide of the cylinder, juſt over the right line AB (*fig.* 28.) where the parallels of altitude begin, and its length or diſtance of the point *e* from the cylinder muſt be equal to the radius *a* A of the quadrant AE (*fig.* 28.) When this *dial* is uſed, the horizontal foot BC is placed on a level table, or hung by the ring F, where the ſun ſhines, and the horizontal top AD, which is made moveable, is turned till the ſtyle ſtands juſt over the day of the month. Then the cylinder is turned round, till the ſhadow of the ſtyle falls upon it, parallel to the upright lines which divide the ſigns; or till the ſhadow is parallel to a ſuppoſed axis in the middle of the cylinder; and then the point, or loweſt end of the ſhadow, will fall upon the time of the day, as it is before or after noon, among the curve hour-lines, and will ſhew the ſun's altitude at that time, among the croſs parallels of altitude, encompaſſing round the cylinder; and it will alſo ſhew in what ſign of the ecliptic the ſun is at that time, and the degree may be nearly eſtimated by the eye. Ferguſon.

A TABLE ſhewing what altitude the Sun ſhall have at every hour, half, and quarter of the day, at his entrance into every one of the twelve Signs.

Calculated for the latitude of London, 51 deg. 32 min.

Hours and Quarters	♋ Cancer ♌		Leo ♌ ♊ Gemini		Virgo ♍ ♉ Taurus		Libra ♎ ♈ Aries		Scorpio ♏ ♓ Piſces		Sagitt. ♐ ♒ Aquar.		♑ Capric. ♑
	☉ Alt.		☉ Alt.		☉ Alt.		☉ Alt.		☉ Alt.		☉ Alt.		☉ Alt.
	D.	M	D.	M.	D.	M.	D.	M	D.	M.	D.	M.	D. M.
XII.	61	59	58	41	49	59	38	28	26	57	18	15	14 57
1	61	49	58	34	49	52	38	22	26	52	18	10	14 52
2	61	23	58	8	49	32	38	01	26	37	17	56	14 50
3	60	40	57	27	48	57	37	36	26	12	17	34	14 18
XI. I.	59	42	56	33	48	10	36	56	25	37	17	03	13 48
1	58	29	55	25	47	11	36	05	24	53	16	24	13 09
2	57	04	54	06	46	01	35	04	24	01	15	36	12 23
3	55	29	52	34	44	40	33	55	22	59	14	19	11 29
X. II.	53	45	50	55	43	11	32	36	21	49	13	36	10 28
1	51	53	49	07	41	32	31	08	20	31	12	24	9 19
2	49	54	47	12	39	47	29	34	19	06	11	06	8 03
3	47	51	45	13	37	57	27	53	17	36	9	42	6 41
IX. III.	45	42	34	07	35	59	26	05	15	57	8	11	5 13
1	43	31	40	58	33	57	24	12	14	13	6	34	3 39
2	41	16	38	45	31	49	22	15	12	23	4	51	1 59
3	38	59	36	30	29	40	20	13	10	30	3	05	0 15
VIII. IV.	36	41	34	14	27	28	18	08	8	32	1	13	
1	34	23	31	56	25	13	15	58	6	31			
2	32	04	29	37	22	56	13	46	4	25			
3	29	43	27	16	20	37	11	32	2	16			
VII. V.	27	23	24	56	18	18	9	17	0	05			
1	25	04	22	37	15	59	6	58					
2	22	46	20	17	13	39	4	39					
3	20	28	17	57	11	16	2	20					
VI.	18	12	15	42	9	00	0	00					
1	15	58	14	00	6	44							
2	13	46	11	13	4	24							
3	11	37	9	01	2	08							
V. VII.	9	30	6	52									
1	7	25	4	46									
2	5	24	2	42									
3	3	27	0	43									
IV. VIII.	1	34											

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When the ſun is in the equinoctial, and has no declination, his altitude may be eaſily found by the following proportion. As radius is to the coſine of the latitude, ſo is the coſine of the hour from noon to the ſine of the altitude: but if he has north or ſouth declination, ſay, as radius is to the ſine of the declination, ſo is the ſine of the latitude to the ſine of the ſun's altitude at ſix o'clock. For the ſun's altitude at other hours the two following proportions muſt be uſed, viz. 1. As the coſine of the hour from the meridian to radius, ſo is the tangent of the latitude to the tangent of a fourth arc, from which the declination is to be ſubtracted, when north, and to which it is to be added, when ſouth, for a fifth arc. The ſupplement of the ſun's declination, added to the fourth arc, muſt be uſed for this fifth arc, when they exceed a quadrant, in finding the altitudes before and after ſix.

2. As the ſine of the fourth arc is to the coſine of the fifth arc, ſo is the ſine of the latitude of the place to the ſign of the altitude for the given hour and declination.

The altitude in the middle of a ſign may either be had by taking the arithmetic mean between the next greateſt and leaſt, or by computation, in the manner above directed. Leybourn's Dialling, Tract vi. p. 23, &c.

To find the altitude by the globe, ſee GLOBE.

DIAL, *portable, on a card*, is repreſented in *fig.* 29. and may be eaſily conſtructed. Draw the occult line AB (*fig.* 30.) parallel to the top of the card, and croſs it at right angles with the ſix o'clock line ECD; then upon C, as a center, with the radius CA, deſcribe the ſemicircle AEL, and divide it into twelve equal parts, beginning at A, as A *r*, A *s*, &c. and from theſe points of diviſion draw the hour-lines *r*, *s*, *t*, *u*, *v*, *w*, and *x*, all parallel to the ſix o'clock line EC. If each part of the ſemicircle be ſubdivided into four equal parts, they will give the half-hour lines and quarters, as in *fig.* 29. Draw the right line ASD *o*, making the angle SAB equal to the latitude of your place. Upon the center A deſcribe the arc RST, and ſet off upon it the arcs SR and ST, each equal to $23\frac{1}{2}$ degrees, for the ſun's greateſt declination, and divide them into $23\frac{1}{2}$ equal parts, as in *fig.* 29. Through the interſection D of the lines ECD and AD *o*, draw the right line FDG at right angles to AD *o*. Lay a ruler to the points A and R, and draw the line ARF through $23\frac{1}{2}$ degrees of ſouth declination in the arc SR; and then laying the ruler to the points A and T, draw the line ATG through $23\frac{1}{2}$ degrees of north declination in the arc ST; ſo ſhall the lines ARF and ATG cut the line FDG in the proper length for the ſcale of months. Upon the center D, with the radius DF, deſcribe the ſemicircle F *o* G, which divide into ſix equal parts F *m*, *m n*, *n o*, &c. and from theſe points of diviſion draw the right lines *m h*, *n i*, *p k*, and *q l*, each parallel to *o* D. Then ſetting one foot of the compaſſes in the point F, extend the other to A, and deſcribe the arc A ♑ H for the tropic of ♑; with the ſame extent, ſetting one foot in G, deſcribe the arc AEO for the tropic of ♋. Next ſetting one foot in the point *h*, and extending the other to A, deſcribe the arc ACI for the beginnings of the ſigns ♒ and ♐; and with the ſame extent, ſetting one foot in the point *l*, deſcribe the arc AN for the beginnings of the ſigns ♊ and ♌. Set one foot in the point *i*, and having extended the other to A, deſcribe the arc AK for the beginnings of the ſigns ♓ and ♏; and with the ſame extent ſet one foot in *k*, and deſcribe the arc AM for the beginnings of the ſigns ♉ and ♍. Then, ſetting one foot in the point D, and extending the other to A, deſcribe the curve AL for the beginnings of ♈ and ♎; and the ſigns will be finiſhed. This done, lay a ruler from the point A over the ſun's DECLINATION in the arc RST, found by a table, for every fifth day of the year; and where the ruler cuts the line FDG, make marks, and place the days of the months right againſt theſe marks, as in *fig.* 29. Laſtly, draw the ſhadow line PQ parallel to the occult line AB; make the gnomon, and ſet the hours to their reſpective lines, as in *fig.* 29. and the *dial* will be finiſhed.

The lines *a d*, *a b*, and *b c*, of the gnomon, muſt be cut quite through the card; and as the end *a b* of the gnomon is raiſed occaſionally above the plane of the *dial*, it turns upon the uncut line *c d* as on a hinge. The dotted line AB muſt be ſlit quite through the card, and the thread C muſt be put through the ſlit, and have a knot tied behind, to keep it from being eaſily drawn out. On the other end of this thread is a ſmall plummet D, and on the middle of it a ſmall bead for ſhewing the hour of the day.

To rectify this *dial*, ſet the thread in the ſlit right againſt the day of the month, and ſtretch the thread from the day of the month over the angular point, where the curve lines meet at XII; then ſhift the bead to that point on the thread, and the *dial* will be rectified.

To find the hour of the day, raiſe the gnomon, and hold the edge of the *dial* next the gnomon towards the ſun, ſo that the uppermoſt edge of the ſhadow of the gnomon may juſt cover the ſhadow-line; and the bead then playing freely on the face of the *dial*, by the weight of the plummet, will ſhew the time of the day among the hour-lines, in the forenoon or afternoon.

To find the time of ſun-riſing and ſetting, move the thread among the hour-lines, until it either covers ſome one of them, or lies parallel betwixt any two; and then it will cut the time of ſun-riſing among the forenoon hours, and of ſun-ſetting among the afternoon hours for that day of the year to which the thread is ſet in the ſcale of months.

To find the ſun's declination, ſtretch the thread from the day of the month over the angular point at XII, and it will cut the ſun's declination, as it is north or ſouth, for that day, in the proper ſcale.

To find on what day the ſun enters the ſigns; when the bead, as above rectified, moves along any of the curve lines which have the ſigns of the zodiac marked upon them, the ſun enters thoſe ſigns on the days pointed out by the thread in the ſcale of months.

DIAL, *univerſal, on a plain croſs*, is repreſented by *fig.* 31. and is moveable on a joint C, for elevating it to any given latitude on the quadrant C *o* 90, as it ſtands upon the horizontal board A. The arms of the croſs ſtand at right angles to the middle part; and the top of it, from *a* to *n*, is of equal length with either of the arms *n e* or *m k*.

This *dial* is rectified, by ſetting the middle line *t u* to the latitude of the place on the quadrant, the board A level, and the point N northward by the needle; thus, the plane of the croſs will be parallel to the plane of the equator. Then, from III o'clock in the morning till VI, the upper edge *k l* of the arm *i o* will caſt a ſhadow on the time of the day on the ſide of the arm *c m*; from VI till IX, the lower edge *i* of the arm *i o* will caſt a ſhadow on the hours on the ſide *o q*. From IX in the morning to XII at noon, the edge *a b* of the top part *a n* will caſt a ſhadow on the hours on the arm *n e f*; from XII to III in the afternoon, the edge *c d* of the top part will caſt a ſhadow on the hours on the arm *k l m*; from III to VI in the evening, the edge *g h* will caſt a ſhadow on the hours on the part *p q*; and from VI till IX, the ſhadow of the edge *e f* will ſhew the time on the top part *a n*. The breadth of each part *a b*, *e f*, &c. muſt be ſo great, as never to let the ſhadow fall quite without the part or arm on which the hours are marked, when the ſun is at his greateſt declination from the equator.

To determine the breadth of the ſides of the arms which contain the hours, ſo as to be in juſt proportion to their length; make an angle ABC (*fig.* 32.) of $23\frac{1}{2}$ degrees, which is equal to the ſun's greateſt declination; and ſuppoſe the length of each arm, from the ſide of the long middle part, and alſo the length of the top part above the arms, to be equal to B *d*. Then, as the edges of the ſhadow, from each of the arms, will be parallel to B *e*, making an angle of $23\frac{1}{2}$ degrees with the ſide B *d* of the arm, when the ſun's declination is $23\frac{1}{2}^{\circ}$; it is plain, that if the length of the arm be B *d*, the leaſt breadth that it can have, to keep the edge B *e* of the ſhadow B *e g d* from going off the ſide of the arm *d e* before it comes to the end of it *e d*, muſt be equal to *e d* or *d* B. But, in order to keep the ſhadow within the quarter diviſions of the hours, when it comes near the end of the arm, the breadth of it ſhould be ſtill greater, ſo as to be almoſt doubled, on account of the diſtance between the tips of the arms.

The hours may be placed on the arms, by laying down the croſs *a b c d* (*fig.* 33.) on a ſheet of paper; and with a black-lead pencil, held cloſe to it, drawing its ſhape and ſize on the paper. Then take the length *a e* in the compaſſes, and with one foot in the corner *a*, deſcribe with the other the quadrant *e f*. Divide this arc into ſix equal parts, and through the points of diviſion draw right lines *a g*, *a h*, &c. continuing three of them to the arm *c e*, which are all that can fall upon it; and they will meet the arm in thoſe points through which the lines that divide the hours from each other, as in *fig.* 31. are to be drawn right acroſs it. Divide each arm, for the three hours contained in it, in the ſame manner; and ſet the hours to their proper places, on the ſides of the arms, as they are marked in *fig.* 33. Each of the hour ſpaces ſhould be divided into four equal parts, for the half hours and quarters, in the quadrant *e f*; and right lines ſhould be drawn through theſe diviſion-marks in the quadrant, to the arms of the croſs, in order to determine

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termine the places thereon, where the ſubdiviſions of the hours muſt be marked.

This is a very ſimple kind of univerſal *dial*; it is eaſily made, and has a pretty uncommon appearance in a garden. Ferguſon.

DIALS, *refracted*, are ſuch as ſhew the hour by means of ſome *refracting* tranſparent fluid.

If a pin or ſtick be ſet up, or any point be aſſigned in a concave bowl or diſh, for the center of the *dial*, let an horizontal *dial* be applied over the ſame, aſſigning the meridian line on the edges of the bowl, and marking out the reſt of the hour-lines alſo on the edges of the bowl; take away the horizontal *dial*, and elevate a ſtring or thread from the end of the ſaid pin over the meridian line, as much as is the latitude or elevation of the pole of the place: then, by bringing the thread to caſt a ſhadow on any hour-point formerly marked out on the edges of the bowl, by a candle or the like, that ſhade in the bowl is the true hour-line; and if the bowl be full of water, &c. when this is done, it will never ſhew the true hour by the ſhadow of the top of the pin but when it is filled again with the ſame liquor.

DIAL, *ring*, is a kind of *dial*, uſually ſmall and portable, conſiſting of a braſs ring or rim, ſeldom exceeding two inches in diameter, and one third of an inch in breadth. In a point of this rim there is a hole, through which the ſun-beams being received, make a lucid ſpeck on the concavity of the oppoſite ſemicircle, which gives the hour of the day in the diviſions marked therein.

Theſe diviſions are made by deſcribing a circle (*Tab.* IV. *fig.* 34.) to repreſent the ring, and drawing an horizontal chord EF; with this as radius deſcribe the quadrant FD, and graduate it; and through the ſeveral degrees which mark the ſun's altitude for every hour at the time of the equinox, draw lines from F to the oppoſite part of the circle, and there ſet the correſponding figures. Thus the XII o'clock line will paſs through 38° 38′, the co-latitude of the place; the XI and I line through 36° 56′; the X and II through 32° 36′; the IX and III through 26° 5′; the VIII and IV through 18° 8′; and the VII and V through 9° 17′. This may be eaſily calculated by the globe; or ſee the preceding table.

But it only holds good about the times of the equinox. To have the dial perform throughout the whole year, the hole is made moveable, and the ſigns of the zodiac, or the days of the month, are marked on the convex ſide of the ring, by taking, e. g. ET and E*t* (*fig.* 34.) on each ſide of E equal to double the ſun's declination when he enters any particular ſign, as Taurus or Piſces; and there marking the character of the ſaid ſign, or correſponding month, and ſo for all the others; and by means of theſe the *dial* is rectified for the time. It is evident, from a view of the figure, that E XII ♪ is = FE XII = the altitude of the ſun in the equinox; but T XII E is equal to the ſun's declination in Taurus, becauſe it is an angle in the circumference ſtanding upon an arc, which is double the declination; and therefore T XII ♪ is equal to the meridian altitude when the ſun enters Taurus; and a ray paſſing through the hole at T will mark the XII o'clock hour of that day; but this *dial* will not point out the other hours exactly; becauſe T III *d* exceeds E III *d*, the equinoctial hour by the angle of declination; and ſo of the reſt. Some have contrived to remedy this inconvenience, by making the concave ſurface of the ring wider, and deſcribing upon it ſeven circles, the middle one to repreſent the equinoctial, and the extremes the tropics; and in theſe circles they have marked the forenoon and afternoon hours from a table of altitudes.

To uſe it, put the moveable hole to the day of the month, or the degree of the zodiac the ſun is in; then ſuſpending it by the little ring, turn it towards the ſun, till his rays, as before, point out the hour among the diviſions on the inſide.

Univerſal or *aſtronomical Ring*-DIAL, is a ring-*dial* which ſerves to find the hour of the day in any part of the earth; whereas the former is confined to a certain latitude. Its figure ſee repreſented in *Table* IV. *of Dialling*, *fig.* 35.

It conſiſts of two rings or flat circles, from two to ſix inches in diameter, and their breadth, &c. proportionable. The outward ring A repreſents the meridian of any place you are at, and contains two diviſions of 90° each, diametrically oppoſite to one another, ſerving the one from the equator to the north, the other to the ſouth pole. The inner ring repreſents the equator, and turns exactly within the outer, by means of two pivots in each ring at the hour of XII.

Acroſs the two circles goes a thin reglet or bridge, with a curſor C, that ſlides along the middle of the bridge. In the curſor is a little hole for the ſun to ſhine through. The middle of this bridge is conceived as the axis of the world, and the extremities as the poles; and on the one ſide are drawn the ſigns of the zodiac, and on the other the days of the month. On the edge of the meridian ſlides a piece, to which is fitted a ring to ſuſpend the inſtrument by.

In this *dial*, the diviſions on the axis are the tangents of the angles of the ſun's declination, adapted to the ſemi-diameter of the equator as radius, and placed on either ſide of the center: but inſtead of laying them down from a line of tangents, a ſcale of equal parts may be made, whereof 1000 ſhould anſwer exactly to the length of the ſemi-axis, from the center to the inſide of the equinoctial ring; and then 434 of theſe parts may be laid down toward each end from the center, which would limit all diviſions on the axis, becauſe 434 is the natural tangent of 23° 29′. And thus, by a nonius fixed to the ſliding-piece, and taking the ſun's declination from an ephemeris, and the tangent of that declination from the table of natural tangents, the ſlider might be always ſet true within two minutes of a degree. And this ſcale of 434 equal parts might be placed right againſt the $23\frac{1}{2}°$ of the ſun's declination, on the axis, inſtead of the ſun's place, which is there of little uſe. For then the ſlider might be ſet in the uſual way, to the day of the month, for common uſe; but to the natural tangent of the declination, when great accuracy is required.

Uſe of the univerſal Ring-DIAL. Place the line *a* (on the middle of the ſliding-piece) over the degree of latitude of the place (e. gr. $51\frac{1}{2}°$ for London) put the line which croſſes the hole of the curſor to the degree of the ſign, or day of the month. Open the inſtrument ſo as that the two rings be at right angles to each other, and ſuſpend it by the ring H, that the axis of the *dial*, repreſented by the middle of the bridge, may be parallel to the axis of the world. Then turn the flat ſide of the bridge towards the ſun, ſo that his rays, ſtriking through the little hole in the middle of the curſor, may fall exactly on a line drawn round the middle of the concave ſurface of the inner ring; in which caſe the bright ſpot ſhews the hour of the day in the ſaid concave ſurface of the ring.

Note, The hour of XII is not ſhewn by this *dial*, becauſe the outer circle being then in the plane of the meridian, hinders the ſun's rays from falling on the inner; nor will this *dial* ſhew the hour when the ſun is in the equinoctial, becauſe his rays then fall parallel to the plane of the inner circle.

Nocturnal, or *Night*-DIAL, is that which ſhews the hours of the night.

Of this there are two kinds; *lunar*, and *ſiderial*.

Moon-DIAL, or *Lunar* DIAL, is that which ſhews the hour of the night by means of the light, or ſhadow, of the moon, projected thereon from an index.

To deſcribe a Moon-DIAL. Suppoſe, e. gr. an horizontal *moon-dial* required: draw, firſt, an horizontal *ſun-dial*; then erect two perpendiculars, AB and CD (*Tab.* II. *fig.* 25.) to the line of XII o'clock; and, dividing the interval GF into twelve equal parts, through the ſeveral points of diviſion draw lines parallel thereto: now, appropriating the firſt line CD to the day of the new moon, and the ſecond to the day when the moon comes an hour later to the meridian than the ſun; their interſections with the hour-lines will give points, through which to draw a curve line XII XII for the meridian-line of the moon. After the like manner determine the other hour-lines I I, II II, III III, &c. which the ſhadow of the moon, projected from the ſtyle of the *dial*, interſects at the reſpective hours; then blot out the hour-lines of the *ſun-dial*, together with the perpendiculars whereby the lunar hours were drawn, and divide the interval GF, by other parallel lines, into fifteen equal parts, anſwering to the fifteen days between new and full moon: laſtly, to theſe lines write the ſeveral days of the moon's age.

Now, the moon's age being learnt from a calendar, the interſection of the line of the moon's age with the lunar hour-lines, will give the hour of the night.

After the ſame manner may any other *ſun-dial* be converted into a *moon-dial*.

To draw a portable Moon-DIAL. On a plane, that may be raiſed according to the elevation of the equator, deſcribe a circle AB (*fig.* 26.) and divide its circumference into $29\frac{1}{2}$ equal parts: from the ſame center C deſcribe another moveable circle DE, which divide into twenty-four equal parts, or hours; in the center C erect an index, as for an equinoctial *dial*.

This *dial* being duly placed, after the manner of an equinoctial *dial*, and the XII o'clock line brought to the day of the moon's age; the ſhadow of the index will give the hour.

To uſe a ſolar as a Lunar-DIAL, i. e. *to find the hour of the night by a* ſun-dial. Obſerve the hour which the ſhadow of the index points at by moon-light; find the moon's age in the calendar, and multiply the number of days by $\frac{1}{4}$, the product is the number of hours to be added to the hour ſhewn by the ſhadow, to give the hour required;

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quired: the reaſon of which is, that the moon comes to the ſame horary circle later than the ſun by about three quarters of an hour every day; and at the time of new moon the ſolar and lunar hour coincide.

DIALS, *placing of.* Having prepared the plane on which the *dial* is to reſt, the hour may be found with tolerable accuracy by a large equinoctial ring-*dial*, to which a watch is to be ſet; and then the *dial* may be fixed by the watch at leiſure. But in order to have the time more exactly, the ſun's altitude ſhould be taken by a good quadrant, and the preciſe time of obſervation noted by a clock or watch: then the time ſhould be computed for the obſerved altitude, and the watch ſet to agree with that time. Otherwiſe, take two equal altitudes of the ſun in the ſame day in ſummer; one between ſeven and ten in the morning, the other between two and five in the afternoon; mark the moments of the two obſervations by a clock or watch; and if the watch ſhews the obſervations to be at equal diſtances from noon, it agrees exactly with the ſun; if not, the watch muſt be corrected by half the difference of the forenoon and afternoon intervals; and then the dial may be ſet true by the watch. To find a meridian line, ſee MERIDIAN.

It is neceſſary to obſerve, that if a *dial* be made according to the ſtrict rules of calculation, and truly ſet at the inſtant, when the ſun is on the meridian, it will be a minute too faſt in the forenoon, and as much too ſlow in the afternoon, by the ſhadow of the ſtyle; becauſe the edge of the ſhadow that ſhews the time is even with the foremoſt edge of the ſun in the forenoon, and with his hindmoſt edge in the afternoon, on the *dial*; whereas the ſun's center determines the time in the (ſuppoſed) hour circles of the heaven; and as the ſun is half a degree in breadth, he takes two minutes to move through a ſpace equal to his breadth; and there will be two minutes at noon in which the ſhadow will have no motion at all on the *dial*. It likewiſe appears, that if the *dial* be ſet true by the ſun in the forenoon, it will be two minutes too ſlow in the afternoon; and *vice verſâ*. The way of remedying this error, is to ſet every hour and minute diviſion on the *dial* one minute nearer XII than the calculation requires. Ferguſon's Tables and Tracts, p. 73, &c.

DIAL-*planes*, plain ſuperficies, upon which the hour-lines of *dials* are drawn. See DIAL.

DIAL, *ſidérial.* See NOCTURNAL.

DIAL, *tide.* See TIDE-*Dial.*

DIALECT, Διαλεκτος, from Διαγελεσθαι, *to diſcourſe*, the peculiar language of ſome province, or part, of a nation, formed by corruption of the general, or national language.

Homer could ſpeak five different languages in one verſe, i. e. five *dialects*; viz. the Attic, Ionic, Æolic, the Doric, and the common *dialect* of the Greeks.

The Attic *dialect* is more particularly uſed by Xenophon and Thucydides; the Ionic by Herodotus and Hippocrates; the Doric by Pindar and Theocritus; the Æolic by Sappho and Alcea, and often by the two former writers.

The Bologneſe, Bergamaſque, Tuſcan, &c. are the *dialects* of the Italian; the Gaſcon, and Picard, are *dialects* of the French.

In Great Britain, almoſt every county has a *dialect* of its own; all differing conſiderably in pronunciation, accent, and tone, though the language be the ſame.

The method which the Gileadites took to prove the Ephraimites, by the pronunciation of *ſhibboleth*, with *ſchin* or *ſamech*, is well known. Judges xii. 6.

DIALECTICA, DIALECTICS, Διαλεκτικη, the art of reaſoning and diſputing juſtly.

The word comes from the Greek Διαλεγομαι, *I diſcourſe*; formed of Δια, and λεγω, *dico, I ſay.*

Zeno Eleates was the firſt who diſcovered the natural ſeries of principles and concluſions obſerved in reaſoning, and formed an art thereof, in form of a dialogue; which, for this reaſon, was called *dialectica.*

The *dialectica* of the ancients is uſually divided into ſeveral kinds: the firſt was the *Eleatica*, that of Zeno Eleates, which was threefold; viz. *conſecutionum, colloquutionum*, and *contentionum.* The firſt conſiſting of rules for deducing, or drawing, concluſions; the ſecond, the art of dialogue; which became of ſuch univerſal uſe in philoſophy, that all reaſoning was called *interrogation:* then, ſyllogiſm being laid aſide, the philoſophers did all by dialogue; it lying on the reſpondent to conclude and argue from the ſeveral conceſſions made. The laſt part of Zeno's *Dialectics*, Εριστικη, was contentious; or the art of diſputing, and contradicting: though ſome, particularly Laertius, aſcribe this part to Protagoras, a diſciple of Zeno.

The ſecond is the *Dialectica Megarica*, whoſe author is Euclid, not the mathematician, but another, of Megara. He gave much into the method of Zeno, and Protagoras; though there are two things appropriated to him: the firſt, that he impugned the demonſtrations of others, not by aſſumptions, but concluſions; continually making illations, and proceeding from conſequence to conſequence; the ſecond, that he ſet aſide all arguments drawn from compariſons, of ſimilitude, as invalid.

He was ſucceeded by Eubulides, from whom the ſophiſtic way of reaſoning is ſaid to be derived. In his time the art is deſcribed as manifold: mentiens, fallens, electra, obvelata, arcevalis, cornuta, and calva. See SOPHISM.

The third is the *Dialectics* of Plato, which he propoſes as a kind of analyſis, to direct the human mind, by dividing, defining, and bringing things to the firſt truth; where being arrived, and ſtopping there a little, it applies itſelf to explain ſenſible things; but with a view to return to the firſt truth, where alone it can reſt. Such is the idea of Plato's analyſis.

The fourth is Ariſtotle's *Dialectics*, containing the doctrine of ſimple words, delivered in his book of Prædicaments; the doctrine of propoſitions, in his book De Interpretatione; and that of the ſeveral kinds of ſyllogiſm, in his books of Analytics, Topics, and Elenchuſes.

The fifth is the *Dialectics* of the Stoics, which they call a part of philoſophy, and divide into rhetoric, and *dialectic*; to which ſome add the definitive, whereby things are juſtly defined; comprehending, likewiſe, the canons, or criterions, of truth.

The Stoics, before they come to treat of ſyllogiſms, have two principal places; the one, about the ſignification of words; the other, about the thing ſignified. On occaſion of the firſt, they conſider abundance of things belonging to the grammarians province: what, and how many letters; what is a word, diction, ſpeech, &c. On occaſion of the latter, they conſider things themſelves, not as without the mind, but as in it, received in it by means of the ſenſes. Accordingly, they firſt teach, that *nil ſit in intellectu, quod non prius fuerit in ſenſu*; whatever is in the mind, came thither by the ſenſes; and that, *aut incurſione ſui*, as Plato, who meets the ſight; *aut ſimilitudine*, as Cæſar by his effigy; *aut proportione*, either by enlarging, as a giant; or by diminiſhing, as a pygmy; *aut tranſlatione*, as a Cyclops; *aut compoſitione*, as a Centaur; *aut contrario*, as death; *aut privatione*, as a blind man.

The ſixth is Epicurus's *Dialectics.* For though he ſeems to have deſpiſed *dialectic*, he cultivated it with vigour: he was only averſe to that of the Stoics, who, he thought, attributed too much to it; as pronouncing him alone wiſe, who was well verſed in *dialectics.* For this reaſon, Epicurus, ſeeming to ſet aſide the common *dialectics*, had recourſe to another way; viz. to certain canons, which he ſubſtituted in their ſtead, the collection whereof he called Canonica; and as all queſtions in philoſophy are either *de re*, or *de voce*, he gave ſeparate rules for each. See EPICUREANS.

DIALECTICAL *arguments*, in *Logic*, are ſuch as are only probable, and do not convince, or determine, the mind abſolutely to either ſide of the queſtion.

DIALIA, in *Antiquity*, ſacrifices performed by the *flamen dialis*, or prieſt of Jupiter.

It was not, however, of ſuch abſolute neceſſity, that the *dialia* ſhould be performed by the *flamen dialis*; but that others might officiate. We find in Tacitus, Annal. lib. ii. cap. 58. that if he were ſick, or detained by any other public employ, the pontifices took his place.

DIALIS, in *Antiquity*, a Latin term, ſignifying ſomewhat that belongs to Jupiter.

The word is formed from Διος, the genitive of Ζευς, *Jupiter.*

DIALIS, *Flamen.* See FLAMEN.

DIALITHA, from Δια and λιθος, *gem*, in the *Writings of the Ancients*, a word uſed to expreſs the elegant ornaments of the Greeks and Romans, compoſed of gold and gems. They alſo called theſe *lithocolia*, cemented ſtones or gems; the gold being, in this caſe, as a cement, to hold the ſtones together. They wore bracelets, and other ornamental things about their habits, thus made; and their cups and table-furniture for magnificent treats were of this kind. The green ſtones were found to ſucceed beſt of all in theſe things; and the emerald and greeniſh topaz, or, as we call it, chryſolite, were moſt in eſteem for this purpoſe. This uſe of the ſtone explains what Pliny very often ſays of them in his deſcription: *Nihil jucundius aurum decet: nothing becomes gold better.* This he ſays of the green topaz or chryſolite; and this, and many other like paſſages, have greatly perplexed the critics who did not hit upon this explication. The Latins called theſe *dialitha, lithocolla*, and *aurum gemmatum*; and thus Martial, where he ſays *miratur Scythicas virentis auri flammas Jupiter*, alludes to cups of gold, ornamented with Scythian gems, that is, emeralds.

DIALIUM, in *Botany*, a genus of the *diandria monogynia*

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DIALLING.

DECLINATOR

Fig. 1.

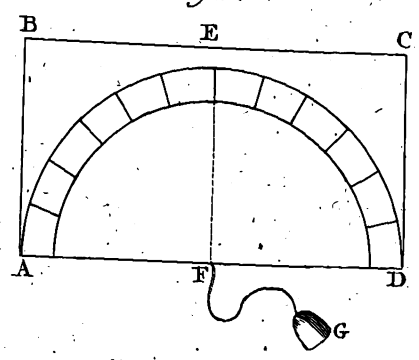


Fig. 2.

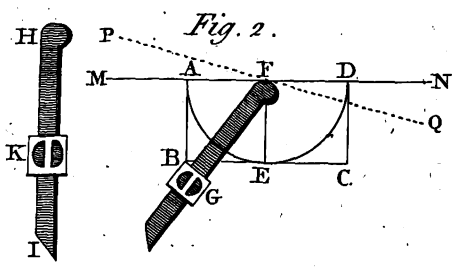
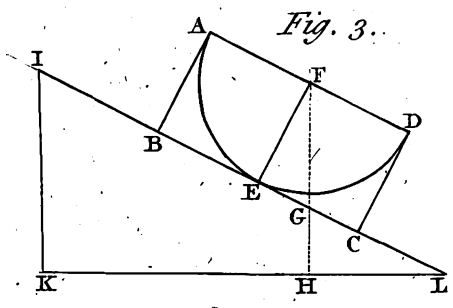


Fig. 3.



Equinoctial DIAL

Universal Equinoctial DIAL

Universal DIAL

Fig. 4.

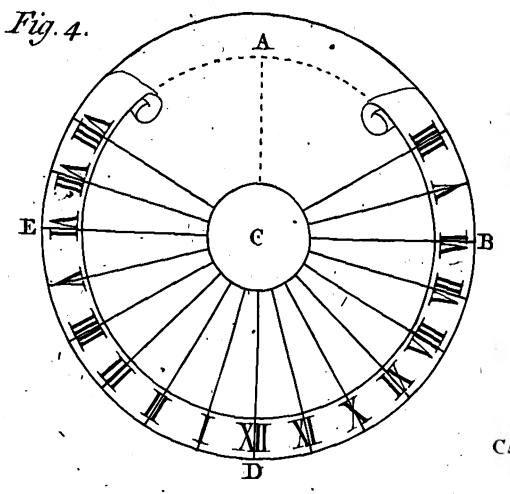


Fig. 5.

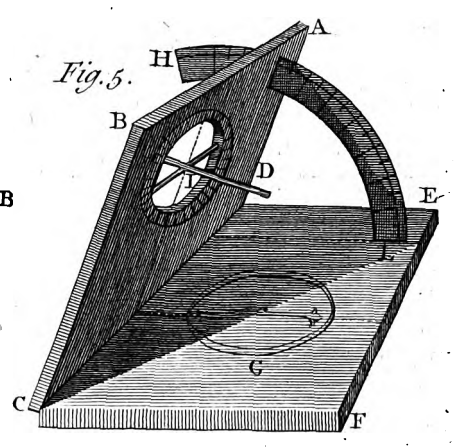
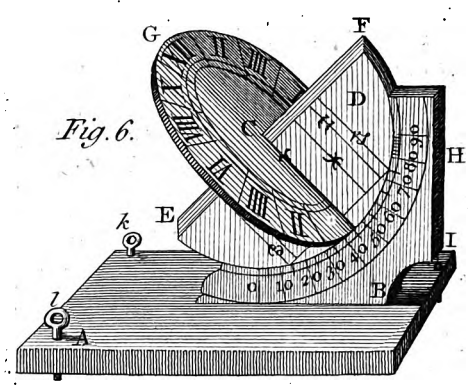


Fig. 6.



Horizontal DIAL

Fig. 7.

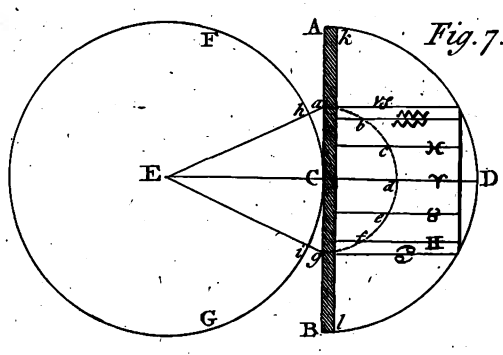


Fig. 8.

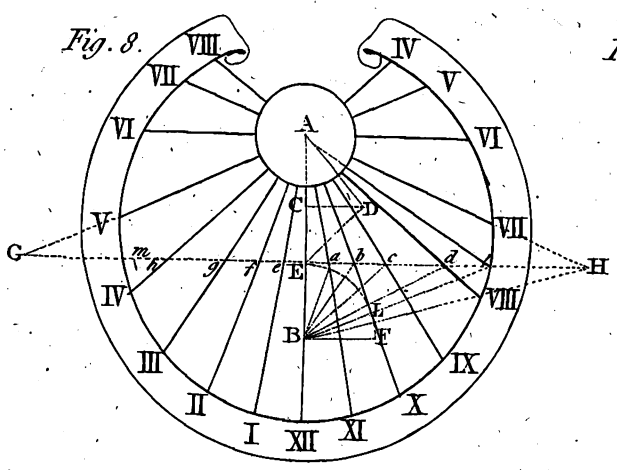


Fig. 9.

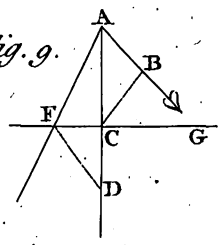


Fig. 10.

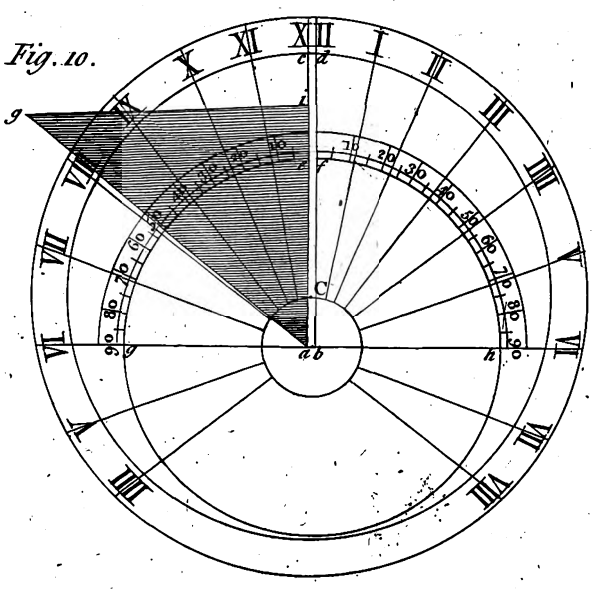
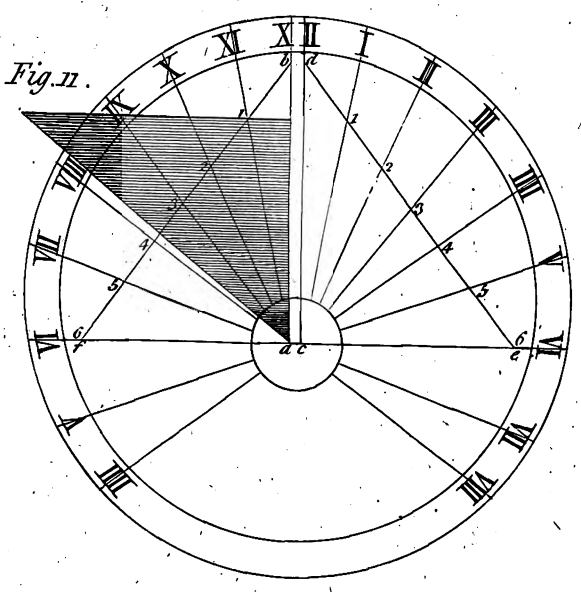


Fig. 11.



Vertical South DIAL

Fig. 12.

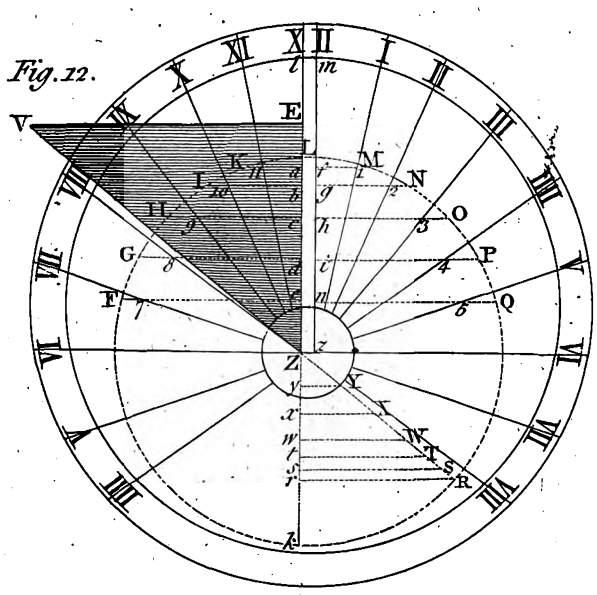


Fig. 13.

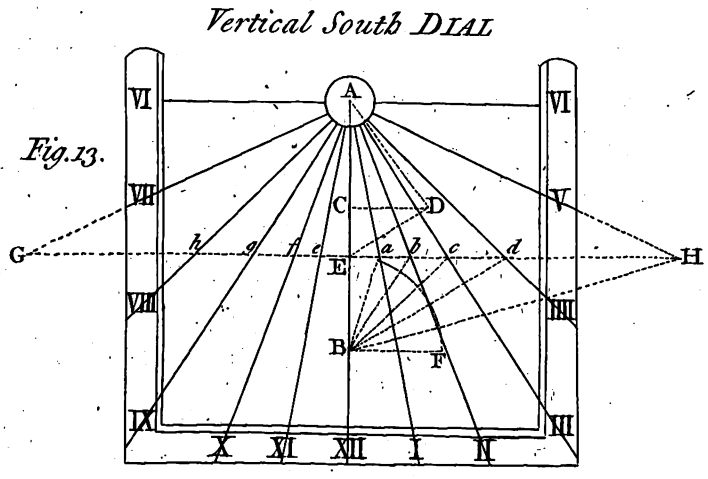


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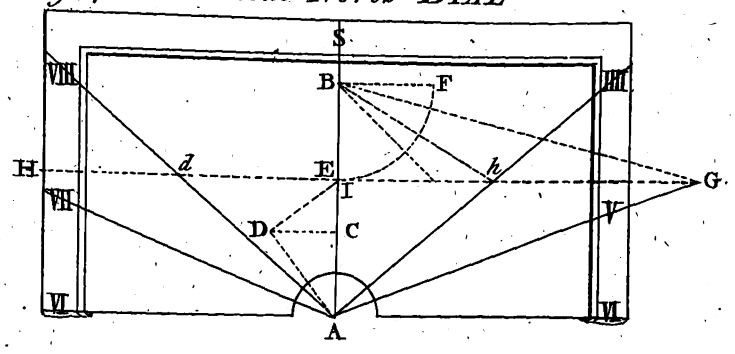
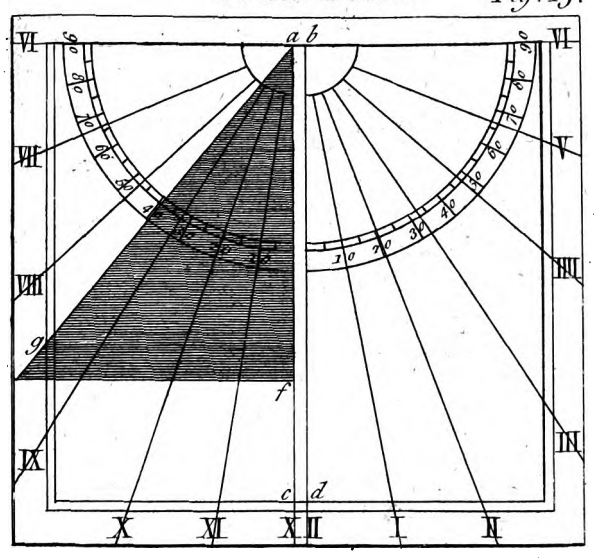
Fig. 14 *Vertical North DIAL*

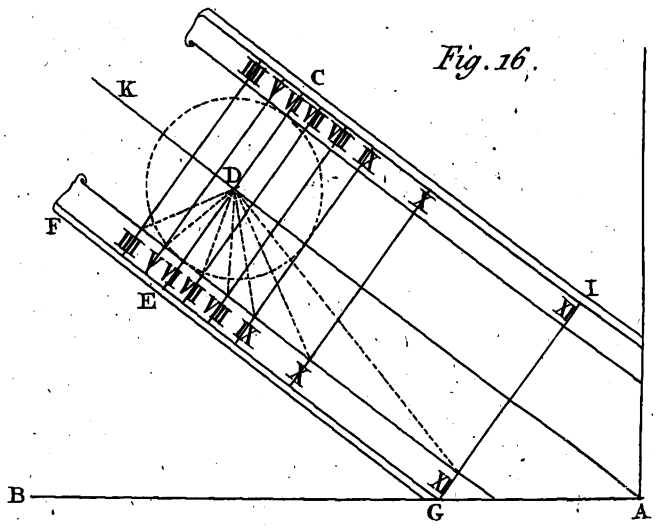


South DIAL Fig. 15.



East DIAL

Fig. 16.



Polar DIAL

Fig. 17.

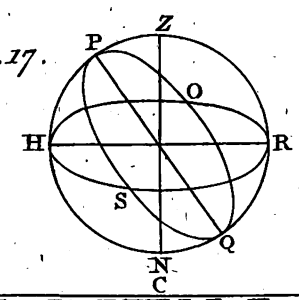
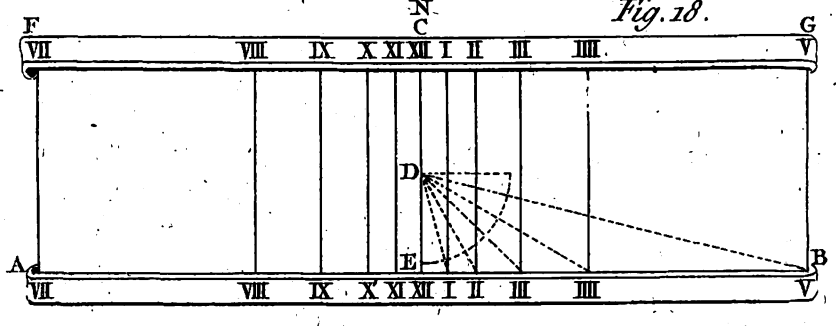
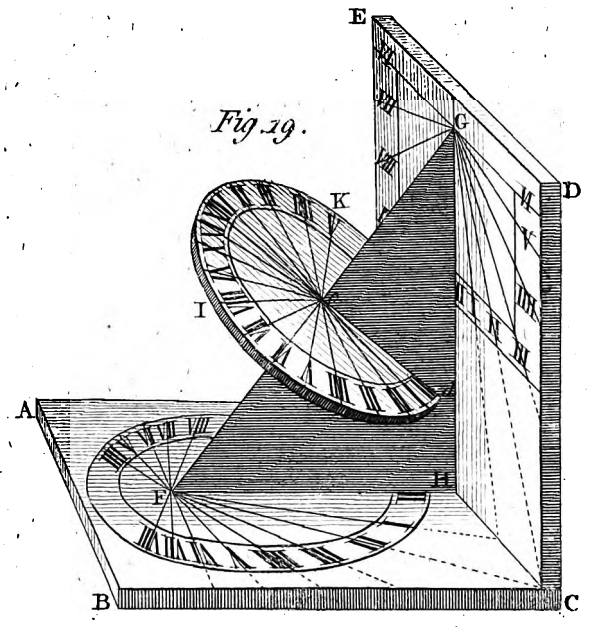


Fig. 18.



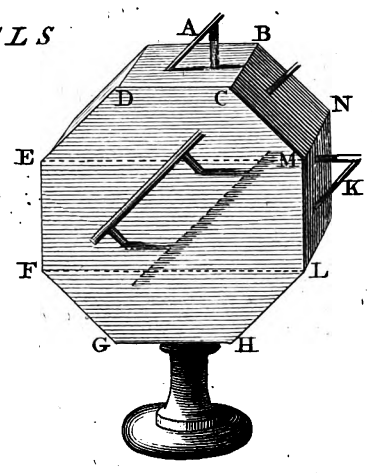
DIAL on three Planes

Fig. 19.



DIALS

Fig. 20.



Vertical Declining DIAL

Fig. 21.

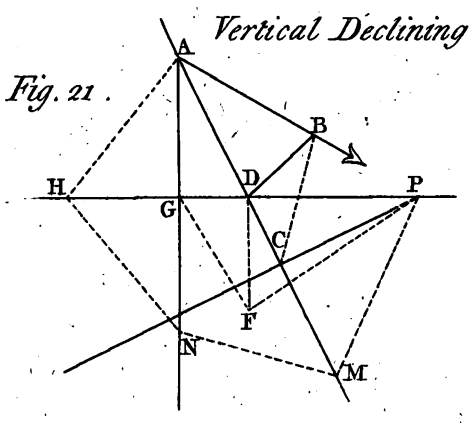
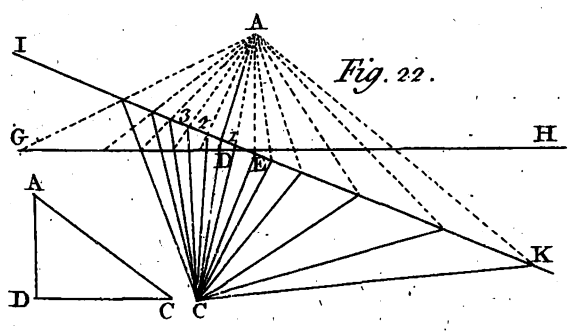
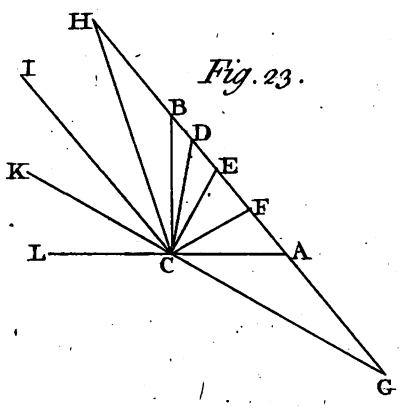


Fig. 22.



Inclined DIAL

Fig. 23.



Universal Mechanical DIAL

Fig. 24.

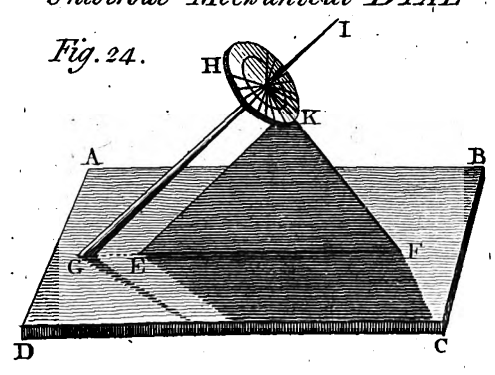


Fig. 25. *Moon DIAL*

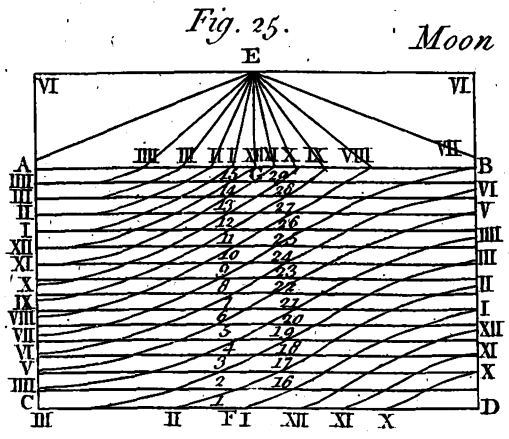
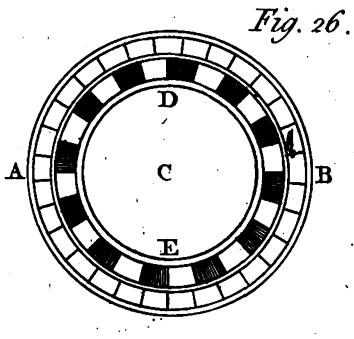


Fig. 26.



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DIALLING. *Tab:III.*

Cylindric DIAL *Fig.28.*

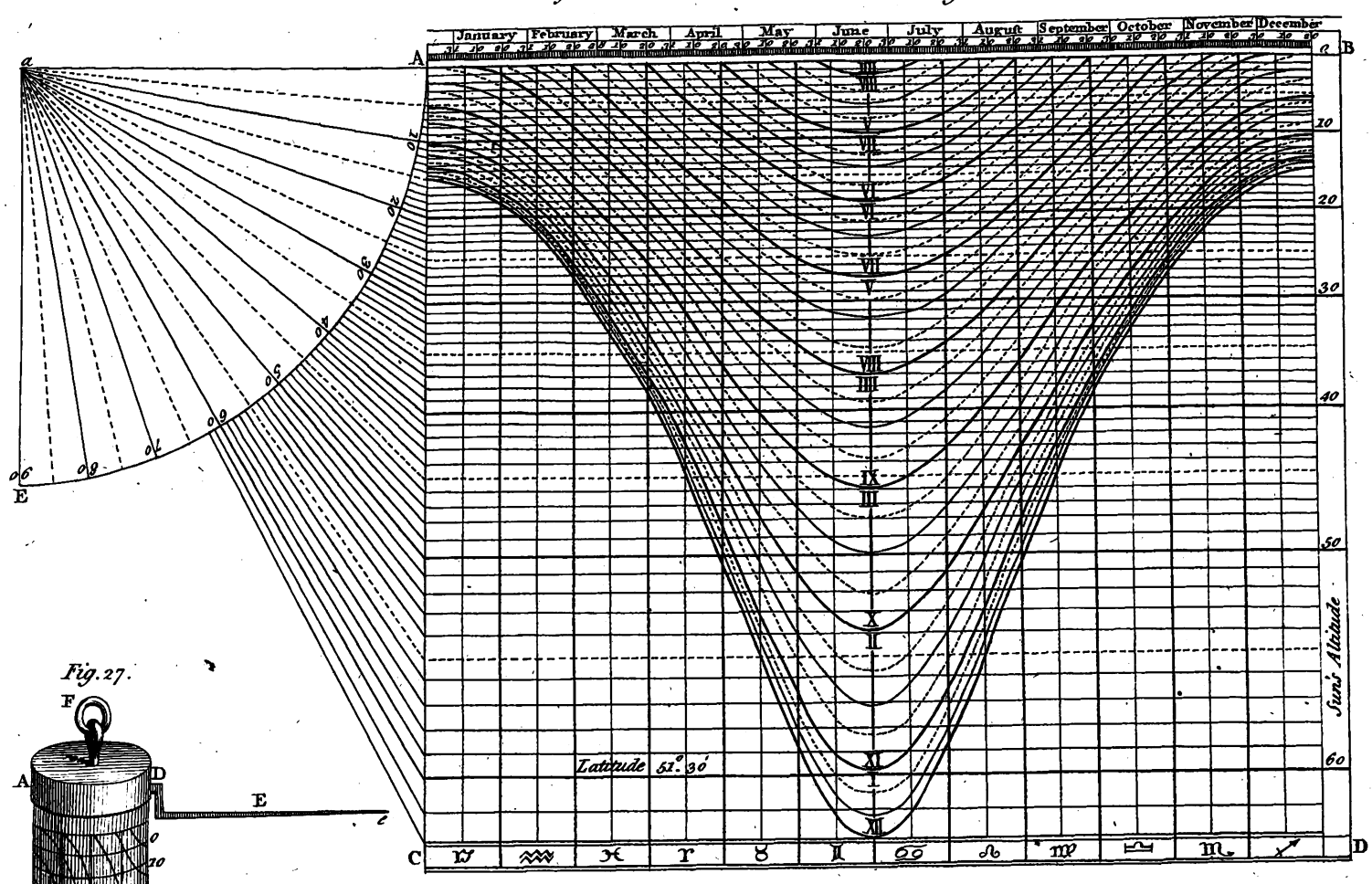
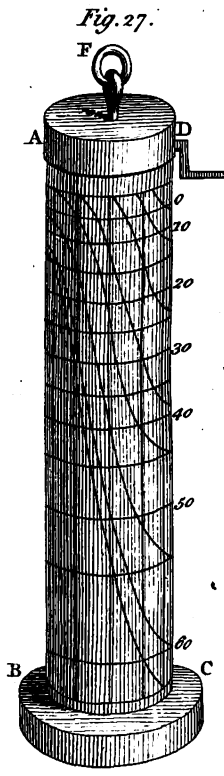
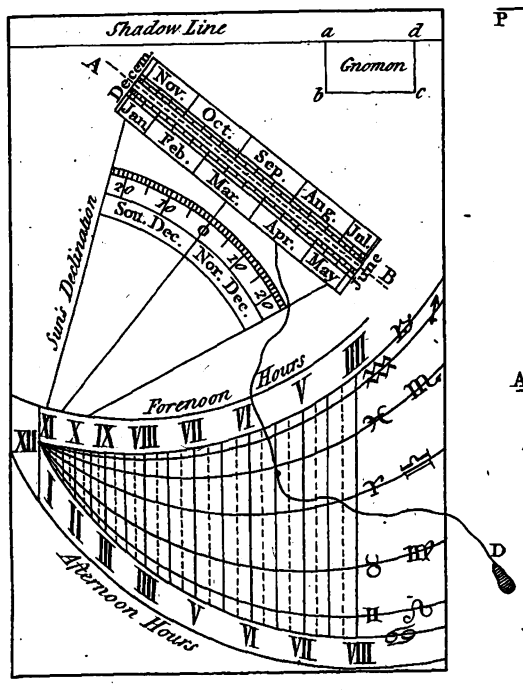


Fig.27.



Portable DIAL.

Fig.29.



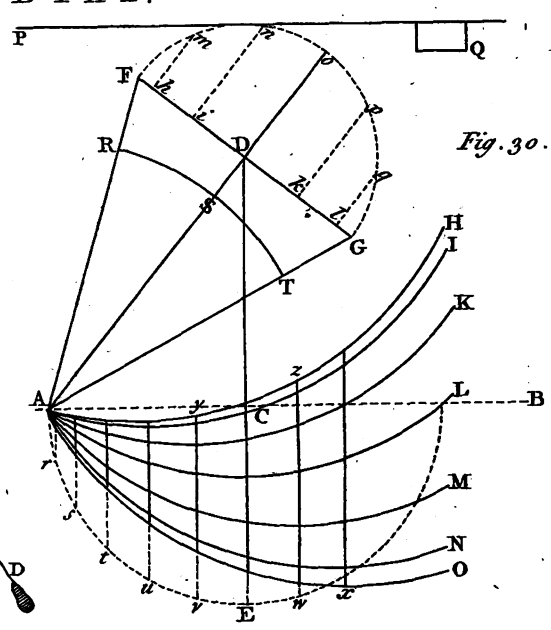


Fig.30.

Universal DIAL on a Croſs.

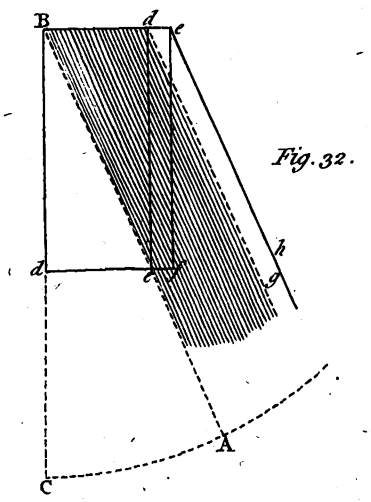


Fig.32.

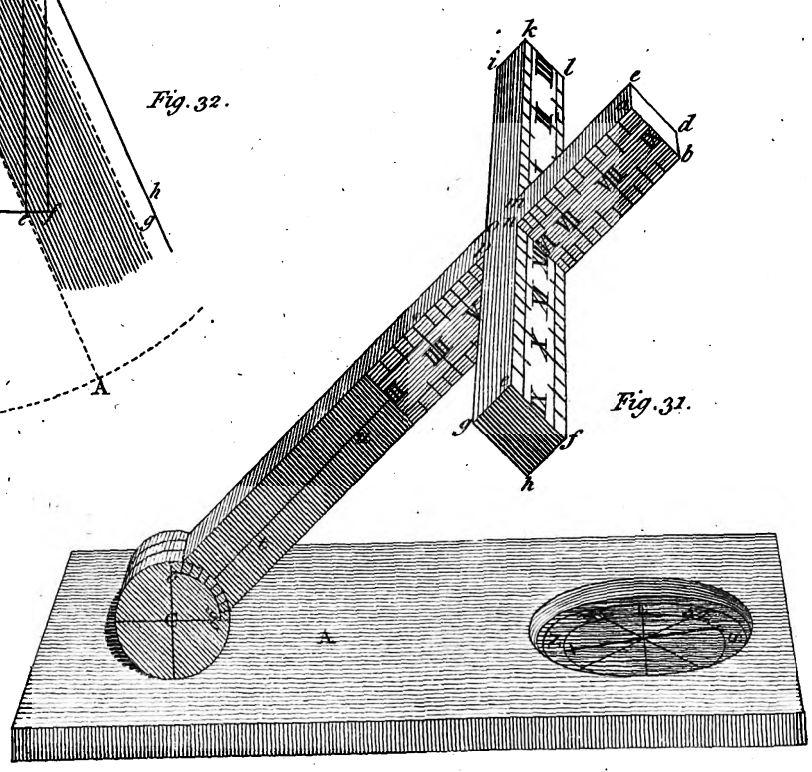


Fig.31.

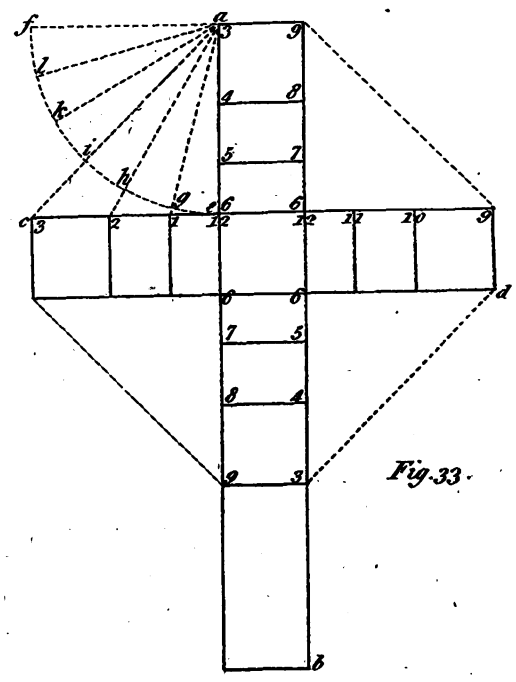


Fig.33.

I. Taylor ſculp.

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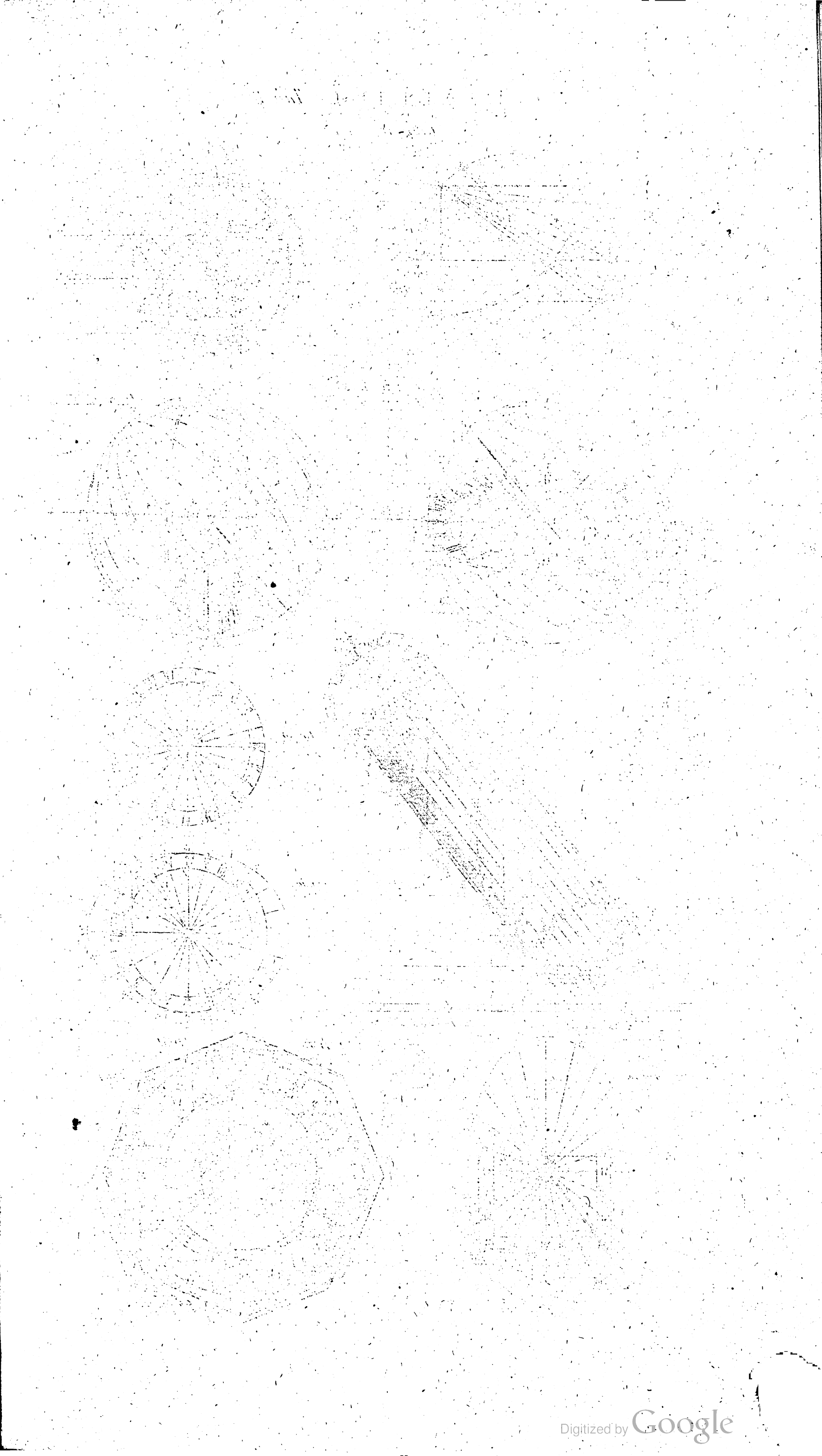

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DIALLING *Tab. IV.*

Ring DIAL

Fig. 34.

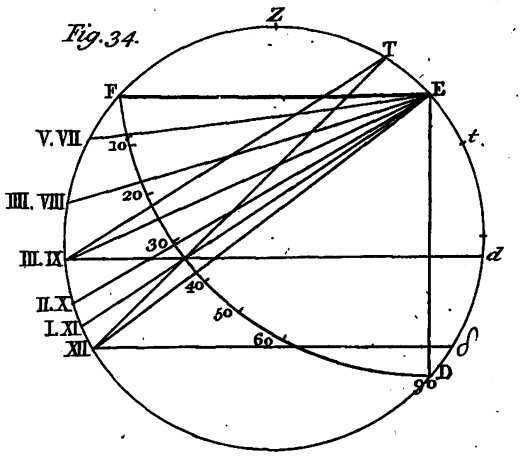
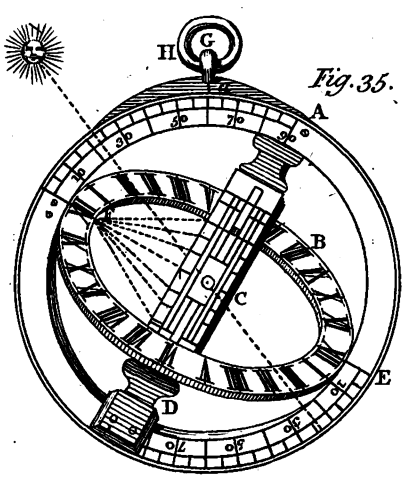


Fig. 35.



DIALLING

Fig. 36.

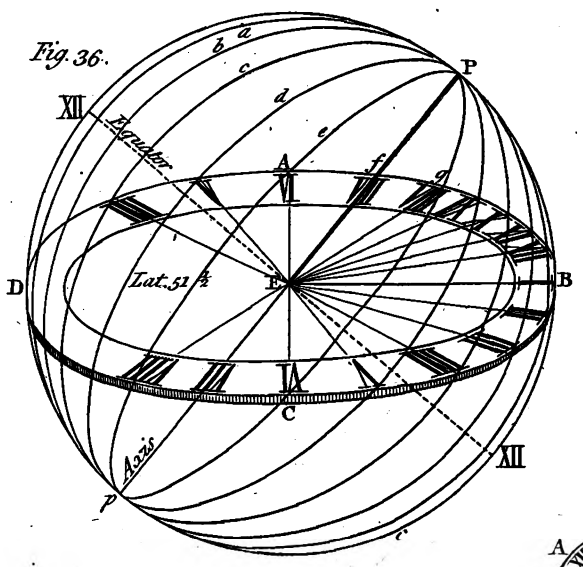


Fig. 37.

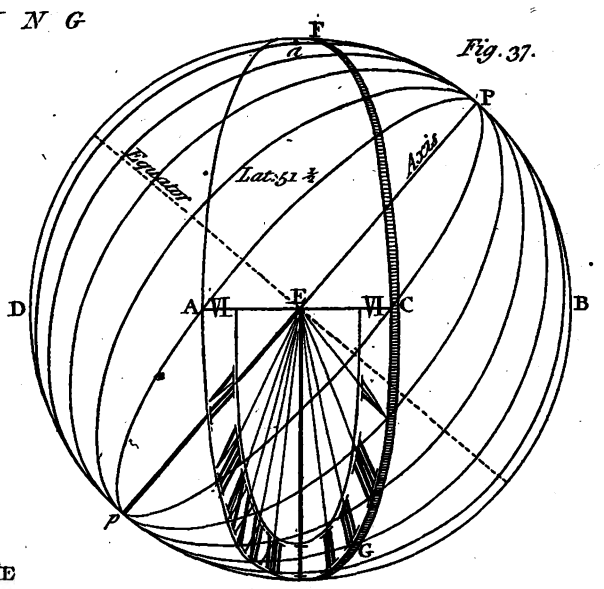


Fig. 38.

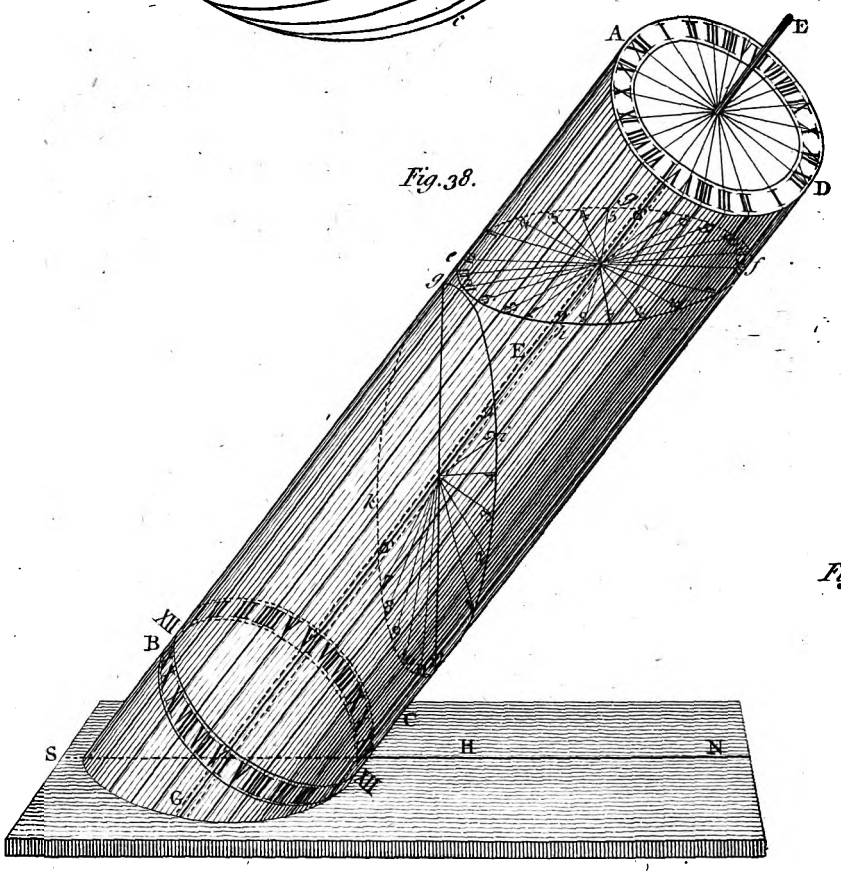


Fig. 39.

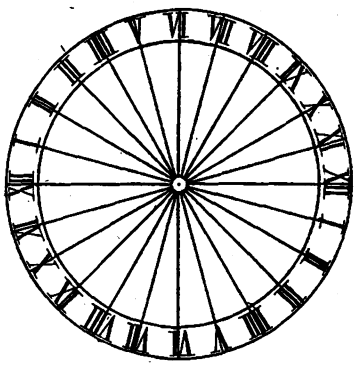


Fig. 40.

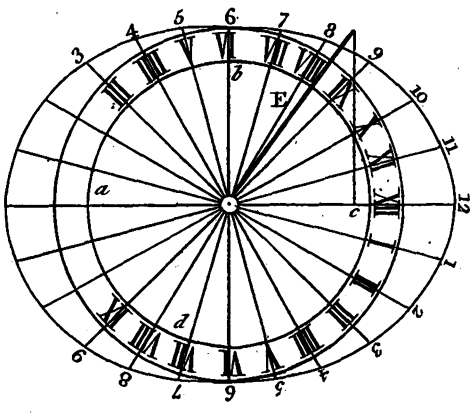
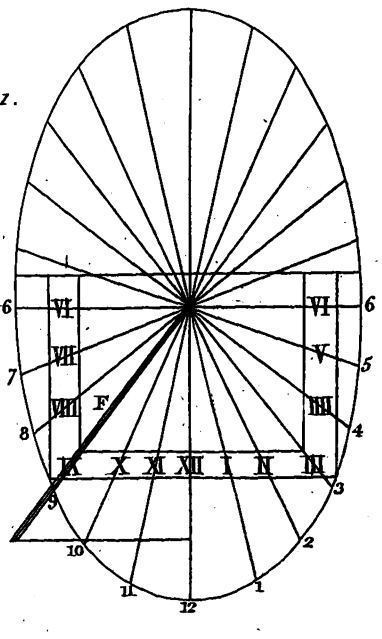
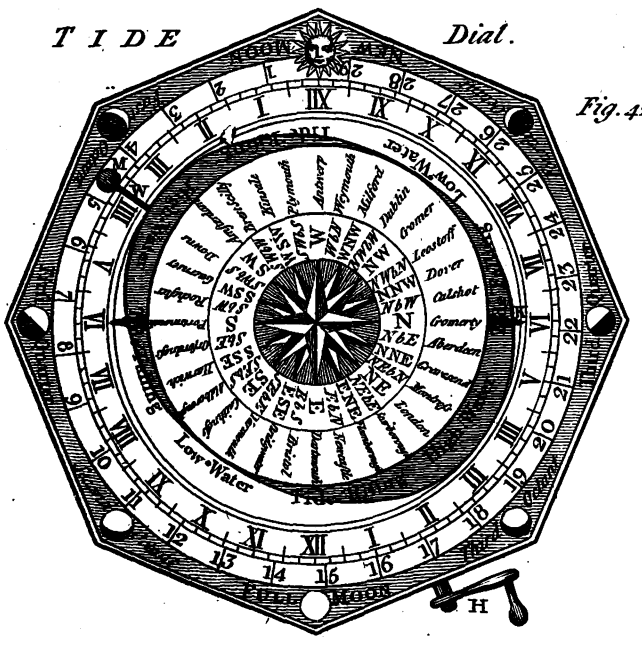


Fig. 41.



TIDE Dial.

Fig. 42.



J. Taylor, fecit.

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claſs; the corolla has five petals, and there is no calyx. There is only one ſpecies.

DIALLACTERII, among the Athenians. See DIÆTETÆ.

DIALLELOS, Διαλληλος, in *Rhetoric*, a figure, wherein the words and meaning of a ſentence are inverted, as *doctis diſertior, diſertis doctior*. Voſſ. Rhet. lib. v. p. 405.

DIALLING, the art of drawing ſun, moon, and ſtar-dials, on any given plane, or on the ſurface of any given body. See DIAL.

The Greeks and Latins call this art *gnomonica*, and *ſciatherica*, becauſe it diſtinguiſhes the hours by the ſhadow of a gnomon. Some call it *photo-ſciatherica*, becauſe the hours are ſometimes ſhewn by the light of the ſun. Laſtly, others call it *horologiography*.

Dialling is wholly founded on the firſt motion of the heavenly bodies, and chiefly the ſun; or rather on the diurnal rotation of the earth; ſo that the elements of ſpherics, and the ſpherical aſtronomy, ſhould be maſtered, before a perſon advances to the doctrine of *dialling*: the doctrine, or theory, we ſay; for, as to the practice, or the operations themſelves diſtinct from the demonſtrations, nothing is more eaſy and obvious.

The principles of *dialling* may be eaſily deduced from the method, already illuſtrated, of conſtructing *dials* by the globe. Or, they may be farther explained, by ſuppoſing the whole earth *a* P *c p* (*Tab.* IV. *fig.* 36.) to be tranſparent and hollow, like a ſphere of glaſs, and its equator to be divided into twenty-four equal parts by ſo many meridian ſemicircles *a*, *b*, *c*, *d*, *e*, *f*, *g*, &c. one of which is the geographical meridian of any given place, as London, which is ſuppoſed to be at the point *a*; and if the hour of XII were marked at the equator, both upon that meridian and the oppoſite one, and all the reſt of the hours in order on the other meridians, thoſe meridians would be the hour circles of London: becauſe, as the ſun appears to move round the earth, which is in the center of the viſible heavens, in twenty-four hours, he will paſs from one meridian to another in an hour. Then, if the ſphere had an opake axis, as P E *p*, terminating in the poles P and *p*, the ſhadow of the axis, which is in the ſame plane with the ſun and with each meridian, would fall upon every particular meridian and hour, when the ſun came to the plane of the oppoſite meridian, and would conſequently ſhew the time at London, and at all other places on the ſame meridian. If this ſphere was cut through the middle by a ſolid plane A B C D in the rational horizon of London, one half of the axis E P would be above the plane, and the other half below it; and if ſtrait lines were drawn from the center of the plane to thoſe points where its circumference is cut by the hour circles of the ſphere, thoſe lines would be the hour lines of an horizontal dial for London; for the ſhadow of the axis would fall upon each particular hour line of the dial, when it fell upon the like hour circle of the ſphere. If the plane which cuts the ſphere be upright, as A F C G (*fig.* 37.) touching the given place, e. g. London, at F, and directly facing the meridian of London, it will then become the plane of an erect direct ſouth dial; and if right lines be drawn from its center E, to thoſe points of its circumference where the hour circles of the ſphere cut it, theſe will be the hour lines of a vertical or direct ſouth dial for London, to which the hours are to be ſet in the figure, contrary to thoſe on an horizontal dial; and the lower half E *p* of the axis will caſt a ſhadow on the hour of the day in this dial, at the ſame time that it would fall upon the like hour circle of the ſphere, if the dial plane was not in the way. If the plane, ſtill facing the meridian, be made to incline, or recline, any given number of degrees, the hour circles of the ſphere will ſtill cut the edge of the plane in thoſe points to which the hour lines muſt be drawn ſtrait from the center; and the axis of the ſphere will caſt a ſhadow on theſe lines at the reſpective hours. The like will ſtill hold, if the plane be made to decline by any given number of degrees from the meridian towards the eaſt or weſt; provided the declination be leſs than 90 degrees, or the reclination be leſs than the co-latitude of the place; and the axis of the ſphere will be the gnomon: otherwiſe, the axis will have no elevation above the plane of the dial, and cannot be a gnomon.

Thus it appears, that the plane of every dial repreſents the plane of ſome great circle on the earth, and the gnomon the earth's axis; the vertex of a right gnomon the center of the earth or viſible heavens; and the plane of the dial is juſt as far from this center as from the vertex of this ſtile. The earth itſelf, compared with its diſtance from the ſun, is conſidered as a point; and therefore, if a ſmall ſphere of glaſs be placed upon any part of the earth's ſurface, ſo that its axis be parallel to the axis of the earth, and the ſphere hath ſuch lines upon it, and ſuch planes within it, as above deſcribed; it will ſhew the hours of the day as truly as if it were placed at the earth's center, and the ſhell of the earth were as tranſparent as glaſs. Ferguſon, ubi ſupra.

The firſt profeſſed writer on *dialling*, is Clavius; who demonſtrates all, both the theory, and the operations, after the rigid manner of the ancient mathematicians; but ſo intricately, that probably no body ever read them at all: Dechales, Ozanam, and Schottus, give much eaſier in their Courſes, and Wolfius in his Elements. M. Picard has given a new method of making large dials, by calculating the hour lines; and M. de la Hire, in his Dialling, printed in 1683, a geometrical method of drawing hour lines from certain points, determined by obſervation. Eberhardus Walperus, in 1625, publiſhed his Dialling, wherein he lays down a method of drawing the primary dials on a very eaſy foundation. The ſame foundation is deſcribed at length by Sebaſtian Munſter, in his Rudimenta Mathematica, publiſhed in 1651. Sturmius, in 1672, publiſhed a new edition of Walperus's Dialling, with the addition of a whole ſecond part, about inclining, and declining dials, &c. In 1708, the ſame work, with Sturmius's additions, was republiſhed with the addition of a fourth part, containing Picard's, and De la Hire's methods of drawing large dials, which makes much the beſt, and fulleſt book on the ſubject. Peterſon, Michael, and Muller, have each written on *dialling*, in the German tongue; Coetſius, in his Horologiographia Plana, printed in 1689; Gauppenius, in his Gnomonica Mechanica; Leybourn, in his Dialling, fol. and Bion, in his Uſe of Mathematical Inſtruments. We have a treatiſe by Mr. Deparcieux, in 1740. Mr. Ferguſon has alſo written on this ſubject in his Lectures on Mechanics.

DIALLING *Cylinder*, *Univerſal*, is repreſented by *fig.* 38. A B C D is a glaſs cylindrical tube, cloſed at both ends with braſs plates, in the centers of which a wire or axis E F G is fixed. The tube is either fixed to an horizontal board H, ſo that its axis may make an angle with the board equal to that which the earth's axis makes with the horizon of any given place, and be parallel to the axis of the world; or it may be made to move on a joint, and elevated for any particular latitude. The twenty-four hour lines are drawn with a diamond on the outſide of the glaſs, equidiſtant from each other and parallel to the axis. The XII next B ſtands for midnight, and the XII next the board H for noon. When the axis of this inſtrument is elevated according to the latitude, and the board ſet level, with the line H N in the plane of the meridian, and the end N towards the north; the axis E F G will ſerve as a gnomon or ſtile, and caſt a ſhadow on the hour of the day among the parallel hour lines, when the ſun ſhines on the inſtrument. As the plate A D at the top is parallel to the equator, and the axis E F G perpendicular to it, right lines drawn from the center to the extremes of the parallels will be the hour lines of an equinoctial dial, and the axis will be the ſtile. An horizontal plate *e f* put down into the tube, with lines drawn from the center to the ſeveral parallels cutting its edge, will be an horizontal dial for the given latitude; and a vertical plate *g c*, fronting the meridian and touching the tube with its edge, with lines drawn from its center to the parallels, will be a vertical ſouth dial: the axis of the inſtrument ſerving in both caſes for the ſtile of the dial: and if a plate be placed within the tube, ſo as to decline, incline, or recline, by any given number of degrees, and lines be drawn, as above, a declining, inclining, or reclining dial will be formed for the given latitude. If the axis with the ſeveral plates fixed to it be drawn out of the tube, and ſet up in ſunſhine in the ſame poſition as they were in the tube, A D will be an equinoctial dial, *e f* an horizontal dial, and *g c* a vertical ſouth dial; and the time of the day will be ſhewn by the axis E F G. If the cylinder were wood, inſtead of glaſs, and the parallel lines drawn upon it in the ſame manner, it would ſerve to facilitate the operation of making theſe ſeveral dials. The upper plate with lines drawn to the ſeveral interſections of the parallels, which appears obliquely in *fig.* 38. would be an equinoctial dial as in *fig.* 39. and the axis perpendicular to it be its ſtile. An horizontal dial for the latitude of the elevation of the axis might be made, by drawing out the axis and cutting the cylinder, as at *e f g h*, parallel to the horizontal board H; the ſection would be elliptic, as in *fig.* 40. A circle might be deſcribed on the center, and lines drawn to the diviſions of the ellipſe would be the hour lines; and the wire put in its place again, as E, would be the ſtile. If this cylinder were cut by a plane perpendicular to the horizontal board H, or to the line S H N, beginning at *g*, the plane of the ſection would be elliptic, as in *fig.* 41. and lines drawn to the points of interſection of the parallels on its edge would be the hour lines of a vertical direct ſouth dial, which

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might be made of any ſhape, either circular or ſquare; and F the axis of the cylinder would be its ſtile. Thus alſo inclining, declining, or reclining dials might be eaſily conſtructed, for any given latitude. Ferguſon, ubi ſupra.

DIALLING *Globe*, is an inſtrument made of braſs, or wood, with a plane fitted to the horizon, and an index; particularly contrived to draw all ſorts of dials, and to give a clear exhibition of the principles of that art.

DIALLING *Lines*, or *Scales*, are graduated lines, placed on rules, or the edges of quadrants, and other inſtruments, to expedite the conſtruction of dials.

The principal of theſe lines are, 1. A ſcale of ſix hours, which is only a double tangent, or two lines of tangents each of 45 degrees, joined together in the middle, and equal to the whole line of ſines, with the declination ſet againſt the meridian altitudes in the latitude of London, ſuppoſe, or any place for which it is made: the radius of which line of ſines is equal to the *dialling ſcale* of ſix hours. 2. A line of latitudes, which is fitted to the hour ſcale, and is made by this canon: as the radius is to the chord of 90 degrees; ſo are the tangents of each reſpective degree of the line of latitudes, to the tangents of other arches: and then the natural ſines of thoſe arches are the numbers, which, taken from a diagonal ſcale of equal parts, will graduate the diviſions of the line of latitude to any radius. The line of hours and latitudes is generally for pricking down all dials with centers. For the method of conſtructing theſe ſcales, ſee SCALE.

DIALLING *Sphere*, is an inſtrument made of braſs, with ſeveral ſemicircles ſliding over one another, on a moving horizon, to demonſtrate the nature of the doctrine of ſpherical triangles, and to give a true idea of the drawing of dials on all manner of planes.

DIALLING, in a *Mine*, called alſo *Plumbing*, is the uſing of a compaſs (which they call *dial*), and a long line, to know which way the load, or vein of ore inclines, or where to ſhift an air-ſhaft, or bring an adit to a deſired place. See MINE, and PLUMBING.

DIALOGISM, Διαλογισμος, in *Rhetoric*, is uſed for the ſoliloquy of perſons deliberating with themſelves. We have an inſtance of it in Virgil, where Dido ſays,

En quid agam? rurſuſne procos irriſa priores
Experiar? &c.

In which ſenſe, it is diſtinguiſhed from dialogue. Voſſ. Rhet. lib. v. p. 355. See DIALOGUE.

DIALOGISM is alſo taken in a more extenſive ſenſe for diſcourſe in general, whether held by a perſon alone, or in company.

DIALOGUE, a converſation of two, or more perſons, real or feigned, either by word of mouth, or in writing. The word is formed from the Latin *dialogus*, of the Greek διαλογος, which ſignifies the ſame.

Dialogue is greatly recommended by many authors, and is the moſt ancient form of writing; and that wherein the firſt authors wrote moſt of their pieces. The archbiſhop of Cambray gives a fine account of the advantages of *dialogue*, at the head of his paſtoral inſtruction. The ſacred writers, and the fathers Athanaſius, Baſil, Chryſoſtom, &c. have uſed this mode of inſtruction.

Antiquity made uſe of *dialogue*, not only on humorous, and comical ſubjects, as Lucian did, but alſo on the moſt ſerious and abſtract: ſuch are the *Dialogues* of Plato, and thoſe of Cicero, which turn altogether on ſubjects of philoſophy, or politics. Among the moderns, the principal dialogiſts are M. de Fenelon, archbiſhop of Cambray; M. Paſchal, in his Provincial Letters; F. Bouhours, in his Entretiens d'Ariſte, & d'Eugene; M. Fontenelle, in his Dialogues of the Dead, and Plurality of Worlds; Addiſon, Hurd, and Lord Lyttelton.

A *dialogue* conſiſts of two parts, an introduction and the body of the diſcourſe. The introduction acquaints us with the place, time, perſons, and occaſion of the converſation. However, the introduction ought not to be too long and tedious. Mr. Addiſon complains of this fault: for though, as he ſays, ſome of the fineſt treatiſes of the moſt polite Latin and Greek writers are in *dialogue*, as many very valuable pieces of French, Italian, and Engliſh appear in the ſame dreſs; yet in ſome of them there is ſo much time taken up in ceremony, that before they enter on their ſubject, the *dialogue* is half over. Dial. II. of Med. ap. init. As to the body of the diſcourſe, care ſhould be taken, to keep up a juſtneſs of character in the perſons that are introduced through the whole of the *dialogue*: and the characters ſhould be ſo diſcriminated, that it may be known from the words themſelves, who is the ſpeaker. The principal ſpeaker ſhould appear to be a perſon of great ſenſe and wiſdom, and intimate acquaintance with the ſubject; and he ſhould be capable of fairly anſwering every queſtion that may be aſked, and every objection that may be ſtarted. In the whole diſcourſe, all wrangling, peeviſhneſs, and obſtinacy ſhould be avoided; and nothing appear but good humour and good-breeding, with a readineſs to ſubmit to conviction, as evidence preſents itſelf. Cicero has given us two characters of this kind in Craſſus and Antony; from whom Mr. Addiſon ſeems to have taken his Philander and Cynthio, in his Dialogues on the Uſefulneſs of Ancient Medals. If younger perſons are introduced, they ſhould rather inquire than diſpute; and neither be too long nor too frequent in the queſtions they propoſe. Sulpitius and Cotta are made to ſuſtain this character by Cicero, and Eugenius by Mr. Addiſon. A perſon of humour may alſo be introduced to enliven the diſcourſe, as Cæſar by Cicero, and Cynthio by Mr. Addiſon. With regard to the ſubject of a *dialogue*, all the arguments ſhould at leaſt appear probable, and nothing be advanced, which may ſeem weak or trivial. Short and pleaſant digreſſions are allowed, but they ſhould not interrupt the thread of the diſcourſe, and break the union of the parts and conſtant reference to the main end, which are eſſential to a *dialogue*. The time allowed for a *dialogue* has been various: Cicero allows two days for his three *dialogues* concerning an orator; but Mr. Addiſon extends his to three days, allowing a day for each. The method of compoſing *dialogues* has likewiſe been various: ſometimes a writer relates a diſcourſe, by way of narrative, which paſſed between other perſons; ſuch are the *dialogues* of Cicero and of Mr. Addiſon laſt mentioned: at other times the ſpeakers are introduced in perſon; Cicero's *Dialogues* of Old Age, of Friendſhip, and of the Parts of Oratory, are written in this manner. Plato and Lucian generally chooſe this method. As for the ſtile of a *dialogue*, the low STILE is the proper character, in which they ſhould generally be written. Ward's Orat. vol. ii. p. 221, &c.

DIALOGUE, in *Muſic*, is a compoſition for at leaſt two voices, or two inſtruments, which anſwer each other; and which frequently uniting at the cloſe, make a trio with the thorough-baſs.

Such are many of the ſcenes in the Italian and French operas.

DIALTHÆA, in *Pharmacy*, an unguent, thus called from its baſis, which is root of the *althæa*, or marſhmallow.

It conſiſts of mucilages drawn from that root, and from linſeed and fenugreek ſeed. The other ingredients are common oil, wax, reſin, and turpentine.

It is eſteemed proper to ſoften, and diſſolve; aſſuage pains of the ſide, ſoften calluſes, and ſtrengthen the nerves. It is applied by rubbing it on the part affected.

DIALYSIS, in *Grammar*, a character, conſiſting of two points ·· placed over two vowels of a word, which would otherwiſe make a diphthong; but are hereby parted into two ſyllables: as in *Moſaïc*. See DIÆRESIS.

DIAMARGARITON, in *Pharmacy*, a medicine denominated from pearls, called, in Latin, *margaritæ*; which are a principal ingredient therein.

There are two kinds; the *hot*, and the *cold*: but both are diſuſed at this time.

DIAMARGARITON, *Hot*, is a powder compoſed of pearls, pellitory, ginger, nutmeg, cinnamon, and divers other hot ingredients. It is reputed hyſteric; it ſtrengthens the womb, promotes the menſes, and aſſiſts digeſtion.

DIAMARGARITON, *Cold*, is a ſolid electary, compoſed of pearls ground fine, and white ſugar diſſolved in roſe water, or that of bugloſs, and boiled to a conſiſtence. It ſtrengthens the ſtomach, moderates the too abundant acids, ſtops the ſpitting of blood, and looſeneſs of the belly.

DIAMARGARITON, *Compound cold*, is a powder made of pearls, red roſes, flowers of nenuphar, and violet, lignum aloes, red and citron ſantal, tormentil root, ſeeds of melon, endive, &c. It is cardiac and ſtrengthening, facilitates reſpiration, and corrects malignant humours.

DIAMARTYRIA, Διαμαρτυρια, in *Antiquity*, a proteſtation that the deceaſed perſon had left an heir, made to hinder the relations from entering upon the eſtate. Potter, Archæol. Græc. tom. i. lib. i. cap. 24. p. 128.

DIAMASTIGOSIS, in *Antiquity*. It was a cuſtom among the Lacedæmonians, for the children of the moſt diſtinguiſhed families to laſh and tear each others bodies with rods before the altars of the gods; the fathers and mothers, who were preſent at the ſpectacle, animating and exciting them all the while, not to give the leaſt ſign of pain, or concern. This practice they called *diamaſtigoſis*, a Greek term, derived from διαμαστιγοω, *I whip, ſcourge*. The deſign hereof, apparently, was no other than to harden their youth, and inure them betimes to blows, wounds, &c. that they might deſpiſe them when they came to war.

DIAMBRÆ *ſpecies*, in the *Materia Medica*, the name of two medicines in the London Diſpenſatory, the one called *ſpecies diambræ ſine odoratis*, the other, *ſpecies diambræ*

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ambræ cum odoratis, from the ambergriſe in their compoſition. The *ſpecies diambræ* without perfumes, is originally a preſcription of Meſue, and exactly tranſcribed from him into their firſt Diſpenſatory. This is eſteemed a great cephalic and cordial, and is frequently preſcribed in nervous decays, from apoplexies, epilepſies, palſies, and old age. It ſtrengthens the ſtomach in particular, raiſes the ſpirit, and warms the blood to a very great degree; it is thereby a provoker to venery, but more as a ſtimulus than by ſupplying any freſh recruits, or augmenting the ability. Its doſe is from ten grains to half a dram. James.

DIAMETER, from διὰ, and μετρειν, *to meaſure*, in *Geometry*, a right line paſſing through the center of a circle, and terminated on each ſide by the circumference thereof.

Or, *diameter* may be defined a chord paſſing through the center of a circle. Such is the line A E (*Tab. Geometry*, *fig.* 24.) paſſing through the center C. Hence the *diameter* is the greateſt of all chords.

Half a *diameter*, as C D, drawn from the center C to the circumference, is called the *ſemidiameter*, or *radius*.

The *diameter* divides the circumference into equal parts. And hence we have a method of deſcribing a ſemicircle upon any line; aſſuming a point therein for the center.

To find the ratio of the DIAMETER *to the circumference.* This has been greatly ſought for by the mathematicians; and no wonder; inaſmuch as if this were juſtly given, the quadrature of the circle were atchieved.

Archimedes firſt propoſed a method of finding it, by regular polygons inſcribed in a circle, till arriving at a ſide ſubtending an exceeding ſmall arch, and then ſeeking a ſide of a ſimilar polygon circumſcribed; each of theſe being multiplied by the number of ſides of the polygon, give the perimeter of the polygon both inſcribed, and circumſcribed. In which caſe the ratio of the *diameter* to the circumference of the circle, is greater than that of the ſame *diameter* to the perimeter of the circumſcribed polygon, but leſs than that of the *diameter* to the perimeter of the polygon inſcribed. The difference between both gives the ratio of the *diameter* to the circumference in numbers nearly true.

That celebrated author, as already obſerved, by polygons of 96 ſides, found the ratio of the *diameter* to the circumference to be as 7 to 22; viz. ſuppoſing the *diameter* 1, the perimeter of the inſcribed polygon is found $3\frac{10}{71}$, and that of the circumſcribed $3\frac{1}{7}$.

After his example, later authors have found out ratios yet nearer truth; Wolfius finds it as 1000000000000000 to 3141592653589793 2; but none ſpent ſo much time on it as Van Ceulen, who, after immenſe pains, found that ſuppoſing the *diameter* 1, the circumference is leſs than 3.14159265358979323846264338387950, and yet greater than the ſame number with only the laſt figure 0 changed into 1. Mr. A. Sharp doubled Van Ceulen's numbers; and this is ſo near the truth, that the *diameter* of the earth being given, we might from thence compute the number of ſands equal to the ſolid content of the earth ſo near as not to differ one grain of ſand from the truth. Mr. Machin carried them to one hundred places: thus the circumference of a circle whoſe *diameter* is 1, will be 3.14159265358979323846264338387950288419 71693993751058209749445923078164052862089986280348253421170679.

But as ſuch prolix numbers are too unwieldy for practice, many of our preſent practical geometricians aſſume the *diameter* to be to the circumference as 100 to 314; or in greater circles as 10000 to 31415; in which proportion Ptolemy, Vieta, and Huygens, agree with Van Ceulen. Ad. Metius gives us the ratio 113 to 355, which is the moſt accurate of all thoſe expreſſed in ſmall numbers; as not erring 3 in 10000000. Thoſe in common uſe are Archimedes's, Metius's, or the proportion of 1 to 3.14159.

The DIAMETER *of a circle being given, to find the circumference, and area; and the circumference being given, to find the* diameter. The ratio of the *diameter* to the circumference being had, as in the laſt article, that of the circumference to the *diameter* is had likewiſe. Then the circumference, being multiplied into the fourth part of the *diameter*, gives the area of the circle. Thus, if the *diameter* be 100, the circumference will be 314, and the area of the circle 7850. But the ſquare of the *diameter* is 10000: therefore, this is to the area of the circle as 10000 to 7850, that is, as 1000 to 785 nearly.

The area of the circle being given, to find the DIAMETER. To 785, 1000, and the given area of the circle 246176, find a fourth proportional, viz. 3113600, which is the ſquare of the *diameter*. Out of this extract the ſquare root, and it is the *diameter* itſelf.

DIAMETER *of a conic ſection*, is a right line, as A D (*Tab. Conics*, *fig.* 5.), biſecting all the ordinates M M, &c. in P, &c. See CONIC.

This, when it cuts the ſaid lines at right angles, is more particularly called the *axis of the curve*, or *ſection*.

DIAMETER, *Tranſverſe*, is a right line, as A B (*Tab. Conics*, *fig.* 6. N° 2.), which being continued each way between two curves, biſects parallel right lines between the ſame, as M M.

DIAMETER, *Conjugate*, is a right line, biſecting lines drawn parallel to the tranſverſe *diameter*. See CONJUGATE.

DIAMETER *of a ſphere*, is the *diameter* of the ſemicircle by whoſe rotation the ſphere is generated; called alſo the *axis of the ſphere*.

DIAMETER *of gravity*, is a right line paſſing through the center of gravity.

DIAMETER, in *Aſtronomy*. The *diameters* of the heavenly bodies are either *apparent*, i. e. ſuch as they appear to the eye; or *real*, i. e. ſuch as they are in themſelves.

The *apparent diameters* meaſured with a micrometer, are found different, in different circumſtances and parts of their orbits. Theſe are the angles under which the *diameters* of the planets are ſeen from the earth; and they are equal to the real *diameters* divided by the diſtance from the earth: or, as theſe angles are very ſmall, the *diameters* may be taken for arcs of a circle deſcribed on the eye as a center, with a radius equal to the diſtance of the planets; and they are ſaid to conſiſt of as many minutes and ſeconds as thoſe angles conſiſt of: therefore the *apparent diameters* of a planet are in the inverſe ratio of their real diſtances. The ſun's vertical *diameter* is found by taking the height of the upper and lower edge of his diſk, when he is in or near the meridian; the height of each edge muſt be corrected by proper allowances for parallax and refraction, and the difference between the true height of the upper and lower edge is the true *diameter*. The ſun's *apparent diameter* may be determined by obſerving with a good clock the time which the ſun's diſk takes in paſſing through the plane of the meridian, or ſome other hour circle. If the ſun is in or near the equator, the following proportion may be uſed; viz. as the time between the ſun's leaving the meridian or any other hour circle and returning to it again, is to 360 degrees, ſo is the time of the ſun's tranſit to the number of minutes and ſeconds of a degree contained in his *apparent diameter*. If the ſun is in a parallel at ſome diſtance from the equator, his *diameter* meaſures a greater number of minutes and ſeconds in that parallel than it would do in a great circle, and takes up proportionally more time in paſſing over the meridian; in which caſe ſay, as the whole ſine is to the coſine of the ſun's declination, ſo is the time of the ſun's paſſing the meridian reduced to minutes and ſeconds of a degree, to the arc of a great circle which meaſures the ſun's apparent horizontal *diameter*. See TRANSIT.

The ſun's *apparent diameter* may alſo be taken by the projection of his image in a dark room.

There are ſeveral ways of finding the *apparent diameters* of the planets: but the moſt certain method is that with the MICROMETER.

	Greateſt.			Mean.			Leaſt.		
	′	″	‴	′	″	‴	′	″	‴
Apparent Diameter *of the Sun*, according to Ariſtarchus and Archimedes,	30	0	0	30	0	0	30	0	0
Ptolemy,	33	20	0	32	18	0	31	20	0
Albatennius,	33	40	0	32	28	0	31	20	0
Regiomontanus,	34	0	0	32	27	0	31	0	0
Copernicus,	33	54	0	32	44	0	31	40	0
Tycho,	32	0	0	31	0	0	30	0	0
Kepler,	31	4	0	30	30	0	30	0	0
Ricciolus,	32	8	0	31	40	0	31	0	0
Joh. Dom. Caſſini,	32	46	0	32	13	0	31	40	0
Gaſcoigne,	32	50	0	——	——	——	31	40	0
Flamſteed,	32	48	0	——	——	——	31	30	0
Mouton,	32	32	0	——	——	——	30	29	0
De la Hire,	32	44	0	32	11	0	31	38	0
Louville,	32	37	7	32	4	36	31	32	50
M. Caſſini F.	32	37	30	32	5	0	31	32	30
Monnier,	——	——	——	32	5	0	——	——	——
Short,	32	33	0	——	——	——	31	28	0
Apparent Diameter *of the Moon*,									
according to Ptolemy,	35	20	0	——	——	——	31	20	0
In the Conjunct. Tycho,	28	48	0	——	——	——	25	36	0
In the Oppoſ.	36	0	0	——	——	——	32	0	0
Kepler,	32	44	0	——	——	——	30	0	0
De la Hire,	33	30	0	——	——	——	29	30	0
In Syzygy, Sir I. Newton,	——	——	——	31	30	0	——	——	——
In Quadrature,	——	——	——	31	3	0	——	——	——
Full, in Perigee, Mouton,	33	29	0	——	——	——	——	——	——
In Syzygy, Monnier,	——	——	——	31	30	0	——	——	——
In Quadrature,	——	——	——	31	0	0	——	——	——

Apparent

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	Greateſt.	Mean.	Leaſt.
Apparent Diameter *of Saturn*, according to Albatennius,		1 44 28	
Alfraganus,		1 44 28	
Tycho,	2 12 0	1 50 0	1 34 0
Hevelius,	0 19 0	0 16 0	0 14 0
Hortenſius,	0 42 40	0 37 0	0 31 0
Kepler,	0 30 0		
Ricciolus,	1 12 0	0 57 0	0 46 0
Huygens,			0 30 0
Flamſteed,	0 25 0		
Sir I. Newton, from the obſervations of Pound,		0 16 0	
Monnier,		0 16 0	
Saturn's Ring, according to Huygens,		1 4 0	1 8 0
Sir I. Newton, from the obſervations of Pound,		0 40 0	
Monnier,		0 42 0	
Apparent Diameter *of Jupiter*, according to Albatennius and Alfraganus,		2 36 40	
Tycho,	3 59 0	2 45 0	2 14 0
Hevelius,	0 24 0	0 18 0	0 14 0
Hortenſius,	1 1 40	0 50 0	0 38 30
Kepler,	0 50 0		
Ricciolus,	1 8 46	0 49 46	0 38 18
Huygens,			1 4 0
Flamſteed,	0 54 0		
Sir I. Newton, from the obſervations of Pound,		0 37 15	
Monnier,		0 37 0	
Apparent Diameter *of Mars*, according to Albatennius and Alfraganus,		1 34 0	
Tycho,	6 46 0	1 40 0	0 57 0
Hevelius,	0 20 0	0 5 0	0 2 0
Hortenſius,	1 4 0	0 36 0	0 9 0
Kepler,	6 30 0		
Ricciolus,	1 32 0	0 22 0	0 10 6
Huygens,			0 30 0
Flamſteed,	0 33 0		
Monnier,			0 26 0
Apparent Diameter *of Venus*, according to Albatennius,	3 8 0		
Alfraganus,	1 34 0		
Tycho,	4 40 0	3 15 0	1 52 0
Hevelius,	1 5 0	0 16 0	0 9 0
Hortenſius,	1 40 0	0 53 0	0 15 20
Kepler,	7 6 0		
Ricciolus,	4 8 0	1 4 12	0 33 30
Huygens,			1 25 0
Flamſteed,	1 12 0		
Horrox,	1 18 30		
Crabtree,	1 9 0		
Monnier,		1 17 0	
By the tranſit of 1761,		0 58 0	
By the tranſit of 1769,		0 59 0	
Apparent Diameter *of Mercury*, according to Albatennius,		2 5 20	
Alfraganus,		1 15 12	
Tycho,	3 57 0	2 10 0	1 29 0
Hevelius,	0 11 0	0 6 0	0 4 0
Hortenſius,	0 28 0	0 19 0	0 10 0
Ricciolus,	0 25 12	0 13 48	0 9 20
Bradley,	0 10 45		
Monnier,			0 10 0

The great difference between Tycho, and the other two aſtronomers, Hevelius and Huygens, is owing to this, that Tycho, in imitation of the ancients, meaſured the *diameters*, as they appeared to the naked eye; whereas they uſed teleſcopes, whereby a deal of ſpurious luſtre, which otherwiſe makes them appear bigger than they are, is taken off: nevertheleſs, the *diameters* of the planets meaſured by Huygens's method are ſomewhat bigger than they ought to be, becauſe the rays of light are inflected as they paſs by the edges of ſolid bodies, to which his method of obſerving was liable. On the other hand, Flamſtead's micrometer inflected the rays the contrary way, and gave their *apparent diameters* too ſmall; and therefore Whiſton choſe the mean between the meaſures of Huygens and Flamſtead.

The mean *diameters* of the planets as ſeen from the ſun are as follow: viz. that of Mercury, 20″; of Venus, 30″; of the Earth, 17″; of the Moon, 6″; of Mars, 11″; of Jupiter, 37″; and of Saturn, 16″. See PARALLAX.

The following table ſhews the *apparent diameters* of the ſun at different times of the year.

	′	″		′	″
January 1.	32	38.4	July 1.	31	33.8
7.	32	38.2	7.	31	34.0
13.	32	37.6	13.	31	34.4
19.	32	36.4	19.	31	34.2
25.	32	35.2	25.	31	36.2
February 1.	32	33.0	Auguſt 1.	31	38.0
7.	32	31.2	7.	31	38.8
13.	32	28.8	13.	31	41.8
19.	32	26.2	19.	31	44.2
25.	32	23.4	25.	31	46.6
March 1.	32	21.4	September 1.	31	49.8
7.	32	18.4	7.	31	52.8
13.	32	15.4	13.	31	55.8
19.	32	12.0	19.	31	58.8
25.	32	8.6	25.	32	2.2
April 1.	32	4.6	October 1.	32	5.6
7.	32	1.4	7.	32	8.8
13.	31	58.2	13.	32	12.0
19.	31	55.0	19.	32	15.4
25.	31	52.0	25.	32	18.8
May 1.	31	49.2	November 1.	32	22.2
7.	31	46.4	7.	32	25.2
13.	31	44.0	13.	32	27.6
19.	31	41.6	19.	32	30.0
25.	31	39.6	25.	32	32.2
June 1.	31	37.6	December 1.	32	34.2
7.	31	36.2	7.	32	35.8
13.	31	35.2	13.	32	37.0
19.	31	34.4	19	32	38.0
25.	31	34.0	25.	32	38.4

For the true *diameters* of the ſun, and planets, and their proportion to each other, ſee PLANETS, and SEMIDIAMETER.

DIAMETER *of a column*, is its thickneſs juſt above the baſe. From this the module is taken, which meaſures all the other parts of the column.

DIAMETER *of the diminution*, is that taken from the top of the ſhaft. See DIMINUTION.

DIAMETER *of the ſwelling*, is that taken at the height of one third from the baſe.

DIAMNES, a word uſed by Johannes Anglicus, and ſome other authors, for an involuntary diſcharge of urine.

DIAMOND, in *Natural Hiſtory*, by the ancients called *adamant*, a precious ſtone, the firſt in rank, value, hardneſs, and luſtre, of all gems.

The goodneſs of *diamonds* conſiſts in their water, or colour, luſtre, and weight. The moſt perfect colour is the white. Their defects are veins, flaws, ſpecks of red or black ſand, and a bluiſh or yellowiſh caſt.

Some chemical writers have maintained, that *diamonds* are refractory in the fire, and even apyrous: nevertheleſs, experiments have been made, which prove that they are capable of being diſſipated, not only by the collected heat of the ſun, but alſo by the heat of a furnace. A *diamond*, by expoſure to a concave ſpeculum, the diameter of which was forty inches, was reduced to an eighth part of its weight, Phil. Tranſ. N° 386.; and in ſome experiments made on precious ſtones, by order of the grand duke of Tuſcany, with a burning lens, the diameter of which was two thirds of a Florentine ell, near the focus of which was placed another ſmaller lens, it appeared, that a *diamond* weighing thirty grains, expoſed during thirty ſeconds, loſt its colour, luſtre, and tranſparency, and became of an opake white. In five minutes, bubbles appeared on its ſurface; ſoon afterwards it burſt into pieces, which were diſſipated; and the ſmall fragment which remained was capable of being cruſhed into fine powder by the preſſure of the blade of a knife. No addition of glaſs, flints, ſulphur, metals, or ſalt of tartar prevented this diſſipation, or occaſioned any degree of fuſion. Experiments were alſo made by order of the emperor Francis I. on precious ſtones, from which we find, that *diamonds* were entirely diſſipated by having been expoſed in crucibles to a violent fire of a furnace during twenty-four hours: and when they were expoſed during two hours only at a time, they were obſerved firſt to loſe their poliſh, then to ſplit into thin plates, and laſtly, to be totally diſſipated. M. D'Arcet has found, that *diamonds* may not only be perfectly diſſipated by being expoſed, in porcelain crucibles cloſe, or covered with perforated lids, to the long and intenſe heat of a porcelain furnace; but that they may be totally volatiliſed with a much inferior degree of heat, by expoſing them in a coppel under the muffle of an aſſay furnace. He obſerved in this experiment, that the diſſipation was gradual, and that it was effected by a kind of exfoliation: M. Macquer, who repeated the experiment, further obſerved,

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ſerved, that, before the diſſipation began, the *diamonds* were by the fire rendered brilliant and ſhining, with a kind of phoſphoric light. In order to determine whether *diamonds* were diſſipated by evaporation or combuſtion, Meſſrs. Lavoiſier, Macquer, and Cadet expoſed them to an intenſe heat in an earthen retort, during ſeveral hours, without any other effect than the loſs of their poliſh, and about one ſeventh diminution of their weight.

M. Mitouard put *diamonds* in a tobacco-pipe filled with pounded charcoal, and accurately cloſed with lute; and in order further to ſecure them from the acceſs of air or flame, he placed the tobacco-pipe in a crucible to which another crucible was inverted and carefully luted: the reſult was, that the *diamonds*, thus expoſed to the moſt intenſe heat, were not altered or diminiſhed; which he aſcribes not merely to the excluſion of air, but to ſome peculiar property of the charcoal; and he was confirmed in this opinion by finding, that they were not ſo well preſerved by powder of chalk, or of calcined hartſhorn. M. Cadet expoſed *diamonds* in covered and luted crucibles to the violent heat of a forge during two hours; by which operation they loſt only one ſixteenth part of their weight; and he concludes, that the deſtruction of them by fire in open veſſels is not a true volatilization, as M. D'Arcet imagines, but merely an exfoliation, cauſed by the fire expanding the air contained between the thin plates of which the ſtones conſiſt, and that by this exfoliation, the plates are reduced to ſo fine a powder as to eſcape obſervation. M. Lavoiſier has lately made ſome curious experiments on *diamonds* with Tchirnhauſen's great BURNING *lens*; from which he infers, that the *diamond* is a ſubſtance properly combuſtible, even in a moderate degree of heat; that, like other combuſtible bodies, it exhibits a black coaly matter at its ſurface; that when its combuſtion is prevented, through the want of air, it becomes almoſt as fixed in the fire as charcoal; but that in expoſing it to the extremeſt degree of heat, it is capable of being reduced in part into an incoercible vapour, or a kind of GAS, poſſeſſing the properties of that which is produced from effervеſcent and fermenting mixtures, and in metallic reductions. He alſo found, that when a *diamond* was expoſed to the focus of the lens *in vacuo*, its tranſparence was not diminiſhed; but that it was at length reduced into elaſtic or aerial vapours. Dict. Chem. Eng. ed. 1777, and Hiſt. Acad. Sc. an. 1772. Mem. 1. and 2.

In Europe, the lapidaries examine the goodneſs of their rough *diamonds*, their water, points, &c. by day-light: in the Indies, they do it by night; in order to which, a hole is made in the wall a foot ſquare, and therein a lamp is placed, with a thick wick, by the light whereof they judge of the ſtone, holding it in their fingers.

The water called *cæleſtis* is the worſt of all, and yet is ſomewhat difficult to diſcover in a rough *diamond*. The only infallible way is to examine it in the ſhade of ſome tufted tree.

The *diamond* becomes luminous in the dark by expoſure during a certain time to the rays of the ſun, by heating it in a crucible, by plunging it in boiling water, or by rubbing it with a piece of glaſs. It alſo acquires an electrical property by friction, and attracts light bodies. Dr. Wall has applied theſe properties as *criteria* for diſtinguiſhing *diamonds* from other precious ſtones; but they are not peculiar to *diamonds*, and therefore an inſufficient teſt. Phil. Tranſ. vol. iv. part 2. p. 277. See GAS, PHOSPHORUS, TOURMALIN, &c.

The *diamond* is by ſome reckoned poiſonous; others will not admit it into the liſt of poiſons. The accounts in favour of *diamonds* are more numerous, as well as more credible, than thoſe which would make us believe them to be of a poiſonous nature.

Diamonds are found in the Eaſt Indies, principally in the kingdoms of Golconda, Viſapour, Bengal, and the iſland of Borneo. There are four mines, or rather two mines and two rivers, whence *diamonds* are drawn. The mines are, 1. That of Raolconda, in the province of Carnatica, five leagues from Golconda, and eight or nine from Viſapour. It has been diſcovered about 250 years. 2. That of Gani, or Coulour, ſeven days journey from Golconda, eaſtwardly. It was diſcovered about 170 years ago by a peaſant; who, digging in the ground, found a natural fragment of twenty-five carats. 3. That of Soumelpour, a large town in the kingdom of Bengal, near the *diamond*-mine: this is the moſt ancient of them all. It ſhould rather be called that of Goual, which is the name of the river, in the ſand whereof theſe ſtones are found. Laſtly, the fourth mine, or rather the ſecond river, is that of Succudan, in the iſland of Borneo.

DIAMOND-*mine of Raolconda*. In the neighbourhood of this mine the earth is ſandy, and full of rocks, and copſe: in theſe rocks are found ſeveral little veins, of half, and ſometimes a whole inch broad, out of which the miners, with a kind of hooked irons, draw the ſand, or earth, wherein the *diamonds* are; breaking the rocks when the vein terminates, that the track may be found again, and continued. When a ſufficient quantity of earth, or ſand, is drawn forth, they waſh it two or three times, to ſeparate the ſtones therefrom: the miners work quite naked, except for a thin linen cloth before them; and, beſides this precaution, they have likewiſe inſpectors, to prevent their concealing of ſtones: which, however, in ſpite of all this care, they frequently find means to do, by watching opportunities, when they are not obſerved, and ſwallowing them down.

DIAMOND-*mine of Gani, or Coulour*. In this mine are found a great number of ſtones from ten to forty carats, and even more; and it was there that the famous *diamond* of Aureng-Zeb, the great mogul, which, before it was cut, weighed 793 carats, was found. The ſtones of this mine are not very clear; their water is uſually tinged with the quality of the ſoil; being black, where that is marſhy; red, where it partakes of red; and ſometimes green, and yellow, if the ground happen to be of thoſe colours. Another defect, of ſome conſequence, is, a kind of greaſineſs appearing on theſe *diamonds*, when cut, which takes off part of their luſtre. There are uſually no leſs than ſixty thouſand perſons, men, women, and children, at work in this mine.

When the miners have found a place where they intend to dig, they level another, ſomewhat bigger, in the neighbourhood thereof, and incloſe it with walls about two feet high, only leaving apertures, from ſpace to ſpace, to give paſſage to the water: after a few ſuperſtitious ceremonies, and a kind of feaſt, which the maſter of the mine makes for the workmen, to encourage them, every one goes to his buſineſs, the men digging the earth in the place firſt diſcovered, and the women and children carrying it off into the other, walled round. They dig twelve or fourteen feet deep, and till ſuch time as they find water; then they ceaſe digging: and the water, thus found, ſerves to waſh the earth two or three times; after which, it is let out at an aperture reſerved for that purpoſe. This earth being well waſhed, and well dried, they ſift it in a kind of open ſieve, or riddle, much as we do corn in Europe; then they thraſh it, and ſift it afreſh; and, laſtly, they ſearch it well with the hands, to find the *diamonds*. They work naked here, as in the mine of Raolconda, and are watched, after the like manner, by inſpectors.

DIAMOND-*mine of Soumelpour, or river Goual*. Soumelpour is a large town built all of earth, and covered with branches of cacao-trees: the river Goual runs by the foot thereof, in its paſſing from the high mountains, towards the ſouth, to the Ganges, where it loſes its name. It is from this river that are brought all our fine *diamond*-points, or ſparks, called *natural ſparks*. They never begin to ſeek for *diamonds* in this river till after the great rains are over, that is, after the month of December; and they uſually even wait till the water is grown clear, which is not before January: the ſeaſon at hand, eight or ten thouſand perſons, of all ages, and both ſexes, come out of Soumelpour, and the neighbouring villages. The moſt experienced among them ſearch and examine the ſand of the river; going up it from Soumelpour to the very mountain whence it ſprings. A great ſign that there are *diamonds* near, is, the finding of thoſe ſtones which we Europeans call thunder-ſtones. When all the ſand of the river, which at that time is very low, has been well examined, they proceed to take up that wherein they judge *diamonds* likely to be found; which is done after the following manner: they dam the place round with ſtones, earth, and faſcines; and, lading out the water, dig about two feet deep: the ſand, thus got, is carried into a place walled round on the bank of the river. The reſt is performed after the ſame manner as at Coulour, and the workmen are watched with equal ſtrictneſs.

DIAMOND-*mine in the iſland of Borneo, or river of Succudan*. We are but little acquainted with this mine; the prince who reigns in that part of the iſland not allowing ſtrangers to have any commerce in theſe ſtones: though there are very fine ones to be bought at Batavia, brought thither by ſtealth. They were anciently imagined to be ſofter than thoſe of the other mines; but experience ſhews, they are in no reſpect inferior to them.

Beſide theſe four *diamond-mines*, there have been two others diſcovered; one of them between Coulour and Raolconda, and the other in the province of Carnatica: but they were both cloſed up almoſt as ſoon as diſcovered: that of Carnatica, becauſe the water of the *diamonds* was always either black, or yellow; and the other, on account of their cracking, and flying in pieces when cut and ground.

Diamond-mines were diſcovered about the year 1728 in

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the Braſils belonging to the king of Portugal, who in the year 1740 let them to a company at Rio Janeiro, for a certain ſtipulated annual rent, which is ſaid to be 130,000 cruſades, on condition that the ſaid company employ no more than ſix hundred ſlaves in working them; ſince which time the value of *diamonds* is diminiſhed.

The *diamond*, we have already obſerved, is the hardeſt of all precious ſtones. It can only be cut, and ground, by itſelf, and its own ſubſtance. To bring it to that perfection which augments its price ſo conſiderably, they begin by rubbing ſeveral againſt each other, while rough; after having firſt glued them to the ends of two wooden blocks, thick enough to be held in the hand: it is the powder thus rubbed off the ſtones, and received in a little box for the purpoſe, that ſerves to grind and poliſh the others.

Diamonds are cut and poliſhed by means of a mill, which turns a wheel of ſoft iron ſprinkled over with *diamond*-duſt mixed with oil of olives: the ſame duſt, well ground, and diluted with water and vinegar, is uſed in the ſawing of *diamonds*; which is performed with an iron or braſs wire, as fine as a hair: ſometimes, in lieu of ſawing the *diamonds*, they cleave them, eſpecially if there be any viſible plates in them; but the Europeans are not uſually daring or expert enough, to run the riſque of cleaving, for fear of breaking.

DIAMOND, *Rough*, is that not yet cut, but juſt as it comes out of the mine.

A *rough diamond* muſt be choſen uniform, of a good ſhape, tranſparent, not quite white, and free of flaws and ſhivers. *Rough diamonds* are more commonly found of a ſix-pointed figure than of any other; and theſe are called *ſix-pointed rough diamonds*, the figure of which is compoſed of two ſquare pyramids, joined at their baſes. Hence the whole figure is compoſed of eight triangular faces, or planes, four of which meet in a point above the baſe, and four below it, in another point. The diſtance of theſe two points is the axis of the figure.

There are others flat, cubical, or rounded: the former are the beſt and hardeſt; the latter ſort are ſofter, and more liable to have their forms altered by attrition. *Diamonds* are ſaid to conſiſt of laminæ or plates, and probably have ſome uniform texture; becauſe lapidaries find that they may be poliſhed much more eaſily in one than in any other direction.

Black, rugged, dirty, flawey, veiny ſtones, and all ſuch as are not fit for cutting, they uſe to pound in a ſteel mortar made for that purpoſe; and, when pulveriſed, they ſerve to ſaw, cut, and poliſh the reſt. Shivers are occaſioned, in *diamonds*, by this; that the miners, to get them more eaſily out of the vein, which winds between two rocks, are often forced to break the rocks with huge iron wedges, which ſhakes and fills the ſtone with cracks and ſhivers. The ancients had two miſtaken notions, with regard to the *diamond*: the firſt, that it became ſoft, by ſteeping it in hot goat's blood; and the ſecond, that it was malleable, or bore the hammer. Experience ſhews us the contrary: there being nothing capable of molliſying the hardneſs of this ſtone; though its hardneſs be not ſuch, that it will endure being ſtruck at pleaſure with the hammer.

DIAMOND, *Brilliant*, is that cut in faces both at the top, and bottom; and whoſe table, or principal face at the top is flat.

To make a complete *ſquare brilliant*, if the rough *diamond* be not found to be of the figure here deſcribed, it muſt be made ſo. And if the work be perfectly executed, the length of the axis will be equal to the ſide of the ſquare baſe of the pyramid. Jewellers then form the table and collet, by dividing the block or length of the axis into eighteen parts. They take $\frac{5}{18}$ from the upper part, and $\frac{1}{18}$ from the lower. This gives a plane at $\frac{4}{18}$ diſtance, from the girdle for the table; and a ſmaller plane at $\frac{8}{18}$ diſtance, for the collet; the breadth of which will be $\frac{3}{5}$ of the breadth of the table. In this ſtate the ſtone is ſaid to be a *complete ſquare table diamond*.

The *brilliant* is an improvement on the table *diamond*, and was introduced within the laſt century, according to Mr. Jeffries.

To render a *brilliant* perfect, each corner of the above deſcribed table *diamond* muſt be ſhortened by $\frac{1}{20}$ of its diagonal. The corner ribs of the upper ſides muſt be flattened, or run towards the center of the table $\frac{1}{6}$ leſs than the ſides. The lower part which terminates in the girdle, muſt be $\frac{1}{3}$ of one ſide of the girdle; and each corner rib of the under ſides muſt be flattened at the top, to anſwer the above flattening at the girdle, and at bottom muſt be $\frac{1}{4}$ of each ſide of the collet.

The parts of the ſmall work which complete the *brilliant*, or the ſtar and ſkill facets, are of a triangular figure. Both of theſe partake equally of the depth of the upper ſides from the table to the girdle, and meet in the middle of each ſide of the table and girdle, as alſo at the corners. Thus they produce regular lozenges on the four upper ſides and corners of the ſtone. The triangular facets, on the under ſides, joining to the girdle, muſt be half as deep again as the above facets to anſwer to the collet part.

The ſtone here deſcribed is ſaid to be a *full-ſubſtanced brilliant*.

If the ſtone be thicker than in the proportion here mentioned, it is ſaid to be an *over-weighted brilliant*.

If the thickneſs be leſs than in this due proportion, it is called a *ſpread brilliant*.

The beauty of *brilliants* is diminiſhed by their being either over-weighted or ſpread. The true proportion of the axis or depth of the ſtone to its ſide, is as 2 to 3.

Brilliants are diſtinguiſhed into ſquare, round, oval, and drops, from the figure of their reſpective girdles.

DIAMOND, *Roſe*, is that quite flat underneath, but its upper part cut in diverſe little faces, uſually triangles, the uppermoſt whereof terminate in a point. In *roſe diamonds*, the depth of the ſtone from the baſe to the point muſt be half the breadth of the diameter of the baſe of the ſtone. The diameter of the crown muſt be three fifths of the diameter of the baſe. The perpendicular from the baſe to the crown muſt be three fifths of the depth of the ſtone. The lozenges, which appear in all circular *roſe diamonds*, will be equally divided, by the ribs that form the crown; and the upper angles, or facets, will terminate in the extreme point of the ſtone, and the lower in the baſe or girdle.

The taſte which now prevails of converting *roſe diamonds* into brilliants, is condemned by Mr. Jeffries; unleſs the *roſe diamonds* be over-weighted. He thinks, that the diſplay of beauty in *roſe diamonds*, is often preferable to that of brilliants. See his Treatiſe on Diamonds, p. 32, 35.

DIAMOND, *Table*, is that which has a large ſquare face at the top, encompaſſed with four leſſer.

DIAMONDS, *Complexions of*. The fineſt *diamonds* are thoſe of a complexion like that of a drop of the cleareſt rock-water: and if ſuch ſtones be of a regular form, and truly made, as alſo free from ſtains, fouls, ſpots, ſpecks, flaws, and croſs veins, they will have the higheſt luſtre of any, and be eſteemed the moſt perfect.

If *diamonds* be tinctured yellow, blue, green, or red, in a high degree, they are next in eſteem. But if they partake of theſe colours only in a low degree, it greatly ſinks their value.

There are other complexions of *diamonds*, ſuch as the brown, and thoſe of a dark hue; the firſt ſometimes reſemble the browneſt ſugar-candy, and the latter duſky iron. A black tinge in *diamonds* is conſidered as an imperfection, though, when the *diamond* is cut, a black foil placed under it improves its beauty; for the *roſe diamonds*, the collet or ſocket in which the ſtone is ſet, is ſpecked with ivory black in little dots; and for *brilliants*, it is all over blacked. Dr. Lewis mentions a black *diamond* cut and ſet in a ring, which at a diſtance looks uniformly black, but, on cloſer examination, appears in ſome parts tranſparent, and in others charged with foulneſs, on which the black hue depends. Commerce of Arts, p. 1637.

The *firſt water* in *diamonds* means the greateſt purity and perfection of their complexion, which ought to be that of the cleareſt drop of water.

When *diamonds* fall ſhort in this perfection, they are ſaid to be of the *ſecond* or *third water*, &c. till the ſtone may be properly called a coloured one: for it would be an impropriety to ſpeak of a *diamond* imperfectly coloured, or having other defects, as a ſtone of a *bad water* only.

DIAMONDS, *Magnitude of*. The moſt remarkable *diamonds* for ſize now known, are, that known in France under the name of *grand ſancy*, by corruption of *cent ſix*, which is one of the crown jewels, weighing 106 carats; governor Pitt's *diamond*, purchaſed by the late duke of Orleans for Louis the XV. king of France, weighing $136\frac{3}{4}$ carats, and ſaid to be bought for 125,000*l.* the *diamond* of the great duke of Tuſcany, which weighs $139\frac{1}{2}$ carats; that of the great Mogul, weighing $279\frac{2}{16}$ carats; and one mentioned by Mr. Jeffries, in a merchant's hands, weighing $242\frac{1}{16}$ carats.

DIAMONDS, *Valuation of*. The following is a rate, or manner of eſtimating the value of *diamonds*, drawn up by a perſon well verſed in ſuch matters; and which, for its curioſity, as well as the uſe it may be of to perſons who deal in precious ſtones, we judge, will not be unacceptable.

Table

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Table of DIAMONDS.

Dutch Cut.

A *Diamond* weighing 1 grain, is worth from	Lib.	Sh.		Lib.	Sh. sterl.
1½	1	16	to	1	17
2	2	15	to	3	0
2½	3	12	to	3	15
3	4	15	to	5	0
4	7	17	to	8	0
5	15	0	to	15	15
6	22	0	to	25	0
7	30	0	to	34	0
8	42	0	to	45	0
9	60	0			
10	75	0			
12	112	0	to	120	0
15	187	0	to	220	0
19	330	0	to	380	0
24	450	0			
30	700	0	to	735	0
40	1500	0	to	1800	0
50	3500	0	to	4500	0
60	4500	0	to	5620	0

Antwerp Cut.

A *Diamond* weighing 1 grain, is worth from	Lib.	Sh.		Lib.	Sh. sterl.
	0	15	to	0	18
1½	1	6	to	1	10
2	2	2	to	2	5
3	3	12	to	3	15
4	6	0	to	6	7
5	10	10	to	11	5
6	13	10	to	15	0
7	18	15	to	22	10
8	24	0	to	26	0
9	33	15			
10	37	0	to	40	0
12	55	0	to	58	0
15	112	0	to	130	0
18	247	0			
24	315	0			
40	900	0	to	970	0
50	2200	0	to	2300	0
60	3500	0	to	4500	0

Mr. Jeffries lays down the following rule for the valuation of *diamonds* of all weights. He firſt ſuppoſes the value of a rough *diamond* to be ſettled at 2*l. per* carat, at a medium; then to find the value of *diamonds* of greater weights, multiply the ſquare of their weight by 2, and the product is the value required. E. g. To find the value of a rough *diamond* of two carats, 2×2=4, the ſquare of the weight, which multiplied by 2, gives 8*l.* the true value of a rough *diamond* of two carats. For finding the value of manufactured *diamonds*, he ſuppoſes half their weight to be loſt in the manufacturing them; and therefore to find their value we muſt multiply the ſquare of double their weight by 2, which will give their true value in pounds: thus, to find the value of a wrought *diamond* weighing two carats; we firſt find the ſquare of double the weight, viz. 4×4 = 16, then 16×2 = 32. So that the true value of a manufactured *diamond* of two carats is 32*l.*

By this rule Mr. Jeffries has conſtructed tables of the price of *diamonds* from 1 to 100 carats.

According to Mr. Jeffries's rule, that the value of *diamonds* is in the duplicate ratio of their weights, and that a manufactured *diamond* of one carat is worth at a medium 8*l.* the great mogul's *diamond* muſt be valued at above 624962*l.* this being the value of a *diamond* of 279½ carats.

It muſt be obſerved, however, that defects in the water, or ſhape, red or black ſpots, ſhivers, and other failings, frequently found in theſe ſtones, reduce the price by one third, and ſometimes more.

When *diamonds* are fouled with a yellow or brown colour, it is a common practice among jewellers to put them in a fierce fire; this diveſts them of their colours, without doing them the leaſt ſenſible injury. Du-Fay, in Mem. Acad. Paris, 1735.

As to brilliant *diamonds* of very ſmall cut, the price is always leſs by one third, than that of *diamonds* of a larger cut, though the weights be the ſame: the reaſon is, that the latter ſhew themſelves a great deal more when ſet in their collets, than the former.

DIAMONDS, *Specific gravity of.* Mr. Boyle has given us the obſervation of a perſon much converſant in *diamonds*, that ſome of thoſe gems in their rough ſtate were much heavier than others of the ſame bigneſs, eſpecially if they were cloudy or foul; and Mr. Boyle mentions one that weighed 8 grains and $\frac{8}{10}$, which being carefully weighed in water, according to the rules of hydroſtatics, proved to an equal bulk of that liquor, as $2\frac{2}{3}$ to 1. So that as far as could be judged by that experiment, a *diamond* weighs not thrice ſo much as water; and yet in his table of ſpecific gravities, that of a *diamond* is ſaid to be to water as 3400 to 1000, that is, as $3\frac{2}{5}$ to 1; and therefore, according to theſe two accounts, there ſhould be ſome *diamonds* whoſe ſpecific gravity differs nearly $\frac{1}{8}$ from that of others. But this is a much greater difference than can be expected in two bodies of the ſame ſpecies, and indeed on an accurate trial does not prove to be the caſe in *diamonds*.

It is certain that there may be ſome difference in theſe trials, from the nature and temper of the water uſed in the experiments; ſome waters, as that of pumps or wells, being heavier than rain or diſtilled water; and the heat or coldneſs of the water may alſo make ſome variation: this, however, is much leſs than might be expected; careful experiments having proved, that the ſpecific gravity of any body will not differ above $\frac{1}{200}$ at moſt, on account of the difference of the water in quality and temper taken together; whereas the heavieſt and lighteſt of the *diamonds* in Mr. Boyle's and theſe experiments differ about one thirty-fifth part, which is about ſix times as much as $\frac{1}{200}$.

Mr. Ellicot, who made theſe experiments, has drawn out a table of their ſeveral differences, which is done with great care and accuracy, and taking in all the common varieties in *diamonds*, may ſerve as a general rule of their mean gravity and differences.

	In air. Grains.	In water. Grains.	Specific gravity.
Water			1000
N°1. A Brazil *diamond*, fine water, and rough coat,	92,425	66,16	3518
2. Ditto, fine water, rough coat,	88,21	63,16	3521
3. Ditto, fine bright coat,	10,025	7,170	3511
4. Ditto, fine bright coat,	9,560	6,830	3501
5. An Eaſt India *diamond*, pale blue,	26,485	18,945	3512
6. Ditto, bright yellow,	23,33	16,71	3524
7. Ditto, very fine water, bright coat,	20,66	14,8	3525
8. Ditto, very bad water, honey-comb coat,	20,38	14,59	3519
9. Ditto, very hard bluiſh caſt,	22,5	16,1	3515
10. Ditto, very ſoft, good water,	22,615	16,2	3525
11. Ditto, a large red foulneſs in it,	25,48	18,23	3514
12. Ditto, ſoft, bad water,	29,525	21,140	3521
13. Ditto, ſoft, brown coat,	26,535	18,99	3516
14. Ditto, very deep green coat,	25,25	18,08	3521
The mean ſpecific gravity of the Brazil *diamonds* appears to be			3513
The mean of the Eaſt India *diamonds*			3519
The mean of both			3517

Therefore, if any thing determinate is to be ſaid, as to the ſpecific gravity of the *diamond*, it is, that it is to water as 3517 to 1000. Phil. Tranſact. vol. xliii. for 1745. art. 19. p. 472.

Attempts have been made to produce *artificial diamonds*, but with no great ſucceſs.

The *factitious diamonds* made in France, called *temple diamonds*, on account of the Temple at Paris, where the beſt of them are made, fall vaſtly ſhort of the genuine ones; accordingly they are but little valued, though the conſumption thereof is pretty conſiderable for the habits of the actors on the ſtage, &c. See PASTES.

DIAMONDS, *Corniſh*, in *Natural Hiſtory*, a name given in England to all the ſpecies of cryſtals, which are compoſed of a column, terminated at each end by a pyramid. The name takes in two genera of cryſtal, of each of which there are ſeveral ſpecies. Dr. Hill has determined this to be the true figure of perfect cryſtal, and accounts all thoſe which are affixed by one end to ſome ſolid body, and terminated at the other by a pyramid, to be mutilated or imperfect cryſtals. The ſame author, according to the length or thickneſs of the intermediate column, has divided theſe bodies into two genera, the firſt the macroteloſtyla, the other the brachyteloſtyla. See MACROTELOSTYLA and BRACHYTELOSTYLA.

DIAMOND is an inſtrument of conſiderable uſe in the glaſs manufactory, for ſquaring the large plates, or pieces; and among glaziers, for cutting their glaſs.

Theſe *diamonds* are differently fitted up. That uſed for looking-glaſſes, and other large pieces, is ſet in an iron ferril two inches long, and a quarter of an inch in diameter. The reſt of the cavity of the ferril is filled with melted lead, which keeps the *diamond* firm in its place.

The glaziers have a handle of box, or ebony, fitted into

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the ferril to hold it by. In the former there is a little piece of box croſſing the ferril, in form of a little plane, covered at bottom with a thin copper-plate.

DIAMOND, in *Heraldry*, is uſed to expreſs the black colour in the atchievements of noblemen.

Gwillim diſlikes the way of blazoning the coats of peers by precious ſtones, inſtead of metals, or colour. But the Engliſh practice allows it. See COLOUR.

DIAMOND-*cutter*. See LAPIDARY.

DIAMOND-*glaſs*. See GLASS.

DIAMOND-*powder* is of great uſe for grinding hard ſubſtances. And Mr. Boyle obſerves, that though it be much dearer than emery, yet it makes ſo great diſpatch, and the tools employed laſt ſo much longer, as greatly to over-balance the cheapneſs of the emery.

DIAMORUM, Διαμωρον, a compoſition in pharmacy, of which there are two kinds; *ſimple*, and *compound*.

DIAMORUM, *Simple*, is the common ſyrup of mulberries, made of the juice of that fruit, boiled up with ſugar. It is good againſt diſeaſes of the throat, and to ſtop dyſenteries.

There is alſo a ſort of *ſimple diamorum* made of mulberry juice and honey, otherwiſe called *mulberry rob*.

DIAMORUM, *Compound*, is made with mulberry juice, verjuice, myrrh, and ſaffron. It is uſed to deterge phlegm from the ſtomach and breaſt, and to eaſe reſpiration.

DIANA, in *Mythology*, the daughter of Jupiter and Latona, and twin ſiſter to Apollo. She is ſaid to have been born firſt, and to have aſſiſted her mother in the delivery of Apollo. The ſufferings of Latona on this occaſion, gave *Diana* an averſion to marriage, though not to gallantry. She is accuſed of having loved and beſtowed her favours on Endymion, Pan, and Priapus. She was the goddeſs of the woods on earth, Luna in heaven, and Hecate in hell.

The moſt known character of this goddeſs is that of her preſiding over woods, and delighting in hunting. Accordingly the *Diana venatrix*, or goddeſs of the chace, is frequently repreſented in ancient ſtatues, and deſcribed by the Roman poets, as running, with her veſt ſhortened and girt about her, and yet flying back with the wind: ſhe is tall of ſtature; and her face, though ſo very handſome, is ſomewhat manly: her legs are bare, well-ſhaped, and ſtrong: her feet are ſometimes bare, and ſometimes adorned with a ſort of buſkin: ſhe often has her quiver on her ſhoulder; and ſometimes holds a javelin, but more uſually her bow in her right hand. The ſtatues of *Diana* were frequent in the woods, where ſhe is repreſented as hunting, bathing, and reſting herſelf after fatigue. *Diana* has been ſometimes repreſented with three bodies, and hence called the triple, three-headed, and three-bodied *Diana*. Her diſtinguiſhing name, under this triple appearance, is Hecate or Trivia; under which character of the infernal *Diana* ſhe was invoked in enchantments, and repreſented as a Fury, holding inſtruments of terror in her hands, and graſping cords, ſwords, ſerpents or flaming torches. When ſhe is repreſented as the intelligencer that preſides over the moon, ſhe appears in a car, drawn by ſtags, or by does, but more commonly by horſes of a perfectly white colour, with a lunar crown or creſcent on her forehead. Spence's Polymetis, p. 100, 102, 104.

She had many temples dedicated to her, of which that at Epheſus was the moſt celebrated, and eſteemed one of the wonders of the world. It was burned by Eroſtratus, or Eratoraſtus, to perpetuate his name by the action, on the day in which Alexander was born, A. M. 3648.

Apollo and *Diana* were names for the ſun and moon, and had each of them lances given them, in alluſion to the projection of their rays.

DIANA's *Tree*, *Arbor Dianæ*. See ARBOR.

DIANDRIA, in *Botany*, the ſecond claſs of plants, which have hermaphrodite flowers, with two ſtamina or male parts in each.

The word is formed of the Greek δις, *twice*, and ανηρ, *male*.

Of this claſs of plants, which comprehends three orders, viz. the *monogynia*, *digynia*, and *trigynia*, are the jeſſamine, phillyrea, olive, roſemary, &c. See *Tab. of Botany*, *Claſs* 2.

DIANTHERA, in *Botany*, a genus of the *diandria monogynia* claſs. The characters are theſe: the flower hath a permanent empalement of one leaf, which is tubulous, and cut at the top into five equal parts: the flower is of the grinning kind, having one petal with a ſhort tube; the upper lip is reflexed and bifid; the lower is divided into three parts, the middle being the broadeſt: it hath two ſhort ſlender ſtamina, adhering to the back of the petal, one of which has a twin ſummit, the other is a little taller. It hath an oblong germen ſupporting a ſlender ſtyle of the length of the ſtamina, crowned by an obtuſe ſtigma. The empalement afterward becomes a capſule with two cells, opening with two valves, which are alternately compreſſed at the top and bottom, and open with an elaſticity, caſting a ſingle ſeed out of each cell. This plant grows naturally in Virginia, and other parts of North America.

DIANTHON, from δια, and ανθος, *flower*, in *Medicine*, an antidote deſcribed by Myrepſus, from which the *ſpecies dianthus* in the London diſpenſatory was probably taken. It is thus made:

℞ Flor. roriſm. ℥i. roſar. n. & rad. glych. āā ℥vi. caryoph. arom. ſpic. nard. nuc. moſch. rad. galangal. cort. cinnamon. rad. zedoar. lign. aloes. ſem. card. min. ſem. anethi, aniſi, & macis āā ℈iv. M.

This compoſition is recommended in the cachexy.

DIANTHUS, in *Botany*, a genus of the *decandria digynia* claſs; the clove July flower, carnation, and pink. The generical characters are theſe: the flower hath a cylindrical empalement of one leaf, ſcaly below, with five petals, whoſe tails are as long as the empalement; but their upper part is broad, plain, and ſpread open. It hath ten ſtamina; in the center is ſituated an oval germen, which afterward becomes a cylindrical capſule with one cell, opening in four parts at the top, filled with compreſſed angular ſeeds. There are twelve ſpecies. See CARNATION, PINK, &c.

DIANUCUM, in *Pharmacy*, a kind of rob, made of the juice of green walnuts, and ſugar, boiled together by a moderate fire, to the conſiſtence of honey.

The word is formed from *dia*, and *nux*, *nucis*, *nut*.

It is good to ſtrengthen the ſtomach, promote ſweat, and reſiſt poiſon.

DIAPALMA, in *Pharmacy*, a deſiccative, or drying plaſter, ſaid to be ſo denominated from the wood of the palm-tree, whereof the ſpatula is to be made, that is to ſtir it while boiling. It is compoſed of common oil, hog's fat, and litharge of gold. It is good to dry, reſolve, deterge, and cicatrize; and is the plaſter moſt uſed for wounds and ulcers.

DIAPASMA, a common name for all powders ſprinkled on the body; whether as perfumes or otherwiſe.

The word comes from the Greek διαπασσειν, *inſpergere*, *to ſprinkle*.

DIAPASON, from δια, *by*, and πας, *all*, in *Muſic*, a muſical interval, otherwiſe called *octave*: ſo called, becauſe it contains all the poſſible diverſities of ſound.

The *diapaſon* is the firſt, and moſt perfect of the concords: if conſidered *ſimply*, it is but one harmonical interval; though if conſidered *diatonically*, by tones, and ſemi-tones, it contains ſeven degrees, viz. three greater tones, two leſſer tones, and two greater ſemi-tones.

The interval of a *diapaſon*, that is, the proportion of its grave ſound to its acute, is as 2 to 1.

The ancients had ſeven variations, ſchemes, figures, or ſpecies of the *diapaſon*, ariſing from the various poſitions of the tones and ſemi-tones in the ſcale.

The firſt ſpecies of the *diapaſon*, was from the hypate hypaton to the parameſe; or from B ♮ to b ♮ of our notation. It was called *myxolydian*.

The ſecond, called *lydian*, from the parypate hypaton to the trite diezeugmenon, or from C to c.

The third, called *phrygian*, from the lichanos hypaton to the paranete diezeugmenon, or from D to d.

The fourth, called *dorian*, from the hypate meſon to the nete diezeugmenon, or from E to e.

The fifth, named *hypolydian*, from the parypate meſon to the trite hyperbolæon, or from F to f.

The ſixth, called *hypophrygian*, from the lichanos meſon to the paranete hyperbolæon, or from G to g.

The ſeventh, named *hypodorian*, *common*, and *locrian*, from the meſe to the nete hyperbolæon, or from the proſlambanomenos to the meſe, that is, from our a to a a, or from A to a. Euclid. Introd. Harm. p. 15, ſeq. Bacchius, p. 18. Edit. Meibom. See DIAGRAM.

DIAPASON *diateſſaron*. The Pythagoreans did not admit this interval as a conſonance or concord; for this reaſon, that its ratio 8 : 3 was neither multiple nor ſuperparticular. But Ptolemy contends for its being a good concord, for this reaſon, that the *diapaſon* added to any concord, produces a concord. Ariſtoxenus herein agrees with him. Vide Wallis's Append. ad Ptolem. Harm. p. 155.

DIAPASON, among *Muſical Inſtrument-Makers*, is a kind of rule, or ſcale, whereby they adjuſt the pipes of their organs, and cut the holes of their flutes, hautboys, &c. in due proportion, for performing the tones, ſemi-tones, and concords, juſtly.

A ſquare being divided into eight equal parallelograms; the points wherein a diagonal interſects all theſe parallelograms, expreſs all the uſual intervals in muſic; and on this principle it is, that the *diapaſon* is founded.

There is a particular kind of *diapaſon* for trumpets; ſerving

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ing as a ſtandard, or meaſure, for the different magnitudes they muſt have to perform the four parts of muſic. There is another for ſackbuts, and ſerpents, ſhewing how far they are to be lengthened, or ſhortened, to riſe or fall from one tone or interval to another.

The bell-founders have likewiſe a *diapaſon*, or ſcale, ſerving to regulate the ſize, thickneſs, weight, &c. of their bells.

DIAPASON is alſo the name of two ſtops of an organ, viz. the open and ſtopped.

DIAPASONDIAEX, in *Muſic*, a kind of compound concord; whereof there are two ſorts: the *greater*, which is in the ratio of 10 to 3; and the *leſs*, in that of 16 to 5.

DIAPASONDIAPENTE, in *Muſic*, a compound conſonance, in a triple ratio of 9 to 3.

The *diapaſondiapente* is a ſymphony made when the voice proceeds from the firſt to the twelfth tone. The word is properly a term in the Greek muſic: we ſhould now call it a *twelfth*.

DIAPASONDIATESSARON, in *Muſic*, a compound concord, in the ratio of 8 to 3.

The *diapaſondiateſſaron* is a ſymphony wherein the voice proceeds from the firſt tone to the eleventh. This the moderns would rather call an *eleventh*.

DIAPASONDITONE, in *Muſic*, a compound concord, in the proportion of 10 to 4, or 5 to 2.

DIAPASONSEMIDITONE, a compound concord, whoſe terms are in the proportion of 12 to 5.

DIAPEDESIS, Διαπηδησις, in *Medicine*, an ouſing of blood through the coats of the veins, or arteries; occaſioned either by the blood's becoming too much diſſolved, or attenuated; or by the pores of the veſſels becoming too patent, and open.

The word is compounded of δια, *through*, and πηδαω, *I leap*.

There are ſome able phyſicians who deny there can be any ſuch tenuity of blood, as that it ſhall exude through the veſſels, without any aperture made therein.

DIAPENSIA, in *Botany*, a genus of the *pentandria monogynia* claſs: the corolla is monopetalous and ſalver-ſhaped; the calyx has five leaves imbricated with three ſmall ones; the ſtamina are laid on the tube of the corolla, and the capſule has three cells.

DIAPENTE, in the *Ancient Muſic*, an interval making the ſecond of the perfect concords; anſwering to what in the modern muſic we more uſually call a *perfect fifth*.

The word is formed of δια, and πεντε, *five*.

The *diapente* is a ſimple concord; yet, if conſidered diatonically, it contains four terms, viz. two greater tones, a leſſer tone, and a greater ſemi-tone. The *diapente* is the greater part of the diapaſon, or octave, harmonically divided. It is produced when the voice paſſes from its firſt tone to its fifth.

DIAPENTE is alſo uſed, in *Pharmacy*, for a compound of five ſeveral drugs, or ingredients.

DIAPENTE, among *Farriers*, a drink made for horſes, of gentian, round birthwort, barberries, myrrh, and ivory ſhavings, of each a like quantity, which are to be pounded ſeparately, and finely ſearced: this powder, to the quantity of two or three ſpoonfuls, is mixed with a pint and a half of muſcadine, or ſack, or, for want of either, with ſtrong ale or beer, and given in fevers, the cough, glanders, ſurfeits, inflammations, yellows, &c. It is ſaid to purify the blood from all foulneſſes, as well as to reſtrain the overflowing of the gall, working of the ſpleen, &c.

DIAPER, a ſort of linen cloth wrought with flowers and other figures.

DIAPERED, in *Heraldry*. See DIAPRE.

DIAPHANOUS, in *Philoſophy*, a thing tranſparent, or that gives paſſage to the rays of light; as water, air, glaſs, talc, fine porcelain, &c. See TRANSPARENCY.

The word is formed of δια, *through*, and φαινω, *I ſhew*.

DIAPHANEITY, in the ſchools, the quality of a tranſparent body; or that which denominates it ſuch. See TRANSPARENCY.

DIAPHŒNIC, *Diaphœnicum*, in *Pharmacy*, a ſoft, purgative electary; thus called from the dates, which make its baſis; the palm-tree, whoſe fruit they are, being called by the Greeks φοινιξ. See DATE.

The other ingredients are, penidies, almonds, turbith, ginger, white pepper, mace, cinnamon, rice, fennel, carrot-ſeeds, and honey.

The *electarium diaphœnicum* purges chiefly ſeroſities, and excites the menſes. It is alſo uſed in dropſies, lethargies, apoplexies, and palſies.

DIAPHONICS, from δια, *through*, and φωνη, *ſound*, is ſometimes uſed for the ſcience of refracted ſound, as it paſſes through different mediums.

DIAPHORESIS, Διαφορησις, from διαφερω, *I diſſipate*, in *Medicine*, includes all diſcharges through the ſkin; both ſenſible, and inſenſible: whence *diaphoretic*, &c. See PERSPIRATION.

DIAPHORETIC, in *Medicine*, is applied to remedies that promote the expulſion of humours by inſenſible perſpiration.

Diaphoretic is much of the ſame import as *ſudorific*: except that the latter promotes ſenſible, and the former inſenſible perſpiration. Their only difference, therefore, is in the degree of activity.

DIAPHORETIC *antimony*, or *mineral diaphoretic*, is a preparation of antimony, the proceſs whereof ſee under ANTIMONY.

DIAPHRAGM, *Diaphragma*, in *Anatomy*, a part, popularly called the *midriff*, and by anatomiſts, *ſeptum tranſverſum*. It is a nervous muſcle, ſeparating the breaſt, or thorax, from the abdomen, or lower venter; and ſerving as a partition between the natural, and the vital parts as they are called.

It was Plato, as Galen informs us, that firſt called it *diaphragm*, from the verb διαφραττειν, *to ſeparate*, or *be between two*. Till his time it had been called φρενες, *underſtanding*; from a notion, that an inflammation of this part produced phrenſy: which is not at all warranted by experience, no more than that other tradition, that a tranſverſe ſection of the *diaphragm* with a ſword, cauſes the patient to die laughing.

Its figure is round, reſembling a ray-fiſh, or thornback. It is a double and digaſtric muſcle, conſiſting of two circles, which are both muſcular; of two arteries; and two veins, called *phrenicæ*; and ſeveral branches of nerves. The firſt, or ſuperior circle, called the great muſcle of the *diaphragm*, is fleſhy in its circumference, and tendinous and aponeurotic in the middle; it ariſes from the ſternum, and the ends of the laſt ribs, by radiated fibres: the ſecond, or inferior, called the ſmall muſcle of the *diaphragm*, is thicker than the other, of leſs extent, and of an oblong form; it comes from the vertebræ of the loins by two tendons, called *cruræ*. The upper is covered at the top with a membrane derived from the *pleura*; and the lower is lined at bottom with another from the *peritonæum*.

Its ſituation is oblique, being extended from the *cartilago xiphoides*, by the extremes of the ribs, to the region of the loins. It is pierced in the tendinous part with a round opening for the paſſage of the *vena cava*, which being incapable of contractions, occaſions no interruption to the circulation; and in its fleſhy part for the *œſophagus*, and with another forked opening, partly fleſhy and partly tendinous, for the *aorta*; and between the productions of the inferior circle paſs the *aorta*, which lies in the interſtice between its two *crura*, thoracic duct, and *vena azygos*. In its natural diſpoſition it is convex on the upper ſide towards the breaſt, and concave on the lower towards the belly. Hence it has two motions; the one of contraction, the other of relaxation.

By the contraction, or ſwelling of the fibres, the *diaphragm* becomes flat on each ſide; the conſequence of which is, that the cavity of the breaſt is enlarged, to give liberty for the lungs to receive the air in inſpiration; and the cavity of the abdomen is leſſened, and, conſequently, the ſtomach and inteſtines preſſed, for the diſtribution of the chyle. In its relaxation, whereby it reſumes its natural ſituation, the cavity of the breaſt is diminiſhed, and the lungs preſſed for the expulſion of the air in expiration. See RESPIRATION.

On the *diaphragm*, alſo, in great meaſure, depend the actions of coughing, ſneezing, yawning, laughing, the hiccough, &c. between which motions there is ſome connexion cauſed by the communication of the nerves of different parts, which meet in the *diaphragm*.

Dr. Hook obſerves, that an animal may be kept alive, without thorax, or *diaphragm*, by blowing air into the lungs with a bellows; of which he had made the experiment.

Mr. Senac has given us a new deſcription of the ſtructure of the *diaphragm*, with remarks on the action of this muſcle. See Mem. Acad. Scienc. 1729.

DIAPHRAGM is uſed for the *ſeptum ſcroti*. See SCROTUM.

DIAPHRAGM is alſo a general name, given to all partitions, or ſeparations between two parts of a thing; as the little perforated partitions in the tubes of long teleſcopes.

DIAPHRAGMATIC, is applied to the arteries, veins, and nerves, diſtributed through the *diaphragm*.

They are alſo called *phrenic*, or *phrenetic*.

DIAPHTHORA, from διαφθειρειν, *to corrupt*, is uſed by Galen and Boerhaave to denote the corruption of the aliments in the ſtomach, and by Hippocrates for the corruption of the fœtus in the womb, and abortion.

DIAPORESIS, Διαπορησις, in *Rhetoric*, is uſed to expreſs the heſitation or uncertainty of the ſpeaker.

We have an example in Homer, where Ulyſſes going to relate his ſufferings to Alcinous, begins thus:

Τι πρωτον, τι δ' επειτα, τι δ' υστατιον καταλεξω?
Quid primum, quid deinde, quid poſtremo alloquar?

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This figure is moſt naturally placed in the exordium or introduction to a diſcourſe. See DOUBTING.

DIAPRE', or DIAPERED, in *Heraldry*, a dividing of a field into planes, or compartments, in the manner of fret-work; and filling it with variety of figures.

This chiefly obtains on bordures, which are *diapered*, or fretted over, and the frets charged with things proper to bordures; as in *Tab. Herald. fig.* 18.

DIAPRUNUM, in *Pharmacy*, a ſoft, purgative electary. thus called from the pulp of Damaſcus prunes, which make its baſe.

Diaprunum is either *ſimple* or *compound*.

DIAPRUNUM, *Simple*, or *lenitive*, conſiſts of the pulp aforementioned, with caſſia, tamarinds, rhubarb, red roſes, violet ſeeds, ſaunders wood, both red and citron, ſcrapings of ivory, liquorice juice, and the four cold ſeeds. It is good to prepare, and ſoften the humours.

DIAPRUNUM, *Compound*, or *ſolutive*, is only the ſimple, with the addition of half an ounce of ſcammony to every pound of the electary, to render it more purgative.

DIARRHODON, Διαῤῥόδον, in *Pharmacy*, a name given to divers compoſitions, wherein roſes are a principal ingredient.

The word is formed of δία, and ῥοδον, *roſe*.

DIARRHODON *Abbatis*, is a cordial powder, ſo denominated from an abbot who invented it. It conſiſts of red roſes, red and citron ſaunders, lignum aloes, cinnamon, rhaponticum, ſpikenard, ivory, hartſhorn, ſaffron, maſtich, pearls, ambergriſe, muſk, &c. It is uſed to ſtrengthen the heart, ſtomach, and liver, to aſſiſt in digeſtion, and to prevent vomiting.

There are alſo *Trochiſci* DIARRHODON, compoſed of red roſes, ſhavings of ivory, the ſaunders, liquorice, maſtich, ſaffron, camphor, and roſe-water. They are good to fortify the heart, ſtomach, and liver, and to ſtop dyſenteries, and other fluxes of the belly.

DIARRHODON, *Pilulæ*, are compoſed of aloes, trochiſci *diarrhodon*, wormwood leaves, maſtich, and rock-ſalt. They firſt purge, then fortify the ſtomach, promote digeſtion, and prevent a ſtinking breath. But all theſe compoſitions are out of uſe at preſent.

DIARRHOEA, Διαῤῥοια, in *Medicine*, a looſeneſs, or flux of the belly; or a profuſe evacuation of liquid excrements by ſtool.

The word is formed of the Greek δία, *through*, and ῥεειν, *to flow*.

The word, in the general, is uſed for any kind of flux of the belly; but properly for that wherein the humour, or excrement, flows out either pure, or mixed, with or without pain, in a fluid ſtate.

The *diarrhœa*, looſeneſs, or purging of the bowels, as it is uſually called by us, is properly an increaſed periſtaltic motion of the guts, by means of which nature attempts to throw off a mucous or bilious matter lodged in too great a quantity in the *primæ viæ*, and diſturbing her regular operations.

Diarrhœas are of divers kinds, diſtinguiſhed by the diverſity of the excrements; ſome being bilious, ſome ſerous, ſome pituitous, and ſome purulent.

The purulent always ariſe from ſome abſceſs burſt in the body; the reſt either from morbid humours irritating the inteſtines, and expreſſing the juices out of the adjacent parts; or from a laxneſs of the inteſtinal fibres; or an extraordinary fermentation in the blood, whereby it diſcharges its excrements into the inteſtines.

If this diſorder is attended with pain, it is ſometimes called a colic. When the evacuations are fluid, but partly indigeſted, it is called *cœliaca paſſio*. When the aliment is carried through the bowels, and ejected in an indigeſted ſtate, or nearly ſo, it is called *lienteria*; all which are only different degrees of the ſame diſorder.

DIARRHOEA, *Signs of a*. The ſigns which precede a *diarrhœa* of any kind are uſually a tenſive pain and rumbling, and noiſe in the abdomen, and pungent acute pains, particularly about the region of the navel. The appetite is uſually very bad in the beginning of a *diarrhœa*, and in its future ſtages the ſtrength fails; and the longer it continues, the worſe ſymptoms it brings on: a teneſmus is one common complaint, and the head is weakened and aches at times; and, finally, an internal heat is felt, which is a very bad ſymptom, and threatens miſchiefs of various kinds.

DIARRHOEAS, *Perſons moſt ſubject to*. The ſimple *diarrhœa*, in which a mucous and ſerous matter is voided, is principally a diſeaſe incident to people of phlegmatic habits, whoſe ſtools are generally watery. When this kind of *diarrhœa* obſerves any regular period, it is a ſign of a ſanguine temperament in the perſon. The bilious *diarrhœas* are moſt frequent with perſons of choleric habits; and the critical *diarrhœas* in fevers uſually happen to perſons of a ſanguine one. Perſons of tender and delicate conſtitutions, if they walk about a room when hot with their feet naked, are uſually affected afterwards with a ſimple *diarrhœa*.

DIARRHOEAS, *Cauſes of*. The immediate cauſe is irritation in the inteſtines. Among the principal cauſes of this preternatural irritation, may be reckoned the ſudden repreſſion of ſweats in a morning, while the perſon is in bed: it is a ſtanding obſervation, that ſuch as perſpire but little, are ever ſubject to a *diarrhœa*; and on the contrary, people who perſpire much are commonly coſtive.

Crude foods, and ſuch as are difficult of digeſtion, often throw people into *diarrhœas*, as alſo over-fat meats, eſpecially if perſons drink much after them; and nothing ſo frequently as the free eating of ſummer-fruits, eſpecially if the perſon chance to ſwallow a quantity of any thing liquid ſoon after them.

Feculent or fermenting liquors will alſo do it, and ſometimes the drinking cold liquors in a large quantity, or even the external cold; but in this caſe the tender habit of the patient is as much to be accuſed as any thing.

The cauſe of a lienteric *diarrhœa* is principally the cicatrizing of the bowels after their eroſion in a dyſentery, in which the lacteal veſſels have been alſo injured. The cœliac *diarrhœa* is uſually laid upon a fault in the ſtomach; but it is as often owing to an obſtruction of the lacteal veſſels, as to a weakneſs of that organ. The choleric *diarrhœa* is uſually occaſioned by an effuſion of a larger portion than uſual of bile into the inteſtines, and this is often occaſioned by a violent fit of paſſion in the perſon. Junker's Conſp. Med. p. 553.

Baglivi mentions *diarrhœas* as one uſual great effect of grief; as likewiſe of immoderate anger; without which a fever would, in theſe caſes, be produced.

DIARRHOEAS, *Prognoſtics in*. All *diarrhœas* are diſeaſes of the greateſt conſequence when improperly treated, or raſhly and ſuddenly ſtopped by opiates and aſtringents. On the contrary, the whole courſe of a ſimple *diarrhœa*, if nature be left to herſelf, is attended with no danger. When the moſt ſimple, and, in itſelf, innocent *diarrhœa* is treated in that manner, the conſequences are violent and pungent pains in the abdomen; and, in old people eſpecially, a tranſlation of the matter which nature would have carrried off by that ſoft way, to the head and breaſt; whence vertigoes and ſuffocative catarrhs are often brought on, and the perſons die ſuddenly, and as it is ſuppoſed of apoplexies. The danger of ſtopping a bilious *diarrhœa* is ſtill greater, for the frequent conſequence of this is a cauſus or other violent fever of that kind; but the greateſt danger of all attends the ſtopping of a critical *diarrhœa*. The ſymptomatic *diarrhœas* in the ſmall-pox, meaſles, and purple fevers are often of fatal conſequence. Periodic *diarrhœas*, if nature be left to herſelf, are always ſalutary. The ſimple lienteric and cœliac *diarrhœas* uſually give way eaſily to medicines; and the choleric are of no dangerous conſequence, unleſs they are attended with a fever. Finally, it is to be obſerved, that any *diarrhœa* continuing an immoderate time, will by degrees waſte the ſtrength, and throw the patient into a ſlow fever and an atrophy.

DIARRHOEAS, *Method of curing*. In a ſimple *diarrhœa*, the firſt intention is to incide and attenuate the mucous matter, and then to abſterge it by digeſtive, reſolvent, and colliquating medicines; ſuch are the bitters and aromatics, with ſome of the acrid ones, as the roots of gentian, arum and zedoary, together with ginger, galingals, and the aromatic ſeeds. Theſe may be aſſiſted by the digeſtive ſalts, as cream of tartar, *arcanum duplicatum*, and vitriolated tartar, with the fixed ſalts of wormwood, and the like. To theſe may be added occaſionally the digeſtive and attenuating gums, as ammoniacum, and the like; and in ſome caſes it is proper to reduce the vicious matter into a ſort of pulpy conſiſtence. This is to be done by the abſorbents, as crabs-eyes, and the like. When there is a quantity of a bilious matter mixed with this, the admixture of ſmall doſes of nitre with the other medicines is of great effect; and when the peccant matter is by this means prepared for evacuation, nature is to be aſſiſted in her attempt to throw it off by this proper paſſage, by ſmall doſes of gently laxative medicines, ſuch as rhubarb, and the like. After this, if the motion of the bowels doth not abate and come to its uſual ſtandard on their being thus eaſed of their load, theſe ſymptoms are to be taken off by gentle aſtringents. For though theſe motions were no way to be impeded, when nature meant them for the throwing off what offended her, and were ſalutary in that ſtate; yet when they remain after the end is obtained, they are to be conſidered as a diſeaſe. The medicines proper on this occaſion are dried quinces, the abſorbent powders, ſuch as red coral, and the like, gentle opiates, and the aſtringent ſyrups of cinnamon, and the like; and finally, the

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cure is to be completed by reſtoring the bowels to their due tone by gentle chalybeates.

Putrid *diarrhœas*, which often occur in the laſt ſtage of malignant fevers, have been checked, and in ſome caſes removed, by injecting clyſters of *fixed* AIR every two or three hours, and by ſupplying the patient plentifully with water impregnated with this air. Prieſtley on Air, Appendix, containing Obſervations of Dr. Percival, p. 304, &c.

The lienteric and cœliac *diarrhœas* require the ſame method of treatment with the ſimple, except that in the lienteric a vomit in the beginning is uſually very proper: but in the cœliac, when there is an obſtruction of the lacteal veſſels, a vomit has no uſe; but the reſolvents, aperients, and laxatives alone are to be depended upon.

Periodic *diarrhœas* are to be treated in this manner like the ſimple ones, and nature is to be aſſiſted, not checked, in her operations in them. In theſe caſes a medicated wine prepared with rhubarb, gentian, zedoary, and black hellebore, is a very valuable medicine. When worms are ſuſpected to be in the caſe, as they very frequently are, the uſual anthelmintics are to be joined to the medicines before directed.

The critical and ſemicritical, as well as ſymptomatic *diarrhœas* in fevers, are to be treated as directed under the fevers to which they belong; and the icteric *diarrhœa*, in which the ſtools are white as in the jaundice, is to be treated as the jaundice. See FEVER, INFANT, WORMS, &c.

In the cure of *diarrhœas*, from whatever cauſe they ariſe, the ſtomach muſt be corroborated, and ſudorifics are to be mixed with abſorbents. The patient is to drink ſparingly. His common drink may be the white decoction, or camomile tea, and his diet preparations of rice. Quince and wine burnt with aromatics is good. Wainwright obſerves, that a flannel ſhirt contributes much to the cure of an habitual *diarrhœa*.

DIARTHROSIS, in *Anatomy*, a kind of articulation, or juncture of the bones, which being pretty lax, affords room for a manifeſt motion. See ARTICULATION.

The word comes from διὰ, and ἄρθρον, *juncture, aſſemblage*.

It is oppoſed to ſynarthroſis, wherein the articulation is ſo cloſe, that there is no ſenſible motion at all.

In the *diarthroſis*, or moveable articulations of the bones, the pieces are really ſeparated, and the parts in which they touch are each of them covered by a ſmooth cartilage, by means of which they eaſily ſlide over one another; whereas in the ſynarthroſis, or immoveable articulation, the pieces are joined together in ſuch a manner, that the parts in which they touch have nothing particular in their ſurface, and cannot ſlide upon one another.

The *diarthroſis* is either manifeſt with large motion, or obſcure with ſmall motion. The former kind of *diarthroſis* is of three kinds: 1. When the head of the bone is big, and long, and the cavity that receives it, deep; it is called *enarthroſis*, or orbicular *diarthroſis*: ſuch is that of the thigh, with the hip. 2. When the head of the bone is flat, and the cavity that receives it, ſuperficial; it is called *arthrodia*, and planiform *diarthroſis*: ſuch is that of the jaws, with the bones of the temples. 3. When two bones receive each other reciprocally, and are moveable in each other; it is called *ginglymus*, and alternative or reciprocal *diarthroſis*: thus the cubitus receives the radius, at the ſame time that the radius receives the cubitus.

DIARTHROSIS *ſynarthroidalis*, called alſo *amphiarthroſis*, is a kind of neutral, or dubious articulation; being neither abſolutely *diarthroſis*, as not having a manifeſt motion; nor abſolutely *ſynarthroſis*, as not being quite immoveable.

Thus the articulations of the ribs with the *vertebræ*, and thoſe of the bones of the *carpus*, and *tarſus*, among each other, are *ſynarthroidal diarthroſes*.

DIARY, a term ſometimes uſed for a journal, or day-book, containing an account of every day's proceedings. Thus we ſay *diaries* of the weather, &c.

DIARY *fever*, is a fever of one day. See EPHEMERA.

DIASCHISM, *Diaſchiſma*, in *Muſic*, the difference between the comma and enharmonic dieſis. This is expreſſed by the ratio $\frac{2048}{2025}$.

Mr. Euler has taken this term in the ſenſe here mentioned. Others call it the leſſer comma. The octave contains 61 *diaſchiſms* nearly. Tentam. Nov. Theor. Muſic. p. 107 & 112. See COMMA.

DIASCORDIUM, in *Pharmacy*, a kind of electary, firſt deſcribed by Fracaſtorius, and denominated from *ſcordium*, which is a chief ingredient therein. It is alſo called *confectio Fracaſtorii*.

The other ingredients are red roſes, bole, ſtorax, cinnamon, caſſia lignea, dittany, tormentil roots, biſtort, gentian, galbanum, amber, terra ſigillata, opium, long pepper, ginger, mel roſatum, and Malmſey wine.

It is an aſtringent, and is uſed againſt malignant fevers, the plague, worms, the colic, and to provoke ſleep, and reſiſt putrefaction.

DIASEBESTEN, in *Pharmacy*, a ſoft, purgative electary, whereof ſebeſtens are the baſis.

The other ingredients are prunes, tamarinds, juices of iris, anguria, and mercurialis, penidies, ſimple diaprunum, violet-ſeed, the four cold ſeeds, and diagrydium.

It is good in intermitting and continued fevers, appeaſes thirſt, promotes ſleep, and expels the morbid humours by urine.

DIASENNA, in *Pharmacy*, a ſoft, purgative electary, thus called from *ſenna*, which is its baſe.

The other ingredients are ſugar-candy, cinnamon, lapis lazuli, ſilk, cloves, galanga minor, black pepper, nardus Indica, ſeed of baſilicum, flowers of cloves, cardamoms, ſaffron, ginger, zedoary, roſemary flowers, long pepper, lapis Armenus, and honey.

Diaſenna eaſes and comforts the melancholic and ſplenetic; and is good againſt all diſeaſes ariſing from an atra bilis.

DIASIA, Διάσια, in *Antiquity*, a feſtival at Athens in honour of Jupiter, ſurnamed Μειλιχίῳ, i. e. *the propitious*. Pott. Archæol. lib. ii. cap. 20.

DIASTASIS, from διίστημι, *I ſet apart*, a word uſed by the writers in medicine in many different ſenſes. It is frequently uſed as a name for that ſeparation of the bones, when they naturally recede from one another. Sometimes it is uſed as the term for an interſtice, as that between the *ulna* and *radius*, or between the *tibia* and *fibula*. Sometimes it is put for a diſtenſion of the muſcles in convulſions; and, when applied to the ſtomach, it is made to ſignify an inclination to vomit.

DIASTEM, *Diaſtema*, in *Muſic*, a name the ancients gave to a ſimple interval, in contradiſtinction to a compound interval, which they called a *ſyſtem*.

Ariſtoxenus enumerates many differences of intervals: ſuch as greater, or leſs; conſonant, or diſſonant; compounded, or uncompounded; related to one genus, or to another; laſtly, rational or irrational. Ariſtox. ap. Wallis. Append. ad Ptolem. Harmon. p. 154.

Muſicians divide intervals into two kinds: one of them called *ſyſtem*, which is to contain at leaſt two intervals in any kind of muſic whatever; but many contain more.

The other, called *diaſtem*, is a mere, or ſingle interval; the proper ſignification of the Greek διάστημα, being *interval*.

DIASTOLE, in *Anatomy*, expreſſes that motion of the heart, and arteries, whereby thoſe parts dilate, or diſtend themſelves: the other oppoſite motion being called the *ſyſtole* of the heart, and arteries; wherein they contract themſelves. See ARTERY, and HEART.

The word is Greek, formed from the verb διαστέλλειν, *to ſeparate, open, dilate*.

The *diaſtole* of the heart is properly the receſs of the parietes of the two ventricles from each other; or the enlargement of their cavities, and diminution of their lengths, and their approximation to a ſpherical form.

The *diaſtole*, or dilatation of the heart, ariſes from the blood being brought, by the veins, into its ventricles; and that of the arteries, from the blood being thrown into their cavities by the contraction of the heart. So that the *diaſtole* of the heart, and arteries, is not effected at the ſame time; the *diaſtole* of the heart happening when the arteries are contracted, and that of the arteries when the heart is contracted.

What we call the beating of the pulſe is only the *diaſtole* of the arteries.

The lungs and breaſt have likewiſe their ſyſtole and *diaſtole*; ſo has the brain.

The true cauſe of the *diaſtole* of the heart was not well accounted for before Dr. Drake: that the heart is a muſcle, is made evident beyond all doubt by Dr. Lower; and that the motion of all muſcles conſiſts in conſtriction, is not to be doubted. By ſuch means the ſyſtole is eaſily accounted for.

But inaſmuch as the heart has no antagoniſt muſcle, the *diaſtole* has puzzled men of the greateſt genius. Dr. Lower unhappily attributes it to a motion of reſtitution. *A nullo enim cordis motu, niſi tenſionem ejus remittente, & ab irruente ſanguine*, diaſtole, *ejus libratis vicibus ſuccedit*. De Corde, p. 75.

Mr. Cowper accounts for the *diaſtole* from the analogy the heart of an animal bears to the pendulums of thoſe artificial automata, clocks and watches: its motion, he ſays, is performed like that of other muſcles, the blood doing the office of a pondus, or weight.

Both theſe notions Dr. Drake refutes; and with great reaſon and probability maintains the weight of the atmoſphere to be the pondus, or counterpoiſe, to the contractile

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tractile force of the heart. He has found that reſpiration has an effect upon the heart in this ſenſe which had not been underſtood before. The ſyſtole being the proper motion of the heart, a ſtate of contraction by means of that ſyſtole muſt needs be its natural ſtate, and conſequently no motion of reſtitution natural, and without external violence it could have no *diaſtole* at all.

This will appear more plain, if we conſider the circumſtances of the heart, and its motion as a muſcle, with reſpect to other muſcles. That contraction is the proper action and natural ſtate of all muſcles, is evident from experience as well as from reaſon: for if any muſcle be freed from the power of its antagoniſt, it is immediately contracted; and is not, by any action of the will or ſpirits, to be reduced to a ſtate of dilatation: thus, if the *muſculi flexores* of any joint be divided, the *extenſores* of that joint, the oppoſite muſcles to the *flexores*, being freed from the contrary action of their antagoniſts, will exert themſelves; the joint will be extended without the conſent of the will, and it will continue in that poſture: and, on the other hand, if the extenſors are divided, the contractors will of themſelves exert their force, and the limb will be contracted without the conſent of the will, and it will continue in this poſture. It is very evident from all this, that the muſcles of the human body have no reſtitutionary power of their own, but that all power of this kind in them is derived from the action of their antagoniſts, by which they are balanced: thus likewiſe the ſphincters of the *gula*, *anus*, and *veſica*, having no proper antagoniſts, are always in a ſtate of contraction, and ſuffer nothing to paſs through them, but what is forced on by the action of other ſtronger muſcles; which, though not properly antagoniſts to theſe, yet, on all neceſſary occaſions, perform the office of ſuch.

The heart is a ſolitary muſcle: it has no antagoniſt, and is not under the direction of the will: as it performs alſo no voluntary motion, it in all things approaches more to the nature of the ſphincter muſcles, than to any kind beſides; but, in its conſtant actions of contraction and dilatation, it differs exceedingly from all the muſcles of the body. This reciprocal motion of the heart has given the learned abundance of trouble, who finding nothing peculiar in the ſtructure which ſhould occaſion it, nor any antagoniſt whoſe relation ſhould produce it, have been extremely perplexed to find out the cauſe of it.

Lower having proved the heart a muſcle, and eſtabliſhed the manner of its muſcular motion, takes notice of no farther aſſiſtance that it receives for the performing this, than what it has from the brain, by means of the eighth pair of nerves. Borelli, in his Animal Oeconomy, computes the motive power of the heart to be equal to, at leaſt, that of a weight of three thouſand pounds. The obſtacles to the motion of the blood, through the arteries, he eſteems equivalent to one hundred and eighty thouſand pounds, which is ſixty times as much as he rates the force of the heart at; then deducting forty-five thouſand pounds, for the adventitious help of the muſcular elaſtic coat of the arteries, he leaves the heart, with the full force of three thouſand pounds, to overcome the reſiſtance of a hundred and thirty-five thouſand pounds; that is, with one, to remove forty-five. This ſtupendous effect, he ſatisfies himſelf with aſcribing to the energy of percuſſion; but, had he proceeded in his calculation to the veins, which he allows to contain conſtantly a quantity of blood quadruple to the contents of the arteries, and to which this energy of percuſſion does not either reach at all, or but very languidly, he might probably have ſeen a neceſſity of ſome other expedient, to remove ſo inſuperable a difficulty.

But not to inſiſt regularly on the exactneſs of this computation, we may allow a much greater deduction than would be juſtifiable, without leſſening the difficulty. Dr. Lower, notwithſtanding the care and ſagacity with which he examined this ſubject, ſeems to have overlooked ſomething of very great moment, in the explication of the action of the heart; for, though it ſhould be granted, that the muſcular fibres of the heart, acted by the nerves, are the immediate inſtruments of its ſyſtole or contraction, yet it muſt not be denied that the intercoſtal muſcles and diaphragm are of great ſervice, to aid and facilitate this contraction, by opening a paſſage for the blood through the lungs, which denied, would be an invincible obſtacle: neither do the lungs promote the motions of the heart in that way only, but the manner in which they aſſiſt the heart in its contraction, will appear manifeſtly, if we conſider the different poſture, ſituation, and capacity of the blood veſſels of the lungs, in the ſeveral times of elevation and depreſſion of the *coſtæ*.

The pulmonary artery riſes from the right ventricle of the heart, and runs in one trunk, till it comes to the *aſpera arteria*, where it is divided, and ſends a branch along with each diviſion of the *aſpera arteria*; according to all the minuteſt ſubdiviſions of which, it is alſo ſubdivided, accompanying all the *bronchi* in their paſſage through the lungs.

The pulmonary vein, which empties itſelf into the left ventricle of the heart, ſpreads itſelf on the *aſpera arteria* and *bronchi*, and continues its progreſs in the ſame manner in which the artery does. The neceſſary conſequence of this diſpoſition is, that this artery and vein, being co-extended with, and faſtened to the *bronchi*, muſt needs ſuffer ſuch alteration of ſuperficial dimenſions, as the *bronchi* do in the elevation and depreſſion of the *coſtæ*; while the ribs are in a ſtate of depreſſion, whether before commerce with the external air, or after the annular cartilages of the *bronchi* ſink into one another, and by that means their dimenſions are exceedingly contracted; in conformity to this condition of the *bronchi*, the pulmonary artery and vein muſt likewiſe either by means of their muſcular coats, contract themſelves to the ſame dimenſions, or lie in folds or corrugations, which is much leſs probable.

On the other hand, when the ribs are elevated, and the diaphragm bears downward, the air ruſhing into the lungs, ſhoots out the cartilaginous rings, and divaricates the branches of the *tracheæ*, and by them extends and divaricates the ſeveral diviſions of the pulmonary artery and veins, and thereby lengthens and enlarges their cavities. This enlargement of their cavities is very conſiderable, not only upon the ſcore of the addition which they receive in length thereby, but alſo on account of their divarication; for whereas, when the ribs are depreſſed, and the lungs ſubſide, the blood-veſſels are not only contracted, but their branches, which are exceeding numerous, approach one another, and lie in juxta poſition, by which their cavities are very much compreſſed and ſtraitened: when the ribs are elevated, and the lungs turgid with air, not only the fibres, by which their coats in the oppoſite ſtate were contracted, are extended, but thoſe innumerable veſſels, which lying before in lines almoſt contiguous to one another, compreſſed each other, making an acute angle at their junctures, are divaricated and ſeparated from each other, and make an obtuſe one, whereby their channels are widened.

Thus a paſſage is opened for the blood from the right ventricle of the heart to the left, through the lungs, to which it could not otherwiſe paſs; and the oppoſition, which the blood contained in that ventricle muſt otherwiſe have had made to its conſtriction, is taken off, and the ſyſtole thereby facilitated: nor is this all, for the *diaſtole* being cauſed, as is certainly and demonſtrably the caſe, by the force of the blood ruſhing into the ventricles, this ampliation and extenſion of the pulmonary artery is a ſort of check or counterpoiſe to it, and prevents an endeavour towards two contrary actions at once, which would neceſſarily fruſtrate both: for the heart being a ſpringy and compreſſible body, whoſe proper action, which is contraction, depends upon the influx of certain fluids into its fibres and ſubſtance; and containing beſide a fluid in its ventricles, or great cavities, in one of which is the mouth of this artery, the action of this veſſel muſt in a great meaſure reſemble that of a ſyringe, whoſe extremity is immerſed in water; the enlargement or expanſion of the channels of the artery, anſwering to the drawing of the embolus, as the conſtrictive motion of the muſcle of the heart, does to the preſſure of the atmoſphere on the ſurface of the water, the one making way for the fluid, and the other forcing it to flow where the reſiſtance is leaſt. In this ſenſe we may allow a ſort of attraction to the pulmonary artery, depending wholly upon the action of the intercoſtal muſcles, and diaphragm, which we muſt therefore confeſs to be very ſerviceable and inſtrumental in promoting the ſyſtole of the heart. Phil. Tranſ. N° 281. p. 1222. See HEART.

It has long been known, that the *dura mater* has a ſyſtole and *diaſtole*, exactly correſponding to thoſe of the heart. But its cauſe was not ſo well known. Dr. Ridley, in the Philoſoph. Tranſact. Abr. vol. v. p. 199, &c. having bored a hole in the upper part of the *bregma* of a dog, firſt perceived the alternate vibrations of the *dura mater*; then, continuing the hole to the brain, he found both by his eyes, and even afterwards by touch, very ſenſibly, that there was a like briſk ſyſtole and *diaſtole* of the brain. M. De la Mure, in 1752, made ſeveral experiments with dogs, both living and dead, in order to inveſtigate the cauſe of this motion of the brain; from which he infers, that the true cauſe is the reflux of the blood towards the brain, and that this reflux is owing to the preſſure of the lungs on the veins of the *thorax*, in reſpiration. Encycl. See BRAIN, and DURA *mater*.

DIASTOLE, in *Grammar*, a figure whereby a ſyllable naturally ſhort is made long.

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Thus it is that Virgil begins a verſe with the word *Italus*, the firſt ſyllable whereof is naturally ſhort.

DIASTYLE, from διὰ, and στυλος, *a pillar*, in the *Ancient Architecture*, an edifice, where the columns ſtand at ſuch a diſtance from one another, that three diameters, or ſix modules, are allowed for the intercolumniation. See *Tab. Archit. fig.* 40. D. in the plan of the Baſilic.

DIASYRMUS, Διασυρμος, from διὰ, and συρω, *I draw*, in *Rhetoric*, a figure whereby we ſhortly anſwer, or rather evade, a thing which it would be tedious to reply to in form.

E. gr. *What matters it to reply to an argument foreign to the purpoſe?*

DIATESSARON, in *Pharmacy*, a ſort of theriaca, thus called becauſe it conſiſted of four ingredients, which are roots of ariſtolochia, and gentian, bay-berries, and myrrh.

The word is Greek, compounded of διὰ, and τεσσαρα, *four*, q. d. *a compoſition of four drugs.*

It is alſo called *theriaca pauperum*, becauſe made at a very eaſy expence, and in a ſhort time. It is good againſt ſtingings of venomous beaſts, epilepſies, convulſions, colics, to ſtrengthen the ſtomach, and promote the menſes.

DIATESSARON, in the *Ancient Muſic*, a concord, or harmonical interval, compoſed of one greater tone, one leſſer, and one greater ſemi-tone; its proportion being as 4 to 3.

In the modern muſic, it is called a *perfect fourth.*

Many muſical writers have rejected the *diateſſaron* from the claſs of conſonances. Others have retained it as a ſecondary or imperfect concord; urging that it is only a concord when the harmony conſiſts of two parts, but not by itſelf; and that if it were a perfect conſonance, the replicate of it would be a conſonance likewiſe; whereas the ear can hardly endure it. Thus they ſay, whenever a ſound is a perfect conſonance with its uniſon, the replicate of that ſound will alſo be a conſonance, as is the caſe with the diapente and diapaſon, whoſe replicates, viz. the 15th and the 12th, which are the diapaſon and diapente compounded, are not leſs grateful to the ear than the radical ſounds themſelves: but the diapaſon and diateſſaron compounded in the 11th, do not make a conſonance. See Hawkins's Hiſt. Muſ. vol. ii. p. 192. and vol. iii. p. 134.

DIATHESIS, from διατιθημι, *I diſpoſe*, a term uſed by ſome writers in the ſame ſenſe with conſtitution; and by others for a diſpoſition of the blood to a faulty ſtate.

DIATONIC, from διὰ, and τονος, *tone*, an epithet given to the common muſic, as it proceeds by tones, or degrees, both aſcending and deſcending.

Authors divide the genera or kinds of muſic into *diatonic*, *chromatic*, and *enharmonic.*

The *diatonic* genus was by the ancients divided into two ſpecies; the *molle*, and the *intenſum.* The laſt is in daily practice. It is commonly ſaid to conſiſt of two tones and a ſemi-tone: but, to ſpeak exactly, it conſiſts of a ſemi-tone major, a tone minor, and a tone major.

We find it accurately defined by Didymus, in Ptolemy's Harmonics publiſhed by Dr. Wallis. Vide Wallis, Oper. vol. iii. p. 92. The numbers by which Didymus expreſſes its intervals, are, $\frac{9}{8} \times \frac{10}{9} \times \frac{16}{15} = \frac{4}{3}$. Ptolemy, indeed, makes the *diatonicum intenſum* to be expreſſed by $\frac{10}{9} \times \frac{9}{8} \times \frac{16}{15} = \frac{4}{3}$; but it is plain, this is only tranſpoſing the tones major and minor, which makes no eſſential difference, nor is it ſufficient to conſtitute a new ſpecies. But the firſt of the before mentioned ſpecies, the *diatonicum molle*, has not, till lately, been accurately defined by any author. Its component intervals, according to Dr. Pepuſch, are, the ſemi-tone major, an interval compoſed of two ſemi-tones minor, and the complement of theſe two to the fourth; which complement is equal to a tone major, and an enharmonic dieſis.

Beſides the two ſpecies of the *diatonic* mentioned by Ariſtoxenus and Euclid, Ptolemy, and other ancient muſicians, have left us ſeveral different *diatonic* diviſions of the tetrachord; ſuch are the *diatonic* of Archytas, of Eratoſthenes, and of Didymus, which laſt agrees perfectly with the truth of muſical proportions. Ptolemy himſelf gives us no leſs than five different *diatonics*, by the names of *molle*, *tonicum*, *ditonicum*, *intenſum*, *æquabile.* See GENUS.

But, except one (the *intenſum*) they are all inconſiſtent with the true theory of muſic; which admits of no numbers, or proportions, but 2, 3, and 5, and ſuch as ariſe from theſe primes. Indeed, Ptolemy's tetrachords are ſo miſ-tuned, that Salinas has charged him with having had no ear. Vide Phil. Tranſ. N° 481.

Diatonic muſic only allows of three degrees; the greater and leſſer tone, and the greater ſemi-tone.

Hence *diatonic* muſic appears the moſt natural, and of conſequence is the moſt ancient.

In the *diatonic* muſic there is a tone between every two notes, except between *mi* and *fa*, and *ſi* and *ut*, where there is only a greater ſemi-tone.

DIATONUM, Διατονον, in the *Ancient Muſic*, is uſed for the diatonic genus. See DIATONIC.

DIATRÆTA, a word uſed by Pliny, and other of the ancient Romans, to expreſs a ſort of cups and vaſes, which were of great value, and only ſeen at the tables of the great. They were pellucid and colourleſs, and cut into various forms, and were often engraved upon with figures expreſſive of the deeds of honour of the family who poſſeſſed them. The firſt *diatrætæ* were made of pure cryſtal of the rock, and the working of theſe rendered them very expenſive; but afterwards they were made of common white glaſs, and ſunk greatly in their price and value. The ancients were very nice in their diſtinctions of the ſeveral kinds of cryſtal. They termed the pureſt and fineſt of all *acentatum*, and the others, which were ſubject to blemiſhes and foulneſſes of ſeveral kinds, they called by names expreſſive of them. There was nothing they ſo much feared in the pieces they ſelected for this work, as what they called an over-hardneſs, that is, a brittleneſs, which made the veſſel often fly under the engraver's tool, after it had been formed into ſhape at a great expence: for this reaſon they were cautious of uſing the very brighteſt and cleareſt maſſes; for they often found thoſe ſucceed beſt, which had ſome of thoſe flaws which we call hairs in them. Theſe they thought the tougheſt pieces of cryſtal, and theſe flaws they eaſily concealed among the ſtrokes of their work. See NUBES, and SAL.

DIATRAGACANTH, in *Pharmacy*, is a name applied to certain powders, whereof gum tragacanth is the baſe. There are two kinds, *cold* and *hot.*

Powder of *cold diatragacanth* is compoſed of the gums tragacanth and Arabic, liquorice, ſtarch, white poppy-ſeed, and the four great cold ſeeds. It is good to thicken and ſoften the too ſharp, and ſubtile ſerous humours falling on the breaſt, to aſſuage coughs, and to promote ſpitting.

Powder of *hot diatragacanth* is compoſed of gum tragacanth, cinnamon, hyſſop, almonds, linſeed, fenugreek, liquorice, and ginger. It is good againſt aſthmas, to promote expectoration, ſtrengthen the ſtomach, and aſſiſt digeſtion.

DIATRIBE, from διατριβω, *I delay*, denotes a continued diſcourſe.

DIATYPOSIS, Διατυπωσις, in *Rhetoric*, the lively deſcription of a thing, ſetting it, as it were, before the eyes of the audience. Thus Cicero, vii. in Ver. *Ipſe inflammatus ſcelere & furore, in forum venit; ardebant oculi; toto ex ore crudelitas eminebat, &c.*

DIAUGOPHRAGMIA, in *Natural Hiſtory*, a genus of *ſeptariæ*, whoſe ſepta are of ſpar, with an admixture of cryſtal, which being ſometimes alſo mixed among the matter of the tali, renders the whole more bright and gloſſy. See SEPTARIÆ.

Of this genus we have the following ſpecies: 1. The ferrugineous red *diaugophragmium*, with browniſh yellow partitions. 2. The browniſh yellow *diaugophragmium*, with whitiſh partitions. 3. The bluiſh white *diaugophragmium*, with ſtraw-coloured partitions. Vide Hill, Hiſt. Foſſ. p. 522.

DIAULION, from διὰ, and αυλος, *a flute*, in *Antiquity*, a deſignation given to a performance on the ancient ſtage with the flute alone.

DIAULODROMI, Διαυλοδρομοι, from διαυλος, and δρομος, *courſe*, in *Antiquity*, thoſe racers who turned round the meta, or goal, and finiſhed their courſe at the carcer, or place of ſtarting. The *diaulodromi* always took a ſhort breathing or reſt, when they arrived at the meta, before they ſet out again for the carcer.

DIAULOS, from δις, *twice*, and αυλη, *ſtation*, in *Antiquity*, the name of a particular kind of race, wherein the racers always returned to the place from whence they ſtarted, and were called DIAULODROMI.

DIAULOS is alſo uſed to ſignify a diſtance of two ſtadia.

DIAZEUCTIC, from διαζευγνυμι, *I diſjoin*, or *ſeſquioctave tone*, in the *Ancient Greek Muſic*, was that which diſjoined two fourths, one on each ſide of it, and which, being joined to either, made a fifth.

This in their muſic was from *meſe* to *parameſe*; that is, in ours, from A to B: ſuppoſing *mi* to ſtand in B *ſub mi.* They allowed to this *diazeuctic* tone, which is our tone major or *la*, *mi*, the proportion of 9 to 8, as being the unalterable difference of diapente and diateſſaron.

DIBBLE, from *dipſel*, Du. *a ſharp point*, among *Gardeners*, the name of the ſetting-ſtick, or tool, wherewith they ſet plants; ordinarily made of the handle of an old ſpade.

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DICA, in *Law*, a tally for accounts, by the number of tallies, cuts, or notches.

DICE, among *Gameſters*, certain cubical pieces of bone or ivory, marked with dots on each of their faces, from one to ſix, according to the number of their ſides.

Sharpers have ſeveral ways of falſifying *dice:* 1. by ſticking a hog's briſtle in them, ſo as to make them run high or low as they pleaſe: 2. by drilling and loading them with quickſilver; which trick is diſcovered by holding them gently between two diagonal corners; when if falſe, the heavy ſide will turn always downward: 3. by filing and rounding them. But all theſe methods fall far ſhort of the arts of the *dice*-makers, ſome of whom are ſo dextrous, that ſharping gameſters will give any money for ſuch *dice*.

Dice pay a large ſtamp-duty, and are prohibited to be imported.

DICE-*marle*, in *Huſbandry*. See MARLE.

DICERATION, in the *Writers of Medicine*, a name given to a collyrium mentioned by Celſus, and thus named from κερας, *a horn*, burnt hartſhorn being a principal ingredient in it.

DICHORÆUS, in *Poetry*, the foot of a Latin verſe conſiſting of four ſyllables; of which the firſt is long, the next ſhort, the third long, and the laſt ſhort. It is a double *choræus*, as cōmprŏbārĕ.

DICHOTOMY, *biſection*, a term uſed by aſtronomers for that phaſis, or appearance of the moon, wherein ſhe is biſected, or ſhews juſt half her diſk, or circle; or when ſhe is in the beginning of her firſt and laſt quarter.

The word is Greek, formed of διχοτομεω, *I biſect*, or *cut into two*; of δις, *twice*, and τεμνω, *I cut*.

The time of the moon's *dichotomy* is of conſiderable uſe in fixing the ſun's diſtance from the earth. But it is very difficult to fix the preciſe moment when the moon is biſected, or in her true *dichotomy*. Obſervation informs us, that when ſhe is thirty minutes diſtant from the quadratures, ſhe appears biſected; but ſhe appears ſo too in the quadratures themſelves, and ſome time afterwards, as Ricciolus acknowleges in his Almageſt. So that ſhe appears *dichotomized* at leaſt for the ſpace of a whole hour: in which time any moment may be taken for the true point of the *dichotomy*, as well as any other. But the infinite number of moments of time give an infinite diverſity of diſtances. The moment in which the true *dichotomy* happens being thus uncertain; but it being granted withal, that it happens before the quadrature; Ricciolus takes the middle point between the quadrature, and the time when it is firſt dubious, whether the moon be *dichotomized*, or not, for the true *dichotomy*. Keil.

DICHOTOMY, in *Botany*, a term uſed to expreſs that diviſion of the branches which we ſee in miſletoe, and in the greater part of the ſea-fucuſes, in which each branch is divided into two.

DICHOTOPHYLLUM, in *Botany*, the name by which Dillenius, and ſeveral others, call the *hydroceratophyllum* of Vaillant; and ſome other writers, a genus of plants characterered by Linnæus in his Genera Plantarum under the name of CERATOPHYLLUM.

DICKER, or DICRE, *Dicra*, in our *Old Writers*, a quantity of leather conſiſting of ten hides.

Some derive the word from the Greek δεκα, *ten*.

We find the word *dicra* applied to other things beſides leather; thus, *Civitas Glouceſtriæ reddebat* xxxvi dicras *ferri*; which is interpreted thirty-ſix *dickers* of iron, ten bars to the *dicre*. Gale's Hiſt. Brit. 766. ap. Blount.

DICROTUS, in *Natural Hiſtory*, a word uſed by the ancients to expreſs the deer or ſtag when in its third year's growth. It was called *nebus* by the ancient Greeks in the firſt year, *puttolea* in the ſecond, *dicrota* in the third, and in the fourth and all its life afterwards *ceraſtes*.

DICROTUS, from δις, *twice*, and κρουω, *I ſtrike*, in the *Medicinal Writings of the Ancients*, the epithet given to a peculiar ſort of pulſe, which Dr. Nihill calls very properly in Engliſh the rebounding pulſe. In this kind of pulſe the artery beats as it were double; and it is eſteemed a certain ſign of a future critical hæmorrhage by the noſe. When the rebounding pulſe is perceived at about every thirtieth pulſation, the hæmorrhage uſually follows in about four days after; when it recurs at every ſixteenth pulſation, the hæmorrhage generally follows in three days; when at every eighth pulſation, it is to be expected in two days and a half; and, finally, when it recurs at every fourth, third, or ſecond pulſation, or is continual in every one, the hæmorrhage is to be expected within four and twenty hours. Sometimes nature runs regularly through all the before mentioned progreſſions of this critical pulſe from its firſt appearance at every thirtieth ſtroke, to the ſingle pulſation; and in this caſe the hæmorrhage is ſeen gradually approaching, and happens regularly as expected: but ſometimes ſhe haſtens or delays it; and then the pulſe ſhifting in its indications, it cannot be judged of with any certainty. When the artery rebounds upon the finger with great celerity, and very briſkly follows the firſt ſtroke, the hæmorrhage is juſt at hand, and will appear on the patient's blowing his noſe.

The quantity of the hæmorrhage may be gueſſed from the ſtrength of the rebound in the pulſe, and as the blood diſcharges itſelf, this ſymptom in the pulſe gradually goes off: and if after the hæmorrhage it ſhould be perceived again, it is a ſign of another criſis of the ſame kind. Finally, when the rebounding of the artery is more evident in one wriſt than in the other, the blood uſually flows in the greateſt violence from that ſide of the noſe, or that noſtril which is on the ſame ſide with the hand in the artery of which the rebounding has been moſt violent.

DICTAMNUS, in *Botany*. See DITTANY.

DICTATE, *Dictamen*, in the *Schools*, a ſuggeſtion, motion, or ſentiment of a man's conſcience. See CONSCIENCE.

A good action becomes evil, if done contrary to the *dictates* of one's own conſcience.

DICTATE, *Dictata*, is likewiſe uſed in the *Schools* for a leſſon, or exerciſe, wherein the maſter reading, or ſpeaking ſomething, the ſcholars take it down in writing after him. Here the act of the maſter is likewiſe called *dictating*.

DICTATOR, a Roman magiſtrate, created by the ſenate, or people, on ſome extraordinary and eminent occaſion, to command, with ſovereign authority, for a certain time, ordinarily limited to ſix months; though the office was ſometimes continued to twelve.

Recourſe was never had to ſuch an officer, but in dangerous and difficult times; as in ſudden wars, popular factions, &c. He had abſolute and monarchic power while his dictature laſted: and ſome will even have it, his power went beyond that of the kings. He was arbiter of peace and war, and had command of life and death, without any appeals lying to the people. Twenty-four axes were borne before him, whereas only twelve before the conſuls.

The origin of this office was unknown even in Livy's time: though ſome ancient authors ſpeak of T. Largius Flavus as the firſt *dictator*, who was appointed in the year of Rome 259. *Sed nec anno, nec quibus conſulibus— nec quis primum dictator creatus ſit, ſatis conſtat: apud veterrimos tamen auctores, T. Lartium dictatorem primum, Sp. Caſſium magiſtrum equitum creatos invenio. Conſulares legere.* Liv. lib. ii.

Sylla was the firſt perpetual *dictator*, and Cæſar the next. After Cæſar, there were no more *dictators*. The firſt *dictator* choſen from among the people was Marcus Rutilius, in 399.

Dionyſius Halicarnaſſeus derives the word *ab edicendo*, becauſe they ordained and appointed what they pleaſed. But Varro will have the word taken hence, that the conſul named him, which the Latins call *dicere*, lib. iv. De Lingua Latina. Dictator *quod a conſule dicebatur, cujus dicto audientes omnes eſſent.*

DICTION, the phraſe, elocution, or ſtyle of a writer, or ſpeaker.

The *diction* or language of an orator ſhould be pure, proper to the ſubject, rich without affectation, ſtrong and cloſe without dryneſs, and ſuitable to the perſon, time, place, and audience.

The *diction* of tragedy is accounted the fourth of the eſſential parts thereof: it is of the leaſt importance of any; yet muſt peculiar care be taken herein to make every paſſion ſpeak its proper language.

DICTIONARY, a collection, or catalogue of all the words of a language, or art, with their ſignifications: ranged in the order of the alphabet.

What the Latins, and we after them, call *dictionary*, the Greeks call *lexicon*.

For the proper character, nature, office, &c. of a *dictionary*, ſee the preface to this work. See alſo VOCABULARY.

The moſt ancient *dictionaries* for the Latin tongue, are, that called Papias, compiled by Solomon, abbot of St. Gall, biſhop of Conſtance, who lived about the year 1409; another made in 1469, called Gemma Vocabulorum; a third in 1502, called Gemma Gemmarum; and a fourth by Dionyſius Neſtor, a Cordelier.

The moſt celebrated old Latin *dictionary* is that of Ambroſe Calepine, a hermit of St. Auguſtine at Bergamo, and ſon of the count of Calepin. Conrad Geſner is ſaid to have augmented this with four thouſand words. Paulus Manutius increaſed it ſtill more; and Paſſerat after him: and yet Matthias Martinius made two volumes of their omiſſions.

There is another noted Latin *dictionary* of Criſpinus: to ſay nothing of Cowper, Holyoake, Gouldman, Littleton, Cole, Ainſworth, and many others of leſs conſideration.

For the Greek, we have thoſe of Henry Stephens, and

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Scapula, Schrevelius, and Hedericus: for the Spaniſh, thoſe of Covarruvias, and Delpino: for the Italian, thoſe of the Academy della Cruſca, Veneroni, and Baretti: for the French, thoſe of Nicod, Fa. Monet, Fa. Gaudin, Furetiere, Richelet, Trevoux, that of the French academy, Boyer, and Chambaud: for the Engliſh, we had ſcarce any worth the mentioning (unleſs, perhaps, thoſe of Lloyd, Philips, Kerſey, and Bailey), before the publication of that very complete and accurate one by Johnſon.

Junius has a *dictionary*, or alphabet, of the Gothic, Runic, and Anglo-Saxon. There is another in the Malayan, which is a dead language, famous throughout the Eaſt Indies, where it ſtands inſtead of the Latin among us.

There are alſo hiſtorical and geographical *dictionaries:* as that of Charles Stephens, which is tranſlated into French, and augmented by Moreri: another of Hofmann, printed at Baſil in 1677, in two volumes folio; which were followed by a continuation of as many volumes, in 1683: another of Mr. Bayle, under the title of Hiſtorical and Critical *dictionary*, firſt printed at Rotterdam in 1697, in two large volumes, now making five in Engliſh: a Philoſophical *dictionary*, by Mr. Chauvin of Berlin: beſides ſeveral law *dictionaries*, as Jacob's; phyſical *dictionaries*, as James's; family *dictionaries*; *dictionaries* of arts, as the Encyclopedie, &c. of *commerce*, as Savary's by Poſtlethwaite, &c.

DICTORES, in our *Old Writers*, is uſed for an arbitrator.

DICTUM, in our *Old Writers*, is uſed for an arbitrament or award.

DICTUM *de Kenelworth*, an edict or award between king Henry the III. and thoſe barons who had been in arms againſt him. It was ſo called becauſe made at Kenelworth caſtle in Warwickſhire, anno 51 Hen. III. It contained a compoſition of five years rent for the lands of thoſe who had forfeited them in that rebellion.

DICTYMNIA, or DICTYNNIA, in *Mythology*, were feaſts celebrated at Lacedæmon and in Crete, in honour of Diana *Dictymnia* or *Dictynnia*, or of a nymph taken for her, who, having plunged herſelf into the ſea, to eſcape the paſſion of Minos, was caught in a fiſherman's net or δίκτυον, whence the name.

DIDACTIC, in the *Schools*, ſignifies the manner of ſpeaking, or writing, adapted to teach or explain the nature of things.

The word is formed from the Greek διδάσκω, *doceo, I teach.*

There are many words that are only uſed in the *didactic*, and dogmatic way: and there are many works, ancient and modern, both in proſe and verſe, written after this method: ſuch are the Georgics of Virgil, Lucretius's poem De Rerum Natura, and Pope's Eſſays on Criticiſm and on Man, &c. &c.

DIDAPPER, in *Ornithology*. See DOB-*chick*.

DIDAR, among the Arabian authors, the name of the elm.

DIDELPHIS, the name by which Linnæus calls the animal called philander by other writers. This creature, in that author's ſyſtem of zoology, is alſo a diſtinct genus of animals, of the order of *feræ*, and claſs of *mammalia*; the characters of which are, that they have ten upper fore-teeth, and eight lower, with the two intermediate very ſhort; the laniarii are long, and the molares denticulated: they have alſo a ſmall bag or pouch under the belly. See OPOSSUM.

DIDRACHM, from δίς, *double*, and δραχμα. See DRACHM.

DIDYMI, Δίδυμοι, the ſame with *gemelli*, or *twins*.

DIDYNAMIA, in *Botany*, the fourteenth claſs of plants, whoſe flowers have two of their male parts or ſtamina of greater efficacy in the action of impregnation of the ſeeds than the other two: they are known by the efficacious ſtamina being always much longer than the others. See *Tab. of Botany, Claſs* 14.

The word is formed of the Greek δίς, *twice*, and δυναμις, *power* or *efficacy*. Of this claſs of plants are baum, thyme, lavender, baſil, &c.

Linnæus divides this claſs of plants into two orders: the firſt the *gymnoſpermia*, and the ſecond the *angioſpermia*. The firſt of theſe comprehends the labiated plants of Tournefort, and the verticillate plants of Mr. Ray's method; and the other, the perſonated plants of Tournefort.

The *gymnoſpermia*, or verticillate plants, are diſtinguiſhed from the reſt, by having the ſeeds four in number, excepting phryma, which is monoſpermous; and ſtanding naked in the cup: and the ſtigma divided into two ſegments, the lower of which is crooked. This order contains thirty-four genera, diſtinguiſhed into ſuch as have the calyx quinquifid and nearly equal, of which there are twenty; and ſuch as have the calyx bilabiate, of which there are fourteen.

The ANGIOSPERMIA, or perſonated plants, are diſtinguiſhed from the others, by always having a ſeed-veſſel of ſome form, though very various; and, by the ſtigma being obtuſe and various.

Of the firſt kind, or gymnoſpermia, are the galeopſis and ballota, with the like; and, of the ſecond kind, or angioſpermia, are the antirrhinum, &c.

DIE. See DYE.

DIEBEL, in *Ichthyology*, a name given by Kentman and others to the chub or capito. It is properly a ſpecies of the cyprinus. See CAPITO and CYPRINUS.

DIELCYSTINDA, among the *Ancients*, a kind of exerciſe performed by boys, who being divided into two parties or ſides, each endeavoured to draw the other over to their ſide, and the party which prevailed gained the victory.

DIEM *clauſit extremum*, a writ iſſued out of chancery to the eſcheator of the county, upon the death of any of the king's tenants *in capite*, to enquire by a jury of what lands he died ſeiſed, and of what value, and who was the next heir to him.

DIEMERES, in the *Ancient Muſic*, a word uſed ſometimes alone, and ſometimes joined with the word *phorbeia*. It expreſſed a ſort of bandage, uſed by the ancients, to tie up the lower lip in playing on the pipe. The other kind of *phorbeia* conſiſted only of one perpendicular piece, which went down the cheek, and one tranſverſe one which covered the whole mouth, but had a hole cut into it to admit the mouth-piece of the pipe. See PHORBEIA.

DIER. See DYER.

DIERVILLA, in *Botany*. Its characters are theſe: the flower is of one leaf, cut into five parts at the top: it hath five ſtamina, which are equal with the petal; at the bottom of the flower is ſituated an oval germen, which afterward becomes a pyramidal berry divided into four cells, which contain ſmall round ſeeds. There is but one known ſpecies, which is a native of the northern parts of America.

This, in the Linnæan ſyſtem, is a ſpecies of the LONICERA.

DIES. See DAY.

DIES, in *Common Law*. There are two kinds of *days: juridici, & non juridici.*

DIES *juridici*, or *faſti*, are all days wherein juſtice is adminiſtered in court.

DIES *non juridici*, or *nefaſti*, are all Sundays in the year: and in Eaſter term, the feaſt of the Aſcenſion of our Lord: in Trinity term, the Nativity of St. John the Baptiſt: in Michaelmas term, the feaſt of All Saints, and All Souls: and in Hilary term, the Purification of the Bleſſed Virgin.

The ſame diſtinction holds not only as to legal proceedings in court, &c. but alſo as to contracts.

DIES, in ſome *Ancient Authors*, is alſo uſed for daily proviſion. *Et reddebat dimidium diem mellis*, q. d. *as much honey as ſerved the king's family half a day.*

DIES *datus*, is a day, or time of reſpite given to the tenant, or defendant, by the court.

DIES *Marchiæ*, was a day of congreſs or meeting of the Engliſh and Scotch, appointed annually to be held on the *marches* or borders, to adjuſt all differences between them, and preſerve the articles of peace.

DIESIS, from δίημι, *I divide*, in *Muſic*, a diviſion of a tone, leſſer than a ſemi-tone; or an interval conſiſting of a leſſer, or imperfect ſemi-tone.

The *dieſis* is the ſmalleſt, and ſofteſt change, or inflexion, of the voice imaginable. It is alſo called a *feint*, and is expreſſed by a St. Andrew's croſs, or ſaltier.

Ariſtotle calls *dieſes* the elements of voice, as letters are thoſe of diſcourſe. Indeed, Ariſtotle's *dieſes* were apparently different from ours: and we find Vitruvius expreſsly making the *dieſis* a fourth part of the tone. But the Pythagoreans, who are held the inventors of the name *dieſis*, did not make it ſo ſmall: they only divided the tone into two unequal parts, and called the leſſer, *dieſis*, or *limma*, expreſſing the interval $\frac{2}{243}\frac{56}{43}$, which we call the leſſer ſemi-tone; and the greater, which we call the greater ſemi-tone, they called *apotome*.

But in after-times, when the tone came to be divided into three and four parts, the name *dieſis* was retained to them all. And hence thoſe different accounts, which we meet with in authors, of the quantity of the *dieſis*.

DIESIS, *Enharmonical*, is the difference between a greater and leſſer ſemi-tone. See TONE, GENUS, DEGREE, SCALE, &c.

Dieſes are divided into three kinds: the *leſſer enharmonical dieſis*, or *ſimple dieſis*, denoted by a ſingle croſs, raiſes the note following by two commas, or about $\frac{1}{4}$ of a tone. The logarithm or meaſure of the octave $\frac{1}{1}$ being 1,000,000, the meaſure of the *dieſis* $\frac{1}{1}\frac{2}{2}\frac{8}{5}$ will be 0,034215. Hence 29 *dieſes* will be nearly equal to the octave. See INTERVAL.

The *chromatic*, or *double dieſis*, denoted by a double croſs, raiſes

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raiſes the following note by a leſſer ſemi-tone, or about four commas; which is the common *dieſis*. The ratio of this dieſis is $\frac{2}{125}$.

The *greater enharmonical dieſis*, denoted by a triple croſs, raiſes the note by ſix or ſeven commas, or about $\frac{3}{4}$ of a tone. None but the *double dieſis* is uſed in muſic. A flat is frequently uſed to take away the *dieſis*, and a *dieſis* to take away a flat.

When ſemi-tones are placed where regular tones ſhould be, or a tone where there ſhould be a ſemi-tone: it is called a *dieſis*, or *feint*.

DIESIS, among the *Modern Muſicians*, denotes thoſe ſigns or characters which are uſed to expreſs the ſeveral degrees whereby a ſound may be elevated above, or depreſſed below its natural ſituation: and it either affects the note before which it is placed, or the whole KEY. See SHARP.

DIESPITER, in *Antiquity*, a name given to Jupiter.

Some authors will have it the ſame with *Dios pater*, *Jupiter father*; Jupiter being called in Greek Ζευς, or Δευς, whence the oblique caſe Διος, &c. Others hold *Dieſpiter* to ſignify *Diei pater*, *father of the day*. St. Auguſtin derives the name from *dies*, *day*, and *partus*, *production*, *bringing forth*; it being Jupiter that brings forth the day. Of which ſentiment were Servius, and Macrobius; the former adding, that in the language of the Oſci they called him *Lucentius*, as *Dieſpiter* in Latin.

Struvius, Antiq. Rom. Synt. C. I. ſeems to intimate, that *Dieſpiter* ſignified *Pluto:* but, if that be his meaning, he is apparently miſtaken. For both in Cicero, and in the inſcription he quotes from Gruter, xxi. 8. we have only *Dis pater*, and not *Dieſpiter*.

DIET, *Diæta*, in *Medicine*, *&c.* a regimen, or courſe of living, proper in regard to health.

The word *diet*, in this ſenſe, comes from *diæta*, which ſignified anciently a *banqueting-room*; and at length, an *aſſembly of the ſtates*, becauſe the Germans held moſt of their councils at table.

The word is formed from the Greek Διαιτα, which ſignifies *regimen*, or *rule of life*, preſcribed by phyſicians. And as the phyſicians uſually order a ſpare, ſcanty proportion, leſs than is uſually taken; *diet* has with many paſſed into a name for this retrenchment, or diminution of the ordinary quantity of food, whether it be by advice of a phyſician, or by a perſon's own choice; provided it be to remove, or prevent, ſome diſorder.

Judge Blackſtone obſerves, that, as to exceſs in *diet*, there remains one ancient ſtatute unrepealed, viz. 10 Edw. III. ſtat. 3. which ordains that no man ſhall be ſerved, at dinner or ſupper, with more than two courſes, except upon ſome great holidays there ſpecified, in which he may be ſerved with three. Comm. vol. iv. p. 171.

A *ſpare diet* is a ſovereign remedy againſt all diſeaſes ariſing from repletion.

It is founded on this, that nature ought not to be buſied and diſtracted in the concocting of food, but left wholly to her work of digeſting and expelling the morbific matter.

For the advantages of a *ſpare ſimple diet*, ſee ABSTINENCE.

As no ſubſtance is abſolutely and of its own nature, either ſalutary or noxious, but derives either the one or the other quality from its particular relation to the human body; ſo it is certain that the effects of the non-naturals muſt bear a direct proportion to the different conſtitutions of thoſe who uſe them: ſince in theſe, their conſequences muſt vary, and prove either of the ſalutary or noxious kind, according to the different cauſes which concur to produce them.

Hence it is obvious, that the phyſician acts a prepoſterous and unaccountable part, who to every one preſcribes the ſame method of living; or thinks, that what contributes to the health of one, will without diſtinction or reſerve prove ſalutary to all. For we are ſufficiently taught by daily experience, that all ſubſtances are not equally adapted to all patients; and that what one may bear without being ſenſible of any bad effects, may to another prove prejudicial, and even fatal. Time itſelf has a conſiderable influence in determining the ſalutary or noxious effects of aliments; ſince ſome ſubſtances may ſafely, and without any bad conſequence, be uſed at one ſeaſon, which at another may contribute not a little to the deſtruction of health.

At different ſeaſons of the year different regimens are to be uſed, becauſe a change in the ſtate of the atmoſphere induces a proportionable alteration in animal bodies.

In the winter, the fibres, in conſequence of the increaſed elaſticity of the air, are ſtronger, and better qualified for performing their ſeveral motions, and aſſiſting the concoction of the aliments; for which reaſon we can far better bear aliments of difficult digeſtion in that ſeaſon, than in any other. As during winter tranſpiration is in ſome meaſure obſtructed, the cutaneous ducts being braced up by the cold air, the uſe of rich wines, and ſtrong ales, becomes highly proper. It is alſo expedient to make frequent uſe of warm broths and infuſions; and care is always to be taken, that the perſpiration bear a proportion to the quantity of aliment uſed.

In the ſpring, ſomething is to be retrenched from the quantity of our aliments, and the liquor we uſually drink is ſomewhat to be enlarged.

In the autumn the ſame phænomena are to be obſerved as in the ſpring; becauſe the inclemency of the air is the ſame, and the changes of the weather equally ſudden and frequent; by which means perſpiration, which is abſolutely neceſſary for health, is eaſily obſtructed; and becauſe at this ſeaſon the equinoctial happens, diſeaſes are to be prevented by what we call preſervative cures.

During the ſummer, health is moſt effectually preſerved by vegetables, and draughts of diluting liquors; but we are to abſtain from ſuch aliments as are heavy, and of difficult digeſtion, from wine and brandy.

The *diet* ſhould alſo be adapted to different conſtitutions. Perſons, whoſe ſolids are weak and relaxed, ſhould avoid all viſcid food, or ſuch things as are hard of digeſtion. Their *diet*, however, ought to be ſolid, and they ſhould uſe much exerciſe in the open air. Thoſe who abound with blood ſhould uſe ſparingly every thing that is highly nouriſhing, as fat meat, rich wines, ſtrong ale, &c. Their food ſhould conſiſt moſtly of bread, and other vegetables, and their drink ought to be water, whey, or ſmall beer. Fat people ſhould abſtain from oily, nouriſhing *diet*, and they ought frequently to uſe raddiſh, garlic, and ſpices, in order to promote perſpiration and urine. Their drink ſhould be water, coffee, tea, and the like; and they ought to take much exerciſe, and little ſleep. The courſe of the lean ſhould be oppoſite to this. Thoſe who are troubled with acidities ſhould live much on fleſh meats; and thoſe who are afflicted with hot alkaline eructations ſhould chiefly uſe acid vegetables. Thoſe who are ſubject to the gout, low ſpirits, hypochondriac, or hyſteric diſorders, ſhould avoid all flatulent food, every thing viſcid and hard of digeſtion, all ſalted or ſmoke-dried proviſions, and whatever is apt to turn ſour on their ſtomachs. Their food ſhould be light, ſpare, cool, and of an opening nature.

The *diet* ſhould alſo be adapted to the manner of life, and age, as well as to the ſeaſon and conſtitution; thoſe whoſe buſineſs or profeſſion leads them to a ſedentary life ſhould be more ſparing as to the quantity, and more attentive to the quality of their *diet*, than thoſe that are accuſtomed to much exerciſe; they ought to be particularly cautious in the uſe of every thing that is ſour, windy, rancid, and hard of digeſtion. Particular diſeaſes ſhould likewiſe make us avoid any thing that has a tendency to increaſe them. Gouty perſons ſhould not uſe rich wines, ſtrong ſoups, nor acids. Perſons ſubject to the gravel ſhould ſhun all auſtere and aſtringent aliments, and the ſcorbutic ſhould not indulge too much in animal food. The food in early life ſhould be light, but nouriſhing, and frequently uſed; food that is ſolid, with a ſufficient degree of tenacity, is moſt proper for the ſtate of manhood; and the *diet* of the later period of life ſhould reſemble that of the firſt. At every period of life, gluttony and faſting ſhould be equally avoided; both the one and the other deſtroys the powers of digeſtion; and the frequent repetition of aliments is not only neceſſary for repairing the continual waſte of our bodies, but likewiſe to keep the humours ſound and ſweet. It ſhould be remarked, however, by way of caution, that one meal of fleſh meat in the twenty-four hours is ſufficient. The quantity of animal food conſumed by the Engliſh is generally pernicious, becauſe it produces but little of that air which is antiſeptic: hence they are ſubject to the ſcurvy, and its numerous train of conſequences, indigeſtion, low ſpirits, hypochondriaciſm, &c. whereas if vegetables and milk, whoſe antiſeptic quality, ariſing from the *gas* or air which they plentifully afford, is now generally allowed, were more uſed in *diet*, we ſhould have leſs ſcurvy, and likewiſe fewer putrid and inflammatory fevers. See PUTREFACTION and SCURVY.

Different ſexes alſo require a different *diet* and regimen. Women are weaker than men, and for that reaſon require a *diet* and regimen peculiar to themſelves; they are of a ſpungy and lax habit, and for the moſt part addicted to indolence and pleaſure, drink little, have bodies of a highly delicate and ſenſible nature, much inclined to ſpaſms, and convulſive motions, and diſpoſed to generate a redundance of blood. Beſide, at certain ſtated times, they have a regular evacuation by the veins of the uterus; and in conſequence of theſe circumſtances it is neceſſary that women, rather than men, ſhould obſerve a regimen and method of living, peculiarly and accurately adapted to their habit and conſtitution.

Pregnant women are alſo to have a regimen peculiar to them-

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themſelves directed for them, leſt the mother herſelf or the *fœtus* ſhould ſuſtain any injury; for the infant included in the *uterus* is as it were a part of the mother's body. James, from Hoffman; and Buchan's Domeſtic Medicine, chap. iii.

Dr. Cheyne ſhews, how one may ſupply the place of medicines by *diet:* any one, ſays he, may in effect loſe a pound of blood, take a purge, or a ſweat, by dropping the great meal, or abſtaining from animal food, and ſtrong liquors, for four or five days, in chronical caſes, as effectually as by opening a vein, ſwallowing a doſe of pills, or taking a ſudorific bolus. He adviſes, therefore, all gentlemen of a ſedentary life, and of learned profeſſions, to uſe as much abſtinence as poſſibly they can, conſiſtently with the preſervation of their ſtrength, and the freedom of ſpirits. This they ought to have recourſe to, as ſoon as they find any heavineſs, inquietudes, reſtleſs nights, or averſion to application; either by leſſening one half their uſual quantity of animal food, and ſtrong liquors, till ſuch time as they regain their wonted freedom; or by living a due time wholly on vegetable *diets*, as ſago, rice, pudding, and the like; and drinking only wine and water. See DISEASE.

One great reaſon why leproſies, hot ſcurvies, dyſenteries, plagues, peſtilential fevers, and the like diſtempers, formerly ſo frequent in London, are now ſo rare, is the change that has been made in the *diet* of the inhabitants. Hopped beer, wine, and ſpirituous liquors coming into general uſe, have been a great means of ſuppreſſing putrid diſeaſes; greens and fruit are likewiſe more univerſally eat, and ſalted meats make a much leſs part of *diet* than formerly: to which may be added the more general conſumption of tea and ſugar.

A vegetable *diet* is moſt proper for ſcorbutic and hectical perſons, and does very well with people who have much exerciſe; but in other circumſtances, a mixed *diet* of vegetable and animal ſubſtances, ſuch as is commonly uſed, ſeems beſt calculated to nouriſh and preſerve the body from decay.

Irregularities in *diet* are commonly, though unjuſtly, ſuppoſed to have the greateſt ſhare in producing military diſeaſes. Were this the caſe, the changes in the weather and ſeaſons would not ſo remarkably affect their health; the ſobereſt and moſt regular corps would not be ſo ſickly; different nations in the ſame camp, living variouſly, would not be afflicted with the ſame diſtempers; nor would there be ſuch an inequality in the numbers of the ſick in different years, were the greateſt part of diſeaſes owing ſolely to *diet*.

Againſt exceſs, the moſt common error in *diet*, the ſmallneſs of a ſoldier's pay is a ſufficient ſecurity: in regard to them, therefore, the danger lies on the other hand; for, when all are not obliged to eat in meſſes, ſome will be apt to lay out their pay upon ſtrong liquors, and to ſquander away in one day what is but barely a maintenance for a week; but, on the ſuppoſition that every man contributes his ſhare to a meſs, we may be aſſured there can be no errors in *diet* of any conſequence, whilſt almoſt the whole pay is ſpent upon common food.

As to the abuſe of ſpirits and fruit, ſoldiers are generally blamed without any foundation; ſpirits being rather beneficial than hurtful to them, ſo often expoſed to the extremes of heat and cold, to moiſt and bad air, long marches, wet cloaths, and ſcanty proviſions; and as to fruit, a few diſorderly men may rob orchards, which is the only way they can come at fruit, but the camp diſeaſes are incident to the moſt regular equally with them.

A fundamental rule in regard to the *diet* of ſoldiers, is to oblige them to eat in meſſes, by which means their pay will be laid out upon wholeſome food. The greateſt impediment to meſſing are the wives and children, who muſt often be maintained on the ſoldier's pay; in which circumſtances it is not improper food, but the want of it, that may endanger a ſoldier's health.

The meſſing being eſtabliſhed, there remains only to ſee that the men be well ſupplied with bread, and that the markets be ſo regulated that the traders may have encouragement to come to the camp, and the meſſes have good proviſions at a moderate price; and particularly vegetables, which, during the hot weather, ought to make a great part of the *diet*. In eſtabliſhing the meſſes, ſome regulations might be made with regard to an allowance of ſpirits, either by ſtoppages on the pay or otherwiſe. This is already practiſed in the navy, and probably for the ſame reaſons that make ſpirits neceſſary for ſoldiers; ſince in ſhips men are liable to diſtempers from moiſt and corrupted air.

As to the *diet* of officers, their chief rule, in ſickly times, is to eat moderately, avoiding all ſurfeits and indigeſtion, and uſing wine in moderation. Pringle's Obſ. on the Diſeaſes of the Army. See FOOD.

DIET-*drinks*, a form of phyſic, including all the medicated wines, wheys, and ales, uſed in chronic caſes. They require a courſe or continuance to anſwer any intention of moment. In acute caſes they are of no uſe; but where the diſorder of a conſtitution is gradually to be gained upon, much help may be had from them.

DIET, or DYET, is alſo uſed for an aſſembly of the ſtates, or circles of the empire, or Poland, to deliberate and concert meaſures for the public good.

The general *diet* of the empire is ordinarily held at Ratiſbon. It conſiſts of the emperor in perſon, or by his repreſentative or commiſſary; the nine ELECTORS, three of whom are eccleſiaſtic, and the other ſix ſecular, forming the electoral college; the eccleſiaſtical princes, viz. archbiſhops, biſhops, abbots, and abbeſſes, and the ſecular princes, forming the ſecond college; and the repreſentatives of the imperial cities, who conſtitute the third college, and are divided into two benches, viz. that of Suabia and of the Rhine. This *diet* has been uſually ſummoned by the emperor, but there are ſome caſes in which the electors have ſummoned it without his conſent, or requeſted him to ſummon it. In the abſence of the emperor, the right of convocation belongs to the king of the Romans. The *diet* makes laws, raiſes taxes, determines differences between the ſeveral princes and ſtates, and relieves the ſubjects from the oppreſſions of their ſovereigns. The *diets* of the empire were originally the ſame with the aſſemblies of March and May, held by the kings of France: they met, at leaſt, once a year; and every freeman had a right to be preſent. Theſe were aſſemblies, in which the monarch deliberated with his ſubjects, concerning their common intereſt: but when the princes, dignified eccleſiaſtics, and barons, acquired territorial and independent juriſdiction, the *diet* became an aſſembly of the ſeparate ſtates, which formed the confederacy of which the emperor was the head. Robertſon's Hiſt. Charles V. vol. i. p. 462.

The term *diet* is alſo applied to the aſſembly of electors for the choice of an emperor or king of the Romans: this is uſually held at Frankfort on the Main.

The general *diet* of Poland is by the laws only to be held every two years; but preſſing occaſions convene them every year: the laws alſo confine their ſitting to fifteen days, but they frequently protract it to ſix weeks. The uſual place is at Warſaw, the capital of the kingdom: though it has been often held at other places: in effect, as by the laws every third *diet* is to be convened at Grodno, in Lithuania; whenever, for particular reaſons, it is judged meet to change the order, and hold it elſewhere, the nobility of the grand duchy muſt conſent to it. It is the king who fixes the time, and ſummons it by circular letters ſent to all the palatines. In an interregnum, the archbiſhop of Geſna calls the *diet*.

The ſeveral particular *diets*, which are held ſix weeks before the general one, ſend three deputies each, choſen out of the members thereof.

In Poland there are likewiſe *diets* on horſeback, held in the champagne, or country: ſuch are thoſe wherein they chooſe their king. They are called *poſpolites*.

There are likewiſe *diets* held in Switzerland; *diets* of the proteſtant cantons; *diets* of the catholic cantons; and general *diets*. The firſt aſſemble at Araw, and are convoked by the canton of Zurich; the ſecond at Lucern, convoked by the canton of that name; the third, compoſed of the deputies of all the cantons, both proteſtant and catholic, is held twice a year, at the end of June, and the beginning of December, and meets at Baden. It is the canton of Zurich which has the right of convening it.

DIETA, in our *Old Law Books*, denotes a day's journey. *Omnis rationabilis* dieta *conſtat ex viginti milliaribus*. Fleta.

DETETIC, *Diætetica*, that part of phyſic which conſiders the way of living, with relation to food, ſuitable to particular caſes. See DIET.

DIEU *& mon droit*, q. d. *God and my right*, the motto of the arms of England, firſt given by king Richard I. to intimate, that he held not his empire in vaſſalage of any mortal.

It was afterwards taken up by Edward III. when he firſt claimed the crown of France; and was continued, without interruption, to the time of king William III. who uſed the motto *Je maintiendray*; though he commanded the former to be retained on the great ſeal. The ſame is to be underſtood of the late queen Anne, who uſed the motto, *Semper eadem*; which had been before uſed by queen Elizabeth.

DIEU *ſon act*, in *Law*, are words often uſed in our old law: and it is a maxim in law, that the act of God ſhall prejudice no man. Therefore if a houſe be blown down by a tempeſt, thunder, or lightning, the leſſee or tenant for life or years, ſhall be excuſed in waſte. Likewiſe he hath by the law a ſpecial intereſt to take timber to build the houſe again for his habitation. 4 Rep. 63. 11 Rep.

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Rep. 82. So when the condition of a bond conſiſts of two parts in the disjunctive, and both are poſſible at the time of the obligation made, and afterward one of them becomes impoſſible by the act of God, the obligor is not bound to perform the other part. 5 Rep. 22. And where a perſon is bound to appear in court at a certain day, if before the day he dieth, the obligation is ſaved, &c. See BOND.

DIEXAHÆDRIA, in *Natural Hiſtory*, the name of a genus of ſpars. The word is derived from the Greek δις, *twice*, εξ, *ſix*, and ἑδρα, *ſide*. The bodies of this genus are ſpars, compoſed of twice ſix planes, being formed of two hexædral pyramids, joined baſe to baſe, without any intermediate column. Of this genus there are only two known ſpecies: 1. One with long, narrow, and ſharp-pointed pyramids, found in Lamb's-cave on Mendip-hills: and, 2. One with long, broad, and obtuſe pyramids: this is found in the mine of Goſſelar in Saxony, and in many of the mines of the Hartz Foreſt. Hill's Hiſt. of Foſſils, p. 213.

DIEXODUS, Διεξοδος, in *Rhetoric*, is uſed for digreſſion.

DIFF, is the name of an inſtrument of muſic among the Arabs, ſerving chiefly to beat time to the voice: it is a hoop, ſometimes with pieces of braſs fixed to it to make a jingling, over which a piece of parchment is diſtended. It is beat with the fingers, and is the true *tympanum* of the ancients. Ruſſell's Hiſt. of Aleppo, p. 94.

DIFFAMATORY. See DEFAMATORY.

DIFFARREATION, among the Romans, a ceremony whereby the divorce of their prieſts was ſolemnized.

The word comes from the prepoſition *dis*; which is uſed, in compoſition, for *diviſion*, or *ſeparation*; and *farreatio*, *a ceremony with wheat*, of *far*, *wheat*.

Diffarreation was properly the diſſolving of marriages contracted by confarreation; which were thoſe of the pontifices, or prieſts. Feſtus ſays, it was performed with a wheaten cake. Vigenere will have confarreation and *diffarreation* to be the ſame thing.

DIFFERENCE, in *Logic*, an eſſential attribute belonging to ſome ſpecies, and not found in the genus; being the idea that defines the ſpecies.

Thus, body and ſpirit are the two ſpecies of ſubſtance, which in their ideas include ſomething more than is included in the idea of ſubſtance. In body, for inſtance, is found impenetrability, and extenſion; in ſpirit, a power of thinking, and reaſoning: ſo that the *difference* of body is impenetrable extenſion, and the *difference* of ſpirit is cogitation.

DIFFERENCE, in *Mathematics*, the exceſs of one quantity above another.

When a leſs quantity is ſubtracted from a greater, what remains is called the *difference*.

It was a fundamental principle among the ancient geometers, that the *difference* of any two unequal quantities, by which the greater exceeds the leſſer, may be added to itſelf, till it ſhall exceed any propoſed finite quantity of the ſame kind. This principle ſeems inconſiſtent with the ſuppoſition of an infinitely ſmall quantity or *difference*, which added to itſelf any number of times, is never to be ſuppoſed to become equal to any finite quantity whatſoever; which is the foundation of the modern method of infiniteſimals. However, this laſt may, with proper caution, be made uſeful and accurate.

DIFFERENCE *of longitude* of two places, is an arch of the equator intercepted between the meridians of the places.

DIFFERENCE, *Aſcenſional*, in *Aſtronomy*. See ASCENSIONAL.

DIFFERENCES, in *Heraldry*, certain additaments to coat-armour; whereby ſomething is altered, or added, to diſtinguiſh the younger families from the elder, or to ſhew how far they are removed from the principal houſe. They are called, in Latin, *diminutiones*, and *diſcernicula armorum*; and, by the French, *briſures*.

Of theſe *differences* Sylv. Morgan gives us nine, which obtain principally among us: viz. the *label*, which denotes the firſt and eldeſt ſon; the *creſcent*, the ſecond; the *mullet*, the third; the *martlet*, the fourth; the *annulet*, the fifth; the *fleur de lis*, the ſixth; the *roſe*, the ſeventh; the *croſs-moline*, the eighth; and the *eight-foil*, the ninth. See each under its proper article.

Again, as the firſt *differences* are ſingle for the ſons of the firſt houſe, or deſcent; the ſons of the younger houſes are differed by combining, or putting the ſaid *differences* upon each other. As the firſt *differences* are, the *label*, *creſcent*, &c. for the firſt houſe; the *difference* for the ſecond houſe is the *label* on a *creſcent*, for the firſt of that houſe, during his father's life only; for the ſecond, a *creſcent* charged with a creſcent; for the third brother of the ſecond houſe, a *mullet* on a *creſcent*, &c.

Siſters, except of the blood-royal, have no other mark of *difference* in their coats of arms beſides the form of the eſcutcheon. See LOZENGE.

The original of *differences* is controverted. Camden will have them to have begun about the time of king Richard I. Paradin aſſigns *differences* worn as early as the year 870. The preſident Fauchet obſerves *differences* to have been hereditary in the French families before the time of Louis le Gros, who came to the crown in the year 1110. Moreau refers them to the time of St. Louis; and Lallonette, Belleforeſt, &c. to that of Philip Auguſtus. The occaſion of their riſe is well accounted for by Colombiere.

All nations, ſays he, prefer the eldeſt brothers to the younger; whence thoſe, in a direct line, ſucceeding to their fathers, and becoming maſters of their lands, took on them their coat-armour, without any change, or alteration; and tranſmitted the ſame again to their eldeſt ſons; the younger brothers, or baſtards, not being allowed to bear the ſame arms, without ſome additional mark, to diſtinguiſh them from the elder. Hence ſome heralds, he goes on, have endeavoured to confine them to certain fixed and determinate figures, for diſtinguiſhing the ſecond from the firſt, the third from the ſecond, and ſo on to the ſixth; aſſigning the ſecond a *label*, the third a *bordure*, the fourth an *orle*, the fifth a *battoon*, and the ſixth a *bend* or *cottice*.

And the deſcendents of theſe to bear double *differences*, or *differences* charged on one another; viz. the eldeſt ſon of the ſecond ſon to retain his paternal coat, with the *difference* of the *label* of three points; the ſecond, the *label* of four points; the third, ſuch a *label* on a chief; the fourth, a *label* charged with certain figures, as *eaglets*, *lioncels*, *martlets*, *creſcents*, *roſes*, &c. And, for the ſame reaſon, the ſecond ſon of the third ſon ſhall bear a *bordure* engrailed; the third, a *bordure* charged with *bezants*, or *tourteaux*, &c.

But the ſame author judges the fixing any certain invariable *differences* at all an abuſe; becauſe they may happen not to be agreeable to the paternal coat, but very much deface and blemiſh it. He adds, that many other figures, beſide thoſe above mentioned, may be uſed as *differences*; as ſhells, bezants, cinquefoils, and a thouſand more. Some younger families have made the *difference* in their arms by only diminiſhing the ordinaries, or changing the poſture; and others, by only changing the metal, or colour.

It muſt be added, that the *difference* may be of metal on metal, or colour on colour; which, in other caſes, is falſe heraldry.

DIFFERENCES, *Ancient*. See BORDURES.

DIFFERENTIAL, *Differentiale*, in the *Higher Geometry*, an infinitely ſmall quantity, or a particle of quantity ſo ſmall as to be leſs than any aſſignable one.

It is called a *differential*, or *differential quantity*, becauſe frequently conſidered as the difference of two quantities; and, as ſuch, it is the foundation of the *differential calculus*. Sir Iſaac Newton, and the Engliſh, call it a *moment*, as being conſidered as the momentary increaſe of quantity.

Mr. Leibnitz, and others, call it alſo an *infiniteſimal*. See INFINITESIMAL.

DIFFERENTIAL *of the firſt, ſecond, &c. degree*. See DIFFERENTIO-DIFFERENTIAL.

DIFFERENTIAL *calculus*, or *method*, is a method of differencing quantities; that is, of finding a *differential*, or infinitely ſmall quantity, which, taken an infinite number of times, is equal to a given quantity. See CALCULUS, and FLUXIONS.

DIFFERENTIO-DIFFERENTIAL *Calculus*, is a method of differencing *differential* quantities.

As the ſign of a *differential* is the letter d; that of a *differential* of dx is ddx, and the *differential* of ddx, $dddx$, or d^2x, d^3x, &c. or $\ddot{x}$, $\dddot{x}$, &c.

Thus we have powers, or degrees, of *differentials*.

The *differential* of an ordinary quantity, is called a *differential of the firſt power*, or *degree*; as dx.

DIFFERENTIAL *of the ſecond power*, or *degree*, is an infiniteſimal of a *differential* quantity of the firſt degree; as ddx, or $dx\,dx$, or dx^2, $dx\,dy$, &c.

DIFFERENTIAL *of the third degree*, is an infiniteſimal of a *differential* quantity of the ſecond degree; as $dddx$, dx^3, $dx\,dy\,dz$, and ſo on.

The *powers of differentials*, as dx^2, are differenced after the ſame manner, as the powers of ordinary quantities: and, again, as compound *differentials* either multiply, or divide, each other, or are powers of *differentials* of the firſt degree; *differentials* are differenced after the ſame manner as ordinary quantities; and, therefore, the *differentio-differential calculus* is the ſame, in effect, with the *differential*.

DIFFERENTIAL, in the *Doctrine of Logarithms*. Kepler calls the logarithms of tangents, *differentiales*; which we uſually call *artificial tangents*. See LOGARITHM, MESOLOGARITHM, and TANGENT.

DIFFERENTIAL *equation* is uſed by ſome mathematicians for

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for an equation involving infinitesimal differences, or fluxions. Thus the equation $3x^2\,dx - 2ax\,dx + ay\,dx - 3y^2\,dy + ax\,dy = 0$ in the foreign notation, or $3x\dot{x}\dot{x} - 2a\dot{x}\dot{x} + ay\dot{x} - 3y^2\dot{y} + ax\dot{y} = 0$ in the English notation, is called a *differential equation*. But these equations should, consistently with the English, or Sir Isaac Newton's notation, be rather called fluxional equations. Hence some of our mathematicians have applied the term *differential equation* in another sense, to certain equations defining the nature of series. See SERIES.

DIFFERENTIAL *method*, in *Mathematics*, an appellation given to a method of describing a curve of the parabolic kind through any given number of points.

This method is given by Sir Isaac Newton in the fifth lemma of the third book of his Principles. He distinguishes two cases of this problem; the first, when the ordinates drawn from the given points to any line given in position, are at equal distances from each other; and the second, when these ordinates are not at equal distances. He has given a solution of both cases, but without demonstration in that place, which has since been supplied by himself and others. See his Methodus Differentialis, published with other tracts of the same author, by Mr. Jones, London, 1711; and Stirling's explanation of the Newtonian *differential method* in the Phil. Trans. N° 362. Cotes, De Methodo Differentiali Newtoniana, in his works published by Dr. Smith; Herman. Phoronomia; and Le Seur and Jacquier, in their Comment on Sir Isaac's Principles.

Where it is to be observed, that the methods there demonstrated by some of these authors extend to the description of any algebraic curve through a given number of points, which Sir Isaac, writing to Mr. Leibnitz, mentions as a problem of the greatest use.

By this method, some terms of a series being given, and supposed to be placed at given intervals, any intermediate term may be found nearly; and this therefore gives a method for interpolations. Newt. Method. Differ. prop. 5.

Any curvilinear figure may also be squared nearly, of which some ordinates may be found. Newt. ibid. prop. 6.

And this method may be extended to the construction of mathematical tables by interpolation. Ibid. in Schol. p. 100.

The successive differences of the ordinates of parabolic curves, becoming ultimately equal, and the intermediate ordinate required being determined according to Sir Isaac's rules, by these differences of the ordinates, is the reason of this method being called the *differential method*. To be a little more particular.

The first case of Sir Isaac's problem amounts to this: a series of numbers, placed at equal intervals being given, to find any intermediate number of that series when its interval from the first term of the series is given.

Subtract every term of the series from the next following, and let the remainders be called first differences; then subtract each difference from the next following, and let these remainders be called second differences; again, let each second difference be subtracted from the next following, and let these remainders be called third differences, and so on: then if A be the first term of the series, d' the first of the first differences, d'' the first of the second differences, d''' the first of the third differences, &c. and if x be the interval between the first term of the series and any term sought, E, that is, let the number of terms from A to E, both inclusive, be $= x+1$, then will the term sought,

$$E = A + \frac{x\,d'}{1} + \frac{x \cdot \overline{x-1}}{1 \cdot 2} d'' + \frac{x \cdot \overline{x-1} \cdot \overline{x-2}}{1 \cdot 2 \cdot 3} d''' + \frac{x \cdot \overline{x-1} \cdot \overline{x-2} \cdot \overline{x-3}}{2 \cdot 3 \cdot 4} d'''' + \text{, \&c.}$$

which series differs from the Newtonian in this, that the quantities $\frac{d''}{1 \cdot 2}$, $\frac{d'''}{1 \cdot 2 \cdot 3}$, $\frac{d''''}{1 \cdot 2 \cdot 3 \cdot 4}$ here used, signify the same with d'', d''', used by Sir Isaac.

Hence, if the differences of any order become equal, that is, if any of the quantities d'', d''', d'''', become $= 0$, we shall have a finite expression for E, the term sought; it being evident, that the series must terminate when any of the differences d'', d''', &c. become $= 0$.

It is also evident that the coefficients $\frac{x}{1}$, $\frac{x \cdot \overline{x-1}}{1 \cdot 2}$, &c. of the differences, are the unciæ of the binomial theorem.

A method may be deduced from the foregoing expression, of finding the sums of the terms of such a series. For if we imagine a new series, whereof the first term shall be $= 0$, the second $= A$, the third $= A + B$, the fourth $= A + B + C$, the fifth $= A + B + C + D$, and so on, it is plain that the assigning one term of this series is finding the sum of all the terms A, B, C, D, &c. Now since those terms are the differences of the sums 0, A, A + B, A + B + C, A + B + C + D, and that, by the supposition, some of the differences of A, B, C, D, &c. are $= 0$; it follows that some of the differences of the sums will also be $= 0$; and that whereas in the series $A + x\,d' + \frac{x \cdot \overline{x-1}}{1 \cdot 2} d''$, &c. whereby a term was assigned, A represented the first term, d' the first of the first differences, and that x represented the interval between the first term, and the last, we are to write 0 instead of A, A instead of d', d' instead of d'', d'' instead of d''', &c. and $x+1$ instead of x; which being done, the series expressing the sums will be $0 + x+1 \cdot A + \frac{\overline{x+1} \cdot x}{1 \cdot 2} d' + \frac{\overline{x+1} \cdot x \cdot \overline{x-1}}{1 \cdot 2 \cdot 3} d'' +$, &c. or $x+1 \times A + \frac{x}{2} d' + \frac{x \cdot \overline{x-1}}{2 \cdot 3} d'' + \frac{x \cdot \overline{x-1} \cdot \overline{x-2}}{2 \cdot 3 \cdot 4} d'''$, &c.

Or again, if the real number of terms of the lines be called z, that is, if $z = x+1$, or $z-1 = x$, we shall have the sum of the series $= z \times A + \frac{z-1}{2} d' + \frac{\overline{z-1} \cdot \overline{z-2}}{2 \cdot 3} d'' + \frac{\overline{z-1} \cdot \overline{z-2} \cdot \overline{z-3}}{2 \cdot 3 \cdot 4} d''' +$, &c. See De Moivre, Doct. of Chances, p. 59, 60. Misc. Analyt. p. 153.

For instance, let it be required to find the sum of a series of the squares of the natural numbers $1+4+9+16+25+36$. Then, $A = 1$

	d'	d''	d'''
4	3	2	
9	5	2	0
16	7	2	0
25	9	2	0
36	11		

The sum consequently will be,

$$= z \times 1 + \frac{z-1}{2} \times 3 + \frac{\overline{z-1} \cdot \overline{z-2}}{2 \cdot 3} \times 2$$

$$= z \times 1 + \frac{3z-3}{2} + \frac{zz-3z+2}{3}$$

$$= z \times \frac{6-9+9z+2zz-6z+4}{6}$$

$$= z \times \frac{1+3z+2zz}{6} = \frac{z \cdot \overline{1+z} \cdot \overline{1+2z}}{6} = \frac{6 \cdot 7 \cdot 13}{6} = 91.$$

This easy example will be sufficient to shew the applications of this rule. Those who are desirous of seeing its use in questions of chance, may consult Mr. De Moivre's Doctrine of Chances, p. 59, seq. Various other instances of the use of this rule in finding sums of progressions of figurate members, &c. may be seen in Misc. Analyt. p. 154, seq.

As to the *differential method*, it is to be observed, that though Sir Isaac and others have treated it as a method of describing an algebraic curve, at least of the parabolic kind, through any number of given points; yet the consideration of curves is not at all essential, though it may help the imagination. The description of a parabolic curve through given points, is the same problem as the assigning of quantities from their given differences, which may always be done by algebra, and by the resolution of simple equations. See Mr. Stirling's Methodus Differentialis, p. 97. This ingenious author has treated fully of the *differential method*, and shewn its use in the solution of some very difficult problems. See SERIES.

DIFFERENTIAL *scale*, in *Algebra*, is used for the scale of relation subtracted from unity. See *Recurring* SERIES.

DIFFORM, *Difformis*, from *forma*, *shape*, is a word used in opposition to *uniform*; and signifies, that there is no regularity in the form, or appearance, of a thing.

The botanists use it as a distinction of the flowers of several species of plants.

DIFFRACTION, in *Optics*, a term first used by Grimaldi the Jesuit, to denote that property of the rays of light, which others have called INFLECTION; the discovery of which some attribute to Grimaldi, and others to Dr. Hook.

DIFFUSE, DIFFUSIVE, is chiefly used for a prolix manner of writing, &c.

A dictionary cannot well be too *diffusive*: for a man is never too much informed of the word he wanted; and he is not obliged to read that part of the explication which does not concern him.

A *diffusive* style is proper for discourses in the demonstrative

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ſtrative kind. Demoſthenes is cloſe, and conciſe; Cicero, on the contrary, is *diffuſive*.

DIFFUSION, from *diffundo, I pour out, I dilate*, the act whereby a body is ſpread, or ſtretched out, ſo as to take up more ſpace.

The ſchoolmen make three kinds of *diffuſion:* the firſt, that whereby a pure quality is *diffuſed*; as cold, ſorce, &c. This they diſtinguiſh into *equal*, whereby equal portions, or degrees, of the quality are diſtributed upon equal parts of the medium; thus, when a direct motion is impreſſed on a moveable, all the parts of the moveable receive an equal impetus; and *unequal*, when unequal degrees of the quality are diſtributed on different parts of the ſubject; thus it is, that force is impreſſed on a lever, and cold propagated through a medium.

The ſecond kind of *diffuſion* is that performed by the motion of bodies: ſuch is the *diffuſion* of light, ſound, ſmell, magnetic, electric virtues, &c.

The third is performed partly by the motion of corpuſcles, and partly by the *diffuſion* of a quality; and thus they hold fire to be *diffuſed*.

But the modern philoſophers reject the notion of qualities, and their *diffuſion*. According to them, there is no other *diffuſion*, but that of corporeal ſubſtance, emitted in minute effluvia, or particles, into a kind of atmoſphere all around the body; which *diffuſion* of corpuſcles ſome call *atmoſpherical*, as being ſuppoſed to be terminated by a circle, whereof the *diffuſing* body is the center. Every body, it is now proved, has its ſphere of activity, or *diffuſion*, within which the particles, or corpuſcles, torn from it, and flying away, have a ſenſible effect; as we ſee in odorous, ſonorous, &c. bodies. See QUALITY; where the phyſical law of the *diffuſion* of qualities is laid down.

DIGAMMA. See F.

DIGAMY, the ſame with *bigamy*. See BIGAMY.

DIGASTRICUS, in *Anatomy*, a muſcle of the lower-jaw, thus called, as having a double belly. See *Tab. Anat. (Myol.) fig.* 2. N° 2.

The word is formed from δις, *twice*, and γαστηρ, *belly*. See BIVENTER.

The *digaſtric* muſcles, according to Mr. Monro, do not ſolely pull the lower-jaw down, but ſerve to draw up the os hyoides, and parts annexed to it, in deglutition. We have an account of the ſituation and uſes of theſe muſcles, by this learned profeſſor, in the Med. Eſſ. Edinb vol. i. art. 11.

DIGEST, DIGESTUM, a collection of the Roman laws, ranged and *digeſted* under proper titles, by order of the emperor Juſtinian.

That prince gave his chancellor Tribonianus a commiſſion for this purpoſe; who, in conſequence thereof, choſe ſixteen juriſconſulti, or lawyers, to work upon the ſame Theſe, accordingly, took out the beſt and fineſt deciſions from the two thouſand volumes of the ancient juriſconſulti, and reduced them all into one body; which was publiſhed in the year 533, under the name of the *Digeſt*. To this the emperor gave the force of a law, by a letter at the head of the work, which ſerves it as a preface.

The *Digeſt* makes the firſt part of the Roman law, and the firſt volume of the corpus, or body, of the CIVIL *law*, contained in fifty books.

It was tranſlated into Greek under the ſame emperor, and called Pandecta. See PANDECTS.

Cujas ſays, that *Digeſt* is a common name for all books diſpoſed in a good order and œconomy; and hence it is, that Tertullian calls the Goſpel of St. Luke, a *Digeſt*.

Hence alſo abridgments of the common law are denominated *digeſts* of the numerous caſes, arguments, readings, pleadings, &c. diſperſed in the Year-books, and other reports and books of law, reduced under proper heads, or common places. The firſt was that of Statham, which comes as low as Henry VI. That of Fitzherbert was publiſhed in 1516; Brook's in 1573, of which Hughes's, publiſhed in 1663, is a ſequel. Rolls, Danvers, and Nelſon, have alſo publiſhed *Digeſts* or abridgments of this kind, including the caſes of later days; to which may be added the New Abridgment, and Viner's Abridgment.

DIGESTION, in *Medicine*, that change of the food, taken in at the mouth, which it undergoes in the ſtomach, in order to afford fit matter to compoſe, or increaſe, an animal, till it arrives at its deſtined bulk; and to repair the loſs of thoſe particles which the body, in its natural ſtate, neceſſarily undergoes.

The operation of *digeſtion* ſucceeds to maſtication, and deglutition.

It includes chylification, and is ſucceeded by ſanguification, and nutrition.

The cauſe, manner, and means, of *digeſtion*, have been infinitely controverted: it would be tedious to enter into all the ſyſtems, and hypotheſes that have been framed by philoſophers and phyſicians, to account for this important operation. Some contend, that it is done by a kind of elixation, or boiling, of the ſolid and groſſer parts of the food in the liquid, by the heat of the ſtomach, and of the adjacent parts, the liver, ſpleen, &c.

Others will have it done by attrition; as if the ſtomach by thoſe repeated motions, which are the effects of reſpiration, rubbed or ground off the minuter particles from the groſſer matters; and agitating, and driving the reſt againſt each other, attenuated, and diſſolved them.

Others think, the bilious juice; others the ſpirits, &c. chiefly concerned in the affair.

Others will have the food diſſolved by a menſtruum, or diſſolvent: but theſe are greatly divided as to the nature and origin of this menſtruum; ſome ſuppoſing it an acid, furniſhed by the glands of the ſtomach; others a nitro-aereous ſpirit, which, by penetrating the maſs of food, breaks the connexion of the moſt ſolid parts; and others, a ſaline juice, which divides and volatilizes the parts of the food.

Others, again, ſuppoſe *digeſtion* to be performed by means of a ferment, or leaven; which, mixing with the aliment, excites an inteſtine motion in the parts thereof, by whoſe mutual colliſions, the parts are attenuated and diſſolved.

But theſe, too, differ in their opinions of this ferment; ſome taking it to be the remains of the food laſt *digeſted*, which, by its continuance in the ſtomach, has contracted an acid quality, which renders it a ferment: others take the ferment, or principles of fermentation, to be contained in the aliment itſelf; which, when incloſed in the ſtomach, and heated thereby, being put in motion, enters on its office of fermentation: but theſe, too, are divided; ſome taking it to be the ſpirituous part; and ſome the air in foods.

Others ſuppoſe the matter of this ferment ſupplied by the glands of the ſtomach: and laſtly, others contend for the ſaliva, and make that the ferment ſerving principally for the *digeſtion* of the food.

All theſe ſyſtems are now reduced to three principal ones; which we ſtill find explained, and defended in the ſeveral later writings on that ſubject: the firſt holding *digeſtion* to be performed by fermentation; the ſecond by trituration; and the third by fermentation and trituration together.

The firſt opinion was for a long time the only one. The retainers of it hold, that the food, after it is received into the ſtomach, is there impregnated with certain menſtruous juices, which being aſſiſted by the natural heat of the ſtomach, raiſe a fermentation in the foods, which diſſolves, attenuates, and converts them into chyle, which is a liquor in a ſtate of actual fermentation.

This was, originally, the ſyſtem of the ancients; who, though they only expreſs themſelves in general terms, as diſſolving, ſoftening, ſubduing, concreting qualities, &c. yet ſeem to have the notion of what we call *fermentation*. Thus Empedocles and Hippocrates teach, that *digeſtion* is performed by a putrefaction of the foods, after the like manner as the ſame Empedocles holds water to be converted by putrefaction into wine. Hippocrates and Ariſtotle uſe the term *concoction*, which we likewiſe find in Erotian, Plutarch, and Actuarius, to expreſs the manner of fruits ripening, the muſt changing into wine, and paſte riſing. Hippocrates expreſly names *effverveſcence* and *fermentation*, De Veteri Medicina, cap. 5. and Galen likewiſe, L. de Conſuetudine, cap. 2. And in another place he aſſerts, that a certain ſerous juice of the ſtomach concurs with the bile and ſpirits to effect *digeſtion*. To ſay nothing of Cicero, who, according to the prevailing opinion of his time, attributes *digeſtion* to the heat of the ſtomach. Lib. ii. De Nat. Deor.

Van Helmont, in his Treatiſe De Flatibus, has applied the doctrine of *fixed* AIR, now more generally underſtood, to the explication of the phænomena of *digeſtion*; and Hoffman alſo, in his chapter De Alimentorum Solutione & Salivæ Uſu; and the three ſucceeding ones inſiſt much on the complete change which the aliment undergoes in the firſt paſſages, and makes *digeſtion* a mere fermentatory proceſs.

The juices, or ferments in the ſtomach, to whoſe action *digeſtion* is ſuppoſed owing, are, the ſaliva, bile, and pancreatic juice. This is ſo true, that in certain voracious animals, which eat, and *digeſt* faſt, particularly wolves, oſtriches, and porcupines, the bile diſcharges itſelf immediately into the cavity of the ſtomach; and we have obſerved a diſpoſition analogous thereto in a man that had been a great eater.

There are only three marks to know the fermentation of dough and muſt by: firſt, in that the dough riſes and ſwells; and the muſt bubbles and rarefies; ſecondly, in that the bread and wine made by theſe fermentations have different taſtes and qualities from thoſe the flour

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and muſt had before; thirdly, in that the bread and wine, by diſtillation, yield principles that differ in many reſpects from thoſe drawn from flour and muſt. Now, all theſe characters are found in the change made in the food by *digeſtion*.

Sir John Pringle made ſeveral curious experiments, in order to aſcertain the fermentative quality of animal and vegetable ſubſtances. Bread and water remained for ſeveral days in a heated furnace, without any fermentation; but two drams of freſh meat being added to double the former quantity of bread, and water in proportion, the mixture began to ferment in a few hours, and continued to do ſo about two days. The fermentation was generally ſo ſtrong, that if the cakes had not frequently given way, the phials muſt have burſt. The bread and fleſh, which at firſt lay at the bottom, ſoon roſe to the top, and conſtantly, as the air elapſed, let fall ſome particles, that had been buoyed up by the fluid; thus a ſediment was formed reſembling lees, whilſt the lighteſt part, or flowers, remained on the ſurface; but the fermentation continuing, theſe alſo ſubſided; and the acid taſte and ſmell of the liquors, after the action ceaſed, was a farther proof of the preceding fermentation. This change was the more extraordinary, becauſe, when the motion began, the mixture was tending to corruption, and in a few hours afterwards became actually offenſive; but the next day the putrid ſmell abated and went off, before the fermentation ceaſed. From this and ſeveral other experiments of the ſame kind, Sir John infers, that moſt animal ſubſtances tending to putrefaction are endowed with a power of raiſing a fermentation in the *farinacea*, and even of renewing that action in ſuch as have undergone it before. It appears alſo plain by his experiments, that there is ſomewhat generated, or ſet free, during the firſt ſtage of the fermentation of animal and vegetable mixture, which hath a power of correcting putrefaction. The effect of fermentation is evidently to change putrid ſubſtances into a ſtate of acidity, which they not only retain, but become ſtill more and more acid. It is obſerved, indeed, that the acid ariſing from fermentation has ſomething of an auſtere and ſaltiſh taſte, but without any offenſive ſmell. Now, conſidering how much air is generated by fermentation, it may ſeem ſtrange that the ſame materials, uſed as food, ſhould make ſo little diſturbance in the body; and the difficulty would be the greater, did the SALIVA, as ſome ſuppoſe, promote both fermentation and putrefaction.

From this theory of fermentation, the doctor accounts for the acidity of the ſtomach; a diſorder to which many people are ſubject; ſince not only a ſtrong, but an auſtere acid, may be produced from the food of thoſe who live on fleſh, bread, and water only, as often as the ſtomach is relaxed, or in any way diſabled from conveying the whole aliment into the inteſtines; for what is left, having time to undergo a complete fermentation, is thereby changed into a harſh ſort of vinegar. See HEART-*burn*.

It is farther obſerved, that ſpirits, wines, acids, bitters, aromatics, and the hotter antiſcorbutic plants, retard alimentary fermentation, by their power of correcting putrefaction. However they may have their ſeveral uſes; ſome for checking immoderate fermentation, when, by reaſon of a putrid effluvia, or defect of it, the aliment may ferment too violently; and others, again, for bracing the ſtomach, and fitting it for expelling its contents in due time. All theſe facts correſpond with *digeſtion*; for the moſt nouriſhing and digeſtible food to people in health, conſiſts in a due mixture of animal and vegetable ſubſtances with water. Scorbutic or putrid habits require acids, wine, or other antiſeptics. And acids abounding in the ſtomach are corrected by abſorbents; and, in a want of a natural heat, and a debility of the ſtomach, wines, bitters, and warm and acid ſubſtances, become neceſſary. Obſ. on Diſeaſes of the Army. Appendix.

Fermentations have been uſually ſuppoſed to generate great heat, and effervescence has been uſed as a ſynonymous term, by which to expreſs it. Nevertheleſs many of the moſt violent of them are attended with a very conſiderable cold inſtead of heat. Thus water poured into ſpirit of wine produces heat, in proportion to the water: but the eſſential vegetable oil, which is particularly diſpoſed to take fire, mixed with ſpirit of wine, produces cold; and water has no effect with theſe oils. Mem. Acad. Par. 1727.

Several of Sir John Pringle's experiments have been repeated by Dr. Macbride, to which he has added others of the ſame kind. The following mixtures were prepared, viz. bread and water, about four ounces; bread and boiled mutton, beat up thin, with the requiſite quantity of water, in all about four ounces; this was called the ſimple fermentative mixture: four ounces of this mixture, with two drams of freſh lemon juice; four ounces of the ſame beat up with an ounce of ſpinage; the ſame quantity of the mixture with an ounce of green water-creſſes; and four ounces, with two drams of a very fœtid liquor, that lay about putrid mutton: theſe ſeveral mixtures were placed in a moderate degree of heat, on the top of a ſand furnace, which required a continual fire for three or four days. The bread and water diſcovered no fermentation for fifty-four hours; but at the end of four days it became perceptibly acid. In the other five mixtures, an inteſtine motion was evident in three or four hours; the ſolid part ſoon roſe to the top; bubbles of air, and a thick ſcum, formed on the ſurface; a vapour, with ſome degree of pungency, and which extinguiſhed fire, now began to diſcharge itſelf; and when the motion became very briſk, little pieces of the ſolid matter fell every moment to the bottom of the phials; and when it ceaſed, as it did in the four laſt, in fifty-four hours, and in the firſt in four days, the mixtures were clear and perfectly ſweet.

From theſe and many other experiments, both of a ſimilar nature, and on the great quantity of fixed air which is ſeparated from animal ſubſtances, during their putrefaction, Dr. Macbride was led to conclude, that on the preſence of an elaſtic fluid, or fixed air, in fleſh, depends its coheſion and ſoundneſs; that in proportion as the fixed air is ſeparated from it by fermentation, its texture is deſtroyed, its conſtituent parts become diſunited, and ſeparate to reunite in a different manner, and to form new combinations different from the former. See PUTREFACTION.

Having likewiſe found, that all the alimentary mixtures, which we commonly uſe, are ſuſceptible of fermentation in a ſhort time; that animal and vegetable ſubſtances, when mixed, have a greater aptitude to ferment, than either of theſe ſubſtances poſſeſs ſeparately; and that from all the alimentary mixtures, which he has tried, he always ſeparated a conſiderable quantity of fixed air: he applied theſe different diſcoveries to explain the phænomena, and to eſtabliſh the moſt plauſible and rational theory of *digeſtion*. See the cloſe of the article, and CHYLE. See alſo *Fixed* AIR, and SCURVY.

Haller denies that any kind of fermentation takes place in the ſtomach, in order to *digeſtion*; and ſeems to attribute the greateſt effects, in order to the diſſolution of our aliment, to the ſeparation of the air therein contained, and the action of the bile.

The ſecond ſyſtem was invented, or at leaſt renewed, in the preſent age; and has been maintained with much zeal and vivacity, as is commonly the caſe in any thing that has the appearance of novelty. Thoſe who eſpouſe this opinion, contend, that it is a mere continual attrition, or grinding, that breaks, attenuates, and reduces the food, and with the addition of a proper fluid, forms it into that whitiſh ſubſtance, called *chyle*; much as corn is ground between the ſtones of a mill. Which opinion ſeems to be confirmed by ſomething obſerved in birds; their gizzard, or crop, is compoſed of two ſtrong, ſolid, compact muſcles, which rubbing againſt each other, and being aſſiſted by little angular ſtones, or grains of ſand, ſwallowed by the birds, break and grind the dry food thoſe animals live on; and when the ſand is grown ſmooth, they caſt them off with the other excrements, and ſwallow freſh grains.

The experiments of the Florentine academy, repeated by Redi and Borelli, favour the ſame opinion. Hollow particles of glaſs, which they gave to chickens, ducks, and turkeys, were found reduced to a fine powder.

This ſentiment is thus explained by an able aſſertor thereof, M. Hecquet, in his treatiſe of *digeſtion*. Every thing in the body is vaſcular; conſequently, every thing therein is hollow; every thing therein lives after its manner; conſequently, every thing is in motion; animal life being nothing but motion, and conſequently, all the veſſels are in motion. Now the parts of a body, that are to move, will move moſt readily towards thoſe ſides, where they find the leaſt reſiſtance. But the place of the leaſt reſiſtance in tubes is the cavity; conſequently, the motion of the parts of veſſels is towards their axes. The parts of veſſels that are to move, are the parietes, or ſides, becauſe flexible and elaſtic; and this motion can only be effected by an approximation of thoſe parts; conſequently, the motion of the veſſels conſiſts in an approximation of their parietes: it is, therefore, a ſort of contraction, preſſion, or coarctation. Hence, as all the parts of the body are only veſſels, they all undergo a ſyſtole, preſſion, or contraction.

Farther, all theſe veſſels contain juices in their cavities; and, therefore, all the juices, or liquids in the body, are continually compreſſed. This preſſion is the action of an elaſtic force; conſequently, the preſſion will be ſuch as

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as is the force, and, therefore, alternative: conſequently, it is a pulſe, or palpitation; and therefore the juices are continually beaten. Now, theſe juices are exceedingly diviſible; and conſequently they are continually attenuated and divided; and a diviſion effected by a pulſation, or beating, is a trituration; and conſequently, the juices in the body are continually triturated, or ground. The reaſon why the compreſſive force ſhould be alternative, is, that the membranes, which compoſe the veſſels, conſiſt of two plans, or ſeries of fibres; the one longitudinal, the other circular, cutting the longitudinal, at right angles: the longitudinal are tendinous, and elaſtic; the circular are muſcular, or motive, like ſphincters, which compreſs: the circular are over the longitudinal, and embrace, or gird them round; the former, we have already obſerved, are elaſtic; and their elaſticity oppoſes the compreſſion of the latter. From this oppoſition, or reſiſtance, ariſes a reciprocal action, and re-action, which is the alternative grinding force required.

To ſuch as account for *digeſtion* from a ferment, thoſe philoſophers object, that *digeſtion* is a diſſolution; that to prepare the matters for this diſſolution, they muſt be ſoftened; that the proper effect of acid ferments, is to gnaw, or tear the hardeſt matters, and to harden the ſofter, to thicken the fluid, fix the fat, and coagulate the milky; conſequently, that an acid ferment ſhould rather impede, than promote, *digeſtion*. Add, that, beſide the force to grind the juices, and the veſſels to compreſs them, there are likewiſe liquors to dilute and temper them; viz. the ſaliva, and ſtomach-liquor; and mineral matters, which the ſtomach-liquor cannot diſſolve, are found to be worn and poliſhed, after having ſtayed ſome time in the ſtomach. Now, poliſhing is the effect of triture, or grinding, not of corroſion; accordingly we find pelotoons, or balls of hairs, or threads, in the ſtomachs of cattle, very ſmooth and ſhining, and far from having any marks of corroſion.

The authors who are for the trituration, require three things for *digeſtion* to proceed: a liquor, to wet and dilute the food, which they find in the ſaliva and ſtomach-liquor; a veſſel, which is the ſtomach; and a moving power to grind, which they imagine to have found in the muſcles of the ſtomach, diaphragm, and abdomen. The moving force in the muſcles of the ſtomach they maintain to be equivalent to the weight of 248235 pounds; and the force of the ſtomach, alone, to a weight of 12951 pounds; a power more than equal to that of one of the heavieſt mill-ſtones. See Traité de la Digeſtion, par M. Hecquet.

Borelli, on the footing of the equilibrium of fluids, has demonſtrated, that the force of the flexor of the laſt articulation of the thumb is equal to 3720 pounds; whence Pitcairn deduces, that the force of the fibres of the ſtomach is equal to 12951, and that of the diaphragm, and muſcles of the lower venter, to 248235 pounds. His way of eſtimating is this: the flexor only weighs 122 grains, and yet may ſuſtain 3720 pounds; conſequently, the fibres of the ſtomach, weighing 8 ounces, and the diaphragm, with the muſcles of the lower venter, weighing together 8223 grains, have the force above mentioned. But this argumentation ſeems founded on a miſtake: for it is not in virtue of its weight of 122 grains, that the flexor muſcle is equivalent to 3720 pounds; beſides that it would follow, hence, that the heavier the muſcles of the ſtomach, diaphragm, and abdomen, are, the more force they would have; and, conſequently, the more eaſy and expedite would the *digeſtion* be; which is falſe.

The patrons of this ſyſtem compare the brain to the arbor, or ſcrew, of a preſs; the heart, to a piſton; the lungs, to bellows; the mouth, to a mill-ſtone, or a peſtle; the ſtomach, to a preſs; and the inteſtines, to a receiver, or vat. They contend, that Caſtellus, a phyſician of Meſſina, was the firſt of the moderns who expreſly eſpouſed the ſyſtem of ferments; and that he was followed by Van Helmont, and Willis.

But even the partiſans of trituration are not perfectly agreed among themſelves: Pitcairn will have it performed by a total contraction of the ſtomach; and M. Hecquet by a ſucceſſive periſtaltic, or vermicular, contraction.

Aſtruc, in his treatiſe De la Cauſe de la Digeſtion, refutes this ſyſtem of trituration at large. He makes a ſtrong oppoſition to the calculus which raiſes the moving force of the ſtomach, &c. ſo very high; the contraction of the fibres of the ſtomach, to compreſs the food, he ſhews, cannot exceed three ounces; and it is even *gratis* that he allows ſo much; that of the diaphragm, and abdomen, he computes at about four pounds. He obſerves, that Pitcairn, ſurpriſed, in all probability, with what he had aſſerted of this force, durſt not purſue the proportion whereon his calculus was founded; and according to which, one of the forces would have been found equivalent to 117088 pounds, and the other to 250734; which, together, make 367822 pounds.

The diaphragm, in its motion, has two powers; the one direct, which is that whereby its muſcles draw from the center towards the circumference; the other lateral, whereby it reſts, or preſſes, on the ſtomach; the latter is very ſmall, in compariſon of the former. Now what ſeems to have deceived Pitcairn and Hecquet, is, their taking the direct for the lateral force; the contraction of the fibres, for their preſſure on the ſtomach; and the ſame overſight they are guilty of in the muſcles of the abdomen, whoſe preſſure againſt the abdomen is only lateral. Add, that there are voracious animals without any diaphragm at all; as fiſhes, which reſpire through their gills; and others, that have only a ſingle membrane; as birds, in whom the muſcles of the lower venter are very ſmall and feeble, and in a ſituation that incapacitates them from acting at all on the ſtomach.

The membranes of the ſtomach being very ſoft, and having only a ſlender motion, ſeem very unfit for the office of a mill-ſtone. It is true, in certain fowls the ſtomach conſiſts of a cloſe, compact, fleſhy muſcle, exceeding ſtrong, ſo as to break little ſtones, and bits of glaſs; but to this it is urged, that it is no *digeſtion*, which in theſe animals is effected in the inteſtines; and the ſtructure of our ſtomach, compared with the gizzard, or crop, of granivorous birds, does, on the contrary, furniſh a very cogent argument againſt trituration. The gizzard is provided, on the outſide, with four fleſhy muſcles, the tendons whereof meet in two oppoſite joints; the inſide is lined with a hard, thick, cartilaginous membrane, eſpecially in the places where the tendons meet: by this mechaniſm, nature plainly intimates the office of the gizzard to be the grinding of the grain by the friction of its parietes, or ſides: whereas the membrane in the ſtomach of a man is exceedingly thin and fine, furniſhed with few fleſhy fibres, covered with a tender, ſenſible kind of villi; and the ſtomach itſelf is of a great capacity; and the ſtomach in rapacious birds, who devour huge pieces of raw fleſh without chewing, is ſtill a finer membrane. Laſtly, on the foot of the ſyſtem of trituration there ſeems no accounting for hunger, naufeas, indigeſtions, crudities, &c.

In the ſyſtem of trituration it ſeems impoſſible to explain why certain things eaſy to grind, e. gr. cabbage-leaves, cannot be *digeſted* in certain ſtomachs; which yet find no difficulty in *digeſting* more hard and ſolid meats, as beef and mutton; whereas the difference of diſſolvents gives a natural and eaſy ſolution. Hydropic people continue to *digeſt*, notwithſtanding the fibres of the ſtomach, as well as the reſt of the body, are extremely relaxed, through the redundance of moiſture; and the total, prompt change of nature induced in foods, can be the effect of nothing elſe but fermentation; which even diſcovers itſelf by belches, &c. while it goes on. The iron, needles, pins, &c. ſometimes found undiſſolved in the ſtomach, are no objection to the ſyſtem of fermentation; it being notorious, that no diſſolvent diſſolves all bodies.

In birds, which feed on grain, the fermentation is manifeſt; firſt in the crop, where the grain is prepared for *digeſtion*, by being macerated in a liquor like the ſaliva; and afterwards in the gizzard, where the *digeſtion* is perfected by a diſſolvent poured into it by a conglomerate gland. But the thing is ſtill more apparent in ruminating animals, which are provided with four ſtomachs; the two firſt whereof, though formed of a nervous membrane, make but little alteration in the aliment, for want of a ferment, or menſtruum; ſo that it requires to be chewed again, and only becomes well *digeſted* in the fourth ſtomach, whither a diſſolvent is poured from a conglomerate gland.

The partiſans of the third opinion allow it inconteſtable, that there are acids in the ſtomach which mix with the foods, and act on them; and they hold, likewiſe, that their action is aided and promoted by the motion of the ſyſtole and diaſtole in the viſcera: they add, that the acids produce a fermentation, and the oſcillatory motion of the viſcera a trituration; and that thus *digeſtion* is the effect of fermentation, and trituration at the ſame time.

The doctrine of trituration was firſt propoſed in the time of Hippocrates. An opinion was entertained by ſome phyſicians of thoſe times, that the ſtomach was only the receptacle of the ſolid or dry foods; that theſe, after having been diluted, and broken in the mouth, were again broken more perfectly in the ſtomach; and that, by this means alone, they were converted into chyle; but that the drink, by reaſon of its liquidity, not being ſubject to be broken, went to the lungs, and not to the ſtomach, where, on account of its abundance, it would rather have prejudiced the *digeſtion* than have aided it. Hippocrates, we read, in the fourth book of diſeaſes, vigorouſly oppoſed an opinion ſo contrary both

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to reaſon and experience; and he was the more zealous in his oppoſition, becauſe, as he informs us, the opinion had gained many partiſans. However, it ſoon gave way to the reaſoning of Hippocrates, and the ſyſtem of trituration ſunk with it. But Eraſiſtratus revived it; and the doctrine, after having been ſupported for ſome time, fell into oblivion. Within the laſt century ſeveral have again endeavoured to recover it.

Dr. Pitcairn, M. de Reaumur, and many others, have eſpouſed it. M. de Reaumur made many experiments both on granivorous and carnivorous birds, from which it appeared that the former digeſt their food by trituration, and the latter by ſolution in a proper fluid. Thoſe that have gizzards were made to ſwallow ſhort tubes of glaſs and tin; and when the fowls were killed, the tubes of glaſs were found ſplit aſunder lengthwiſe, and thoſe of tin, either grooved from end to end, or flatted, or unrolled. But in order to ſhew that this was done by the operation of grinding, without the aid of a diſſolvent, M. Reaumur caſt leaden tubes in moulds, whoſe ſhape could not be altered, and into theſe, left open at both ends, he introduced grains of barley, and bits of beef; and theſe, after remaining ſeveral hours, at different times, in the gizzards of fowls, were taken out, without any ſenſible alteration. In order to determine the mode of *digeſtion* in the ſtomachs of carnivorous birds, which are membranous, he caught a young buzzard, and made him ſwallow a tin tube, which might have been ſqueezed together by the preſſure of a finger and thumb; but after twenty-four hours he threw it up, without any the leaſt apparent mark of friction; whence he concluded, that the bird's ſtomach had little, if any, force of trituration. Having filled the tube with fleſh, and fixed a proper quantity to each end, the buzzard was made to ſwallow it, and in twenty-four hours diſgorged it, without the leaſt injury to the thread meſhes at the ends; but the meat was covered with a kind of paſte, and reduced to an eighth part of the original quantity. Other experiments were renewed with meat and bones, ſome of which were wholly diſſolved, and others conſiderably reduced in quantity. Grain was tried in the ſame manner, without any viſible change; the proper food of carnivorous birds being fleſh.

Mr. John Hunter has lately made ſeveral experiments on the *digeſtion* of the ſtomach after death. Having obſerved that animals, or parts of animals, poſſeſſed of the living principle, when taken into the ſtomach, are not in the leaſt affected by the powers of that viſcus, whilſt the living principle remains; he ſhews, that the ſtomach, when deprived of the living principle, is itſelf capable of being digeſted either by the digeſtive powers of other ſtomachs, or by the remains of that power which it had of digeſting other things. And hence it happens, that the ſtomachs of dead bodies are found diſſolved at their greater extremity, from their own natural digeſtive powers, and not in conſequence of any diſeaſe; appearances of this kind being moſt frequent in thoſe who have died violent deaths. This digeſtive power of the ſtomach was farther evinced in fiſh, which ſwallow their food whole, and ſwallow fiſh much larger than the digeſting part of the ſtomach can contain; the part lodged in the ſtomach was found more or leſs diſſolved, whilſt the part left in the œſophagus remained perfectly ſound; and the digeſting part of the ſtomach was itſelf, in many caſes, actually diſſolved.

From ſeveral facts of this kind, Mr. Hunter inferred, that the ſtomach, being dead, was no longer capable of reſiſting the powers of that menſtruum, which itſelf had formed for the *digeſtion* of its contents; and that *digeſtion* is performed not by any mechanical power, nor contractions of the ſtomach nor heart, but by ſomething ſecreted in the coats of the ſtomach, which is thrown into its cavity, and here animaliſes the food, or aſſimilates it to the nature of the blood. Mr. Hunter has found in the ſtomachs of all animals, to which his obſervations or experiments have extended, an acid, but not a ſtrong one, in the juices contained in that viſcus in a natural ſtate. Phil. Tranſ. vol. lxii. art. 32. p. 447, &c.

Some ſuppoſe *digeſtion* owing to gentle heat and motion; by which the texture of the alimentary ſubſtance is changed in the bodies of animals; and then the conſtituent ſolid parts are endued with peculiar attractive powers of certain magnitudes, by which they draw out of the fluids moving through them, like parts in certain quantities, and thereby preſerve their forms and juſt magnitudes. See Dr. Bryan Robinſon of the Animal Oeconomy.

Be it as it will with each of the three ſyſtems, thus much we may venture to lay down from them all, as the real proceſs of *digeſtion*; the end of this operation being to prepare the foods, ſo as that they may ſerve for nutrition, thoſe foods muſt be conſidered from the time the man takes them in; till, being converted into chyle, they mix with the blood, which conveys them into all parts of the body: the foods, then, we take, are either crude, as oyſters, fruits, certain pulſe, &c. or dreſſed, as fleſh and fiſh, which are roaſted, boiled, fried, &c. and ſeaſoned a thouſand divers ways with ſalt, pepper, and other ſpices, vinegar, wine, &c. This is done to heighten and enrich the taſte, as much as to aſſiſt *digeſtion*.

Farther, there are ſome foods we ſwallow without chewing, as liquids; and others, which we break and comminute by chewing, as bread, fleſh, &c. It is of theſe laſt we ſhall here ſpeak, as undergoing more preparations, and more changes to fit them for nutrition, than the others.

The food, then, is firſt broke and divided by the teeth, and, at the ſame time, moiſtened with a liquor ſupplied by the ſalival glands, and thus is formed into a kind of paſte.

Thus prepared, it is paſſed through the œſophagus into the ſtomach, there to ferment. This fermentation is cauſed, 1. By the ſalival and gaſtric juice, which is a ferment, and has the ſame effect on the aliment, that leaven, or yeaſt, has on paſte. 2. By the heat of the ſtomach, viſcera of the abdomen, and even excrements; which here have nearly the ſame effect on foods, as a dunghill has on matters laid by the chemiſts to *digeſt* therein. 3. By the remains of foods left adhering in the rugæ, or folds of the ſtomach, and there turned ſour and acrimonious. 4. By the agitation ariſing from the periſtaltic motion, the compreſſion of the muſcles of the abdomen and diaphragm, and the continual pulſation of the neighbouring blood-veſſels. 5. By the liquor which the repeated compreſſion of thoſe muſcles occaſions to drip from the glands of the ſtomach. And, 6. According to the ſentiment of ſome modern phyſicians, by the air itſelf; which, being mixed, and embarraſſed in the aliments, dilates by the heat of the ſtomach, and ſeparates the parts of the foods. This air, which once adhered to the ſubſtances compoſing our food, in a fixed ſtate, does, in the moment of extrication, reſume its elaſticity, and thus deſtroys the union of their minute particles. This elaſtic air is probably abſorbed again by the alimentary mixtures, and reduced to a fixed or non-elaſtic ſtate, before the chyle enters the lacteals; though Dr. Black maintains, that the alimentary ſubſtances carry their fixed air into the blood, without throwing it off into an elaſtic ſtate, during *digeſtion*; and he is ſo far from believing that the aliment naturally ferments in the ſtomach, that he looks on ſuch fermentation, when it does happen, to be the cauſe of many, and very dangerous diſeaſes. Theſe cauſes all contribute to attenuate and divide the food, ſo as to convert it into a cineritious matter, called CHYLE.

From the ſtomach the chyle deſcends into the duodenum, and through the long tract of the ſmaller inteſtines, where it is further perfected by the pancreatic juice, and the bile, which thin it, precipitate its groſſer parts, and render it more fluid; and chiefly by the fermenting motion which ſtill continues; the chyle, thus perfected and attenuated, enters the lacteal veins, fully charged with the ſubtle, active, antiſeptic ſpirit, called *fixed* AIR, which convey it into the receptaculum chyli, where it is further diluted by the lympha, which is brought hither in abundance; hence it ariſes into the thoracic duct, and enters the ſubclavian vein; where, being taken up by the aſcending cava, it is poured into the right ventricle of the heart. The chyle, thus mixing with the blood, communicates its inteſtine motion to it, and thus prevents the natural tendency of the fluids to putrefaction; and the blood, by its volatile and exalted parts, together with the ſaline and nitrous parts of the air, ſubtilizes, and gives it its laſt perfection. Then the *digeſtion* is finiſhed; and the foods being, by ſo many changes, rendered the immediate matter of nutrition, are carried by the blood into all parts of the body, to repair and fill the vacancies of ſuch as are continually diſſipating and exhaling, or even to add new ones.

As to the groſſer parts of the foods, ſeparated from the chyle by the bile and pancreatic juice, they aſſume the colour of excrements, from the bile; and their rank ſmell they derive from the coarſer ſulphurs thereof, and from the ſour and putrid ferments, that are lodged in the cœcum, which, in a very ſhort time, correct the alimentary remains into their own nature. Theſe ſulphurs, and ſalts of the excrements, together with their putreſcent quality, ſerve, after they have paſſed through the inteſtines, and are arrived at the laſt, which is the rectum, to vellicate the muſcles thereof, and diſpoſe them to relax, and thus to appriſe nature of a neceſſity to diſcharge.

In particular caſes, however, as in thoſe of weak and relaxed habits, of pregnant women, whoſe ſtomachs, and great

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great part of the ſmaller inteſtines, are thrown out of their natural ſituation, and of perſons who lead ſedentary lives, the food is often detained ſo long in the firſt paſſages, as to paſs on to the ſecond or acetous ſtage of alimentary fermentation; and then it produceth a very auſtere acid, which, not being admitted by the lacteals, accumulates, and occaſions ſour eructations, heart-burning, vomiting, griping, or looſeneſs, according to its quantity, degree of ſtrength, and place where lodged. This ſour acrimony precipitates the alimentary mixture through the firſt ſtage of fermentation to the ſecond, and prevents the food from yielding a nutritious chyle, which appears from the paleneſs and languid diſpoſition of thoſe who are much afflicted with ſourneſs in the ſtomach. This circumſtance ſuggeſts one reaſon, why exerciſe, which agitates the viſcera, and prevents the too long ſtay of the aliment in the firſt paſſages, and the aromatic gums and bitters, together with chalybeats, whoſe qualities are ſtrengthening and ſtimulating, prove ſo very ſerviceable in all theſe caſes. But if the aliment, either from its own very putreſcent nature, or from its too long ſtay within the confines of the ſmaller inteſtines, ſhould proceed to the third, or putrefactive ſtage of fermentation, it will become ſo offenſive, as to occaſion immediate efforts for throwing it off, or end in dangerous diſeaſes, and even death. Macbride's Eſſays, p. 20, &c.

The ſeparation of the urine from the blood may be eſteemed a part of perfect *digeſtion*; the deſign of ſuch ſeparation being to render the blood more pure and balſamic; and, of conſequence, more fit for nutrition; which the ſalts, with which the urine abounds, greatly prevented. This ſeparation is thus performed: the branches of the emulgent arteries, which terminate in the glands, whereof the ſubſtance of the kidneys is compoſed, carry the blood thither; where a ſeroſity is ſeparated from the blood, by means of the pores in the glands of the kidneys; thoſe pores repreſenting the holes in a ſieve, which only let paſs ſuch things as are of a leſs diameter than themſelves. This ſeroſity, called urine, is diſcharged hence into ſeveral little tubes, which joining in a kind of pyramids, yield their humour into the pelvis, whence it runs through the ureters into the bladder.

DIGESTION, in *Chemiſtry*, is a preparation of plants, minerals, metals, or other bodies, by putting them, with ſome proper fluid, in a veſſel, and heating them gradually over a gentle fire, like the heat of an animal body.

Digeſtion is ordinarily confounded with maceration; but the two things differ, in that there is heat required to *digeſtion*; whereas maceration is done in the cold.

Digeſtion is uſually performed with the addition of ſome menſtruum ſuitable to the matter: thus roſes and poppies heads are put to digeſt in oil, or water, to make unguents, or ſyrups; calcined lead, and ceruſs, are digeſted in diſtilled vinegar, to make the magiſtery thereof, or the ſal Saturni. Hence Dr. Freind defines *digeſtion*, to be the ſolution of bodies, made by menſtruums, with the aſſiſtance of fire.

The uſe of *digeſtion* in pharmacy, is to extract the more volatile particles, and mix them intimately with the menſtruum. To this end a gentle fire is commonly uſed, that the corpuſcles, which are moſt volatile, may ſeparate, as it were, of their own accord; for a fierce fire forces out the fæces, as well as the finer particles; and if it does not abate the ſtrength of the liquor, as is often the caſe, it will not fail of ſpoiling its clearneſs.

In ſome caſes *digeſtion* is uſed to produce a change in a ſingle body, as in merc. precip. per ſe; in others to promote ſolutions, or other combinations; as of well-calcined, dry fixed alkali, with rectified ſpirit of wine, which digeſted together in a matraſs, with a gentle ſand-bath heat, becomes an alkaline tincture of a yellow reddiſh colour, called tincture of ſalt of tartar. CIRCULATION is a mode of *digeſtion*. The veſſels generally uſed for this purpoſe are matraſſes, or Florence flaſks, either of which may be eaſily converted into circulatory veſſels. The operation is generally performed in a ſand-bath, by which the degrees of heat may be regulated according to the intention of the operator. This heat ſhould never riſe ſo as to make the matter boil. *Digeſtion* is uſed for making tinctures, wines, elixirs, &c.

The chemiſts of late years have too much given into the more elaborate and forced proceſſes, and neglected the more natural and eaſy ones. Among theſe latter is *digeſtion*; a proceſs ſo eaſy, that it requires ſcarce any quality in the operator but patience, and yet will do ſuch things as all the elaborate proceſſes of that art can never arrive at without it. There is ſcarce a proceſs that has more puzzled the chemiſts of an age or two ago, than the volatilizing ſalt of tartar; yet Langelot aſſures us, that after uſing all the caution in the common proceſſes that an earneſt deſire of ſucceſs could inſpire him with, he failed in them all; till trying the effect of a long *digeſtion*, he ſucceeded ſo well in the firſt attempt, that he converted almoſt the whole ſalt into a pure white volatile ſubſtance, leaving only a few inſipid earthy fæces behind.

Another great uſe of *digeſtion* is the duly preparing the eſſences of mineral ſulphurs; the ſtony ſea-plants, which greatly reſemble the nature of foſſils, are alſo better treated by this proceſs than by any other. Tartariſed ſpirit of wine, receives a very high tincture from red coral, after a long *digeſtion*, in any diſtilled vegetable oil, though it will not in the common way be at all coloured by it. Phil. Tranſ. N° 87. See CORAL.

DIGESTION, in *Surgery*, expreſſes a diſpoſition in abſceſſes to ripen, and come to ſuppuration.

Tumours, ariſing on the parotides of children, are of eaſy *digeſtion:* they ripen in a little time. Dionis.

DIGESTION is alſo uſed for maturation, or that ſtate of a diſeaſe wherein the morbific matter is ſo changed in bulk, figure, coheſion, mobility, &c. by the uſe of proper medicines, or even by the force of nature, as to be leſs noxious and hurtful, and, conſequently, to abate the violence of the diſtemper.

The Greeks call it πεπασμος. The matter of the diſeaſe ſo far *digeſted*, as to become next a-kin to ſalubrious, or healthy matter, is ſaid to be *reſolved*.

DIGESTIVE *faculty*. The ancient philoſophers admitted a *digeſtive faculty*, or *quality*, in the human body; as not knowing how otherwiſe to account for the act of *digeſtion*.

DIGESTIVE is alſo uſed, in *Medicine*, for ſuch remedies as ſtrengthen and increaſe the tone of the ſtomach, and aſſiſt in the *digeſtion* of foods. To this claſs belong all ſtomachics and ſtrengtheners, or corroborants.

DIGESTIVE, in *Surgery*, denotes a ſort of unguent, plaſter, or the like, that ripens and prepares the matter of wounds, &c. for ſuppuration.

The common *digeſtive* is compoſed of turpentine, yolk of eggs, oil of St. John's wort, unguentum baſilicum, and tincture of aloes.

The wound muſt be dreſſed the firſt day with a *digeſtive*, to bring it to ſuppuration.

DIGESTOR, or DIGESTER, an artificial means, or inſtrument, ſerving to *digeſt*, or diſſolve meats out of the ſtomach, by a way analogous to that of animal digeſtion.

Mr. Leigh, in the Philoſophical Tranſactions, gives us an artificial *digeſter*, to illuſtrate the natural one: it is prepared from ſpirit of ſulphur, ſpirit of hartſhorn, the chyle of a dog, and its ſaliva. A piece of veal, mutton, beef, or the like, of the bigneſs of a nut, being put in a dram of this preparation, and ſet on a *digeſting* furnace two hours, it drew from the fleſh a juice, that had the colour and taſte of chyle, and left the meat light, dry, and inſipid.

Dr. Havers prepares a *digeſtor* of oil of turpentine, mixed with oil of vitriol; in which, raw fleſh, and crumbs of bread being put, and the whole committed for four hours to *digeſt* in balneo Mariæ, the meat is found diſſolved, and the whole together forms a thickiſh pulp: hence, thoſe authors, each of them, conclude the food in the ſtomach to be *digeſted* by ſome ſuch menſtruums.

But the moſt celebrated *digeſtor*, is an inſtrument of that name, invented by Papin, the effect whereof bears a more near reſemblance to the operation of the ſtomach. It is a ſort of veſſel, wherein meat being put, together with ſo much water as ſerves exactly to fill it, a lid is ſcrewed cloſe on, ſo as to admit of no external air. Then, by the application of two or three lighted charcoals, or even a ſingle ſmall lamp-flame, the meat is in a few minutes (ſix or eight) reduced into a perfect pulp, or rather liquor. By a little increaſe of the fire, or the addition of a few minutes in time, the hardeſt bones themſelves are brought into a pulp or jelly. The effect is accounted for from the ſtrict cloſure of the engine, which excluding the intruſion, or eſcape, of air, the ſucuſions occaſioned by the expanſions and oſcillations of the air included in the fleſh, are equable and ſtrong, and ſo reſolve the whole into one ſeemingly homogeneous body, and mix the aqueous, ſaline, oleous, and other particles, ſo ſtrongly together, as ſcarce to ſeparate, but while hot, to appear one liquor, and when cold, jelly of a ſtrength proportionate to the quantity of fleſh, or bones, diſſolved in the water.

This experiment ſeems to hold a cloſe analogy with the operation of the ſtomach. For though the ſtomach doth not ordinarily diſſolve, either ſo ſtrongly, or ſo quick; yet in proportion to its heat and conſtruction, Dr. Drake takes it to do the ſame thing; thereby breaking, and reſolving into ſmall, the bodies which it included, ſo mixed, *inter minima*, with its humours. Theſe, thus reduced into a fluor, and intimately mixed with the liquids of the drink, and juices of the ſtomach, compoſe that lacteſcent liquor, called *chyle*, or *chyme*. See CHYLE.

DIGGING,

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DIGGING, in *Mineralogy*, a term appropriated by the miners to expreſs that penetrating into the earth, where they have the ore before them, and every ſtroke of the tools turns to account.

They appropriated the word to this ſenſe, expreſſing the random openings, which they make in ſearch of mines, by the word *hatching*, or *eſſay-hatching*. See the article TRAINING *of mines*.

When the eſſay-hatches have been opened ſo long, that the orifice of the mine or load is found, the opening which has led to it, loſes its name of eſſay-hatch, and is called a ſhaft or metal-hatch; this is to be ſunk down about a fathom, and then they leave a ſquare ſpace, called a *ſhamble*, and ſo continue ſinking from caſt to caſt; that is, as high as a man can conveniently throw up the ore with a ſhovel, till the load is found to grow ſmall, or elſe to degenerate into ſome unprofitable ſubſtance, or weed, as they metaphorically expreſs it. The degeneracy of the ore is ſoon perceived, by the finding mundic or marcaſite growing more plentiful among it. This is a ſulphureous mineral, of a yellow, whitiſh, or greeniſh colour, and is very troubleſome to the Corniſh miners. The other unprofitable ſubſtances found in the place of the ore, or mixed in large quantities with it, where it degenerates, are daze, which is white, black, or yellowiſh; *iron-mould*, which is black or ruſty; *caul*, which is red; *gliſter*, which is blood-red, or black, is alſo another degeneracy of the ore. Theſe are the common names given by the miners to various foſſils, and theſe are the marks by which they know the vein is almoſt exhauſted in that part, and will not long be worth *digging*.

In this caſe, they begin to drive either eaſt or weſt, as the goodneſs of the land, or the convenience of the hill, unite. The drift or opening, on this occaſion, is three foot over, and ſeven foot high, ſo that a man may conveniently ſtand and work; but in caſe the land is not broad enough of itſelf, as ſome are ſcarce half a foot, then they break down the deads firſt on the north ſide of the land, for the greater conveniency of the right arm in working, and then they begin to rip the load itſelf. By the term deads, they mean that part of the ſhelf, which contains no metal, but incloſes the load or vein as a wall between two rocks.

The inſtruments commonly uſed in mines with us, and that ſerve for ripping the lands, are the *beele*, or, as it is called in Cornwall, the *tubber*. This is an inſtrument of eight or ten pounds weight, well ſteeled and ſharpened at each end, ending in a point each way, and having a hole in the middle; this will laſt half a year, but muſt be new ſharpened every fortnight. The ſecond inſtrument is a *ſledge*; this is uſually made from ten to twenty pounds weight; and will laſt ſeven years, if new ordered once in three or four months. Beſide theſe, they have *gadds* or wedges; theſe are of about two pounds weight; they are made four-ſquare, and well ſteeled at the point, and they muſt have ladders and wheel-barrows to carry the deads and the ore out of the adits to the ſhambles. The general proportion of the workmen in Cornwall, is this: two ſhovel-men and three beele-men in a drift; theſe are as many as the drift will contain without ſtanding in one another's way. The beele-men rip the deads and the ore, and the ſhovel-men carry it off and land it, by caſting it up from one of the ſhambles to another all the way up. In ſome places they ſave the trouble of this caſting it to the ſhambles by a winder and two buckets: theſe are ſo contrived, that one goes up as the other comes down, and they are filled and emptied with great eaſe. Phil. Tranſ. N° 69.

DIGIT, DIGITUS, in *Anatomy*. See FINGER.

DIGIT, in *Aſtronomy*, is the meaſure whereby we eſtimate eclipſes; amounting to the twelfth part of the diameter of the luminary eclipſed.

The diameter of the body, or diſk, of the ſun or moon, is divided into twelve parts, called *digits*; and an eclipſe is ſaid to be of ten *digits*, when ten of thoſe parts are hid.

Theſe *digits*, Wolfius, and ſome others, call *digiti ecliptici*.

DIGIT, in *Arithmetic*, ſignifies an integer, or number, under ten; as 1, 2, 3, 4, 5, 6, 7, 8, 9.

DIGIT is alſo a meaſure taken from the breadth of the finger. A *digit* is properly three-fourths of an inch, and equivalent to four grains of barley, laid breadth-wiſe, ſo as to touch each other.

DIGITALIS, in *Botany*. See Fox-*Glove*.

DIGITATED *Leaf*, among *Botaniſts*. See LEAF.

DIGITUS *Veneris*, *Venus's finger*, in *Botany*, a name by which ſome authors have called the nymphæa, or water-lily.

DIGLYPH, from δις, *twice*, and γλυφω, *I engrave*, a kind of imperfect triglyph, conſole, or the like, with only two channels, or engravings, inſtead of three. See TRIGLYPH.

DIGNITARY, in the *Canon Law*, a perſon who holds a *dignity*, that is, a benefice, which gives him ſome pre-eminence in the choir, above mere prieſts and canons. Such is a dean, and archdeacon; though the word is now abuſively applied to a mere prebendary, or canon.

Dignities are ſometimes ſimple, ſometimes with cure of ſouls, and ſometimes with juriſdiction and adminiſtration of ſacred things. The canoniſts even define *dignity*, *adminiſtratio cum juriſdictione & poteſtate conjuncta*. If the *dignity* have no contentious, or exterior juriſdiction, it is a ſimple parſonage, and only gives pre-eminence. See BENEFICE, PARSONAGE, &c.

Of *dignities*, including prebends, Camden reckons in England, 544 in number.

DIGNITY, a quality that denotes a man *(dignus) worthy*.

DIGNITY, in its moſt uſual acceptation, ſignifies honour and authority, reputation, &c. and *dignity* may be divided into ſuperior and inferior; as the titles of duke, earl, baron, &c. are the higheſt names of *dignity*; and thoſe of baronet, knight, ſerjeant at law, &c. the loweſt. Nobility only can give ſo high a name of *dignity*, as to ſupply the want of a ſurname in legal proceedings; and as the omiſſion of a name of *dignity* may be pleaded in abatement of a writ, &c. ſo it may be where a peer who has more than one name of *dignity*, is not named by the moſt noble. 2 Hawk. P. C. 185. 230. No temporal *dignity* of any foreign nation can give a man a higher title than that of eſquire. 2 Inſt. 667.

DIGNITY, in *Oratory*, is one of the three parts of general ELOCUTION; and conſiſts in the right uſe of TROPES and FIGURES. See COMPOSITION and ELEGANCE.

DIGRESSION, in *Oratory*, is defined by Quintilian, agreeably to the etymology of the word, to be, a going off from the ſubject we are upon to ſome different thing, which, however, may be of ſervice to it. Inſt. Or. lib. iv. cap. 3.

Digreſſion is not a neceſſary part of a diſcourſe, though it may ſometimes be convenient on ſeveral accounts; as where a ſubject is of itſelf flat and dry, and requires cloſe attention; in this caſe it is of uſe to relieve the mind by ſomething agreeable and entertaining. But as it ſhould never be introduced without ſufficient reaſon, it ſhould never be too frequent, nor too long. Ward's Or. vol. i. p. 283, &c.

DIGYNIA, in the Linnæan ſyſtem of *Botany*, an order of plants, or a ſubdiviſion in moſt of the claſſes eſtabliſhed by Linnæus, denoting that the plants have two ſtyles. The term is derived from δις, *double*, and γυνη, *wife*. See FRUCTIFICATION, and SEXUAL *Syſtem*. See *Tab.* II. *of Botany*.

DIHELIOS, from δια, *through*, and ἡλιος, *ſun*, in the *Elliptical Aſtronomy*, a name which Kepler gives to that ordinate of the ellipſis, which paſſes through the focus, wherein the ſun is ſuppoſed to be placed.

DII *Patrii*, among the Romans, were the three ſupreme deities, Jupiter, Juno, and Minerva. They were firſt received over all the Eaſt, and afterwards, ſucceſſively, in Greece and Italy. They are deſcribed as *indigites* by Virgil, Georg. i. ver. 499. and as *noſtri* by Juvenal, Sat. iii. ver. 145.

DIJAMBUS, in *Poetry*, the foot of a Latin verſe of four ſyllables; it is compounded of two *iambics*, as *ſĕvērĭ'ās*.

DIIPOLIA, Διιπολεια, in *Antiquity*, an Athenian feſtival, celebrated in honour of Jupiter Polieus, or protector of the city. For the ceremonies obſerved at this ſolemnity, ſee Potter's Archæol. Græc. lib. ii. c. 20. tom. i. p. 381.

DIKE, a *ditch*, or *drain*, made for the paſſage of waters.

The word ſeems formed from the verb, *to dig*; though others chooſe to derive it from the Dutch, *diik*, a *dam*, *ſea-bank*, or *wall*.

DIKE, or DYKE, alſo denotes a work of ſtone, timber, or faſcines, raiſed to oppoſe the entrance, or paſſage of the waters of the ſea, a river, lake, or the like.

The word comes from the Flemiſh *dyk*, or *diik*, a heap of earth to bound, or ſtem the water. Junius and Menage take the Flemiſh to have borrowed their word from the Greek τειχος, *wall*. Guichard derives it from the Hebrew *daghah*.

Theſe *dikes* are uſually elevations of earth, with hurdles or ſtakes, ſtones, and other matters.

The *dike* of Rochelle is made with veſſels faſtened to the bottom. The *dikes* of Holland are frequently broke through, and large tracts of land are then drowned.

DILAPIDATION, a waſteful deſtroying, or letting buildings, eſpecially parſonage houſes, run to ruin and decay, for want of neceſſary reparation.

An action lies for *dilapidations*, either in the ſpiritual court by the canon law, or in the courts of common law; and it may be brought by the ſucceſſor againſt the predeceſſor, if living, or, if dead, againſt his executors.

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The money recovered for *dilapidation*, by 14 Eliz. 11. muſt be employed in the repair of the ſame houſes, within two years, on penalty of forfeiting double the value to the crown.

DILATATION, in *Phyſics*, a motion of the parts of a body, whereby it expands, or opens itſelf ſo as to occupy a greater ſpace.

The generality of authors confound *dilatation* with rarefaction; but the more accurate, eſpecially foreigners, diſtinguiſh between them; defining *dilatation* to be the expanſion of a body, into a greater bulk, by its own elaſtic power; and rarefaction, the like expanſion produced by means of heat.

The moderns have obſerved, that bodies, which, after being compreſſed, and again left at liberty, reſtore themſelves perfectly, do endeavour to *dilate* themſelves with the ſame force whereby they are compreſſed; and accordingly, they ſuſtain a force, and raiſe a weight equal to that whereby they are compreſſed.

Again, bodies, in *dilating* by their elaſtic power, exert a greater force at the beginning of their *dilatation*, than towards the end; as being at firſt more compreſſed; and the greater the compreſſion, the greater the elaſtic power, and endeavour to *dilate*. So that theſe three, the compreſſing power, the compreſſion, and the elaſtic power, are always equal.

Again, the motion, whereby compreſſed bodies reſtore themſelves, is uſually accelerated: thus, when compreſſed air begins to reſtore itſelf, and *dilate* into a greater ſpace, it is ſtill compreſſed; and, conſequently, a new impetus is impreſſed thereon, from the *dilatative* cauſe; and the former remaining, with the increaſe of the cauſe, the effect, that is, the motion and velocity, muſt be increaſed likewiſe: thus an arrow ſhot from a bow does not quit the ſtring, till after that be perfectly reſtored to its natural ſtate; nor does the arrow move a whit ſwifter than the ſtring; and if the ſtring, before it have perfectly reſtored itſelf to its right line, be ſtopped, the arrow will not go its full length; which is a proof, that it is continually acquiring a new impetus from the ſtring. And ſince projectiles, at the beginning of their motion, are little or nothing retarded, but rather accelerated, it is evident, that the motion of a ſtring reſtoring itſelf, is likewiſe accelerated. Indeed, it may happen, that where the compreſſion is only partial, the motion of *dilatation* ſhall not be accelerated, but retarded; as is evident in the compreſſion of a ſponge, ſoft bread, gawze, &c.

DILATATION, in *Medicine*, &c. denotes the laying open any orifice, or the lips of a wound wider; or the extenſion of any veſſel, or the like.

This is done by an inſtrument called a *dilatatorium*.

DILATATOR *poſticus urethræ*, in *Anatomy*, a name given by Heiſter and ſome others, to what is ſuppoſed to be a peculiar muſcle by many, and called alſo *levator ſextus ani*, and by ſome other names, though it is really only a proceſs of the ſphincter ani running into the perinæum. See SPHINCTER.

DILATATORES *alæ naſi*, in *Anatomy*, a pair of muſcles common to the *alæ naſi*, and upper lip.

They ariſe thin, broad, and fleſhy, from the cheek-bones under the orbits of the eyes, and deſcend obliquely with a two-fold order of fleſhy fibres in each muſcle; which partly terminate in the upper lip, and partly in the *alæ naſi*. They draw the *alæ* from each other, and widen the external openings of the noſtrils.

DILATORY *pleas*, in *Law*, are ſuch as are put in merely for delay; and there may be a demurrer to a *dilatory plea*, or the defendant ſhall be ordered to plead better, &c. 6 Mod. The truth of *dilatory pleas* is to be made out by affidavit of the fact, &c. by ſtat. 4 and 5 Anne. See PLEA.

DILE, in *Botany*, a name by which ſome authors have called the iſatis or woad. Ger. Emac. Ind. 2.

DILEMMA, Διλημμα, in *Logic*, an argument conſiſting of two, or more propoſitions, ſo diſpoſed, that grant which you will of them, you will be preſſed by the concluſion.

The word is formed from the Greek δις, *bis*, *twice*, and λημμα, *ſumptio*.

A *dilemma* is an argument conſiſting of two contrary parts, or ſides, either of which catches the adverſary. And hence it is alſo called *ſyllogiſmus cornutus*, a *horned ſyllogiſm*, its horns being ſo diſpoſed, that if you avoid the one, you run upon the other.

It is alſo called *crocodilinus*, by reaſon that as the crocodile leads ſuch as follow it, into the water, and purſues ſuch as fly it, to deſtroy them; ſo, whatever the adverſary either affirms, or denies, in this kind of ſyllogiſm, is turned to his diſadvantage.

For an example: A philoſopher once diſſuaded a man from marrying, by this argument: Either the woman you marry will be handſome, or ugly; if handſome, ſhe will give you jealouſy; if ugly, diſpleaſure.

Cicero uſes this fine *dilemma*, to prove, that all pain is to be borne with patience: *omnis dolor aut eſt vehemens, aut levis; ſi levis, facile feretur; ſi vehemens, certe brevis futurus eſt.*

The ſame orator, by another *dilemma*, proves that no meſſengers ſhall be ſent to Anthony: *legatos decernitis; ſi ut deprecentur, contemnet: ſi ut imperetis, non audiet.*

Nor muſt we here omit that beautiful *dilemma* of Tertullian, whereby he clears the Chriſtians, and accuſes Trajan, who had forbad the ſeeking them out, and yet ordered them to be puniſhed when found: *O ſententiam neceſſitate confuſam! negat inquirendos, ut innocentes; & mandat puniendos, ut nocentes: parcit & ſævit, diſſimulat & animadvertit! quid temetipſum cenſura circumvenis? ſi damnas, cur non & inquiris? ſi non inquiris, cur non & abſolvis?*

For a *dilemma* to be legitimate, there are two things required: 1. A full enumeration of parts; thus that of Ariſtippus above mentioned, whereby he diſſuades from marriage, is invalid, as being defective in the enumeration; there being a middle degree, or form, between *handſome* and *ugly*.

2. That the *dilemma* preſs the adverſary alone, and that the perſon who makes it be not liable to have it retorted upon him. This was the caſe in that celebrated *dilemma* of the ſophiſt Protagoras, which the areopagites, with all their wiſdom, were not able to reſolve.

A youth named Evathlus, engaged with Protagoras, to learn dialectics, upon condition, that he ſhould pay him a large ſum of money, the firſt cauſe he pleaded, in caſe he gained the ſame. Evathlus, when fully inſtructed, refuſing to pay the condition, Protagoras brings his action, arguing thus: You muſt pay the money, however the cauſe go; for if I gain, you muſt pay in conſequence of the ſentence, as being caſt in the cauſe; and if you gain it, you muſt pay in purſuance of our covenant. Nay, retorts Evalthus, which way ſoever the cauſe go, you will have nothing: for if I prevail, the ſentence gives it, that nothing is due to you; and if I loſe, then there is nothing due by the covenant.

After the like manner, an ancient prieſteſs diſſuading her ſon from haranguing the people, by this *dilemma*, *nam ſi injuſta ſuaſeris*, ſays ſhe, *habebis Deos iratos: ſin vero juſta, iratos habebis homines:* the youth thus returned the *dilemma* on his mother: *imo*, ſays he, *expedit ad populum verba facere, nam ſi juſta dixero, Dii me amabunt; ſi injuſta, homines.*

DILICTUM, a term uſed by Agricola, to expreſs a brine, made by pouring water upon ſand, ſtones, earth, &c. that had been before ſtrongly impregnated with ſea-ſalt; from this brine, a ſalt, for the uſe of the table, was made by evaporation in his time, and is ſtill ſo in many parts of the world. At Junthall, in Germany, they have a ſalt work of this kind, where they make at the rate of eight hundred loaves of ſalt in a week, each loaf weighing four hundred weight.

DILIGENZA, in the *Italian Muſic*, is uſed for a ſoft or ſweet manner of ſinging or playing.

DILL, *Anethum*, in *Botany*, a genus of the *pentandria digynia* claſs. Its characters are theſe: it is an umbelliferous plant, with many umbels, which are uniform; the flowers have five ſpear-ſhaped petals; under the flower is ſituated the germen, which afterward becomes two compreſſed ſeeds, having borders. We have but one ſpecies of this plant, which is the common *dill*.

This plant both in root, ſtalk, and leaf, very much reſembles common fennel, excepting that it ſeldom grows ſo tall, or is ſo much branched; the whole plant is of a very ſtrong ſcent, leſs pleaſant than fennel. It flowers and ſeeds in July and Auguſt; the leaves and ſeeds are uſed.

The officinal preparations of this plant, are, a water, oil, and aſhes; for which, ſee ANETHUM.

DILLENIA, in *Botany*, the name of a genus of plants, of the *polyandria polygynia* claſs; the characters of which are theſe: the perianthium is compoſed of five leaves, which are large, roundiſh, hollow, and of a coriaceous texture, and remain when the flower is fallen; the flower is compoſed of five roundiſh hollow petals; theſe alſo are large, and of a coriaceous texture. The ſtamina are numerous filaments forming a ſort of globe, the antheræ are oblong and erect. The germina are about twenty in number; they are of an oval oblong figure, and pointed; they are ſomewhat compreſſed, and adhere together by their inner ſurfaces; there are no ſtyles. The ſtigmata are large and pointed, and are diſpoſed in form of a ſtar; the fruit is roundiſh, and is covered with a number of capſules, divided by ſo many furrows. The ſeeds are numerous and ſmall.

DILUTE. To *dilute* a body, is to render it liquid; or, if it were liquid before, to render it more ſo, by the addition of a thinner thereto.

Thoſe things thus added, are called *diluents*, or *dilutors*; ſuch are common wheys, ptiſans, and juleps, which in reſpect

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reſpect of the blood in a ſtate of viſcidity are thinner, and therefore are ſaid to thin, or *dilute* it. Flour muſt be well *diluted*, to make it into paſte. Oker is *diluted* with oil, to paint beams, doors, &c.

DIMACHÆ, from δις, *double*, and μαχω, *I fight*, in *Antiquity*, a kind of horſemen, firſt inſtituted by Alexander. Their armour was lighter than that of the infantry, and at the ſame time heavier than that uſed by horſemen, ſo that they could act as horſe or foot as occaſion required.

DIMACHÆRUS, Διμαχαιρος, from δις, and μαχαιρα, *ſword*, in *Antiquity*, a gladiator who fought with two ſwords.

DIMETER. See IAMBIC.

DIMENSION, the extenſion of a body, conſidered as meaſurable.

Hence, as we conceive a body extended, and meaſurable in length, breadth, and depth, we conceive a *trine dimenſion*, viz. length, breadth, and thickneſs. The firſt called a *line*, the ſecond a *ſurface*, the third a *ſolid*.

DIMENSION is particularly uſed with regard to the powers of the roots, or values of the unknown quantities of equations, which are called the *dimenſions* of thoſe roots. See EQUATION and ROOT.

Thus in a ſimple equation, the unknown quantity is only of one *dimenſion*, as $x=a+b$. In a quadratic equation it is of two *dimenſions*, as $x^2=a^2+b^2$. In a cubic, of three, as $x^3=a^3-b^3$, &c.

DIMETIENT, in *Geometry*, is ſometimes uſed for *diameter*.

DIMINISHED *interval*. See INTERVAL.

DIMINISHED *ſecond* is a ſemitone major, leſſened by a ſemitone minor. See INTERVAL and SECOND.

DIMINISHED *third*, by ſome called *defective third*, is properly a *third* minor leſſened by a ſemitone minor. But among practical muſicians, it commonly ſignifies an interval equal to two ſemitones major. And this they confound with the former; but there is a difference between them, equal to the difference between a tone-major and minor, that is, a comma. The firſt mentioned of theſe *diminiſhed thirds* will be expreſſed by $\frac{1}{1}\frac{1}{2}\frac{1}{5} = \frac{6}{5} : \frac{2}{2}\frac{5}{4}\frac{5}{3}$, and is equal to the tone-major and enharmonic diëſis; for $\frac{1}{1}\frac{1}{2}\frac{1}{5} = \frac{9}{8} \times \frac{1}{1}\frac{1}{2}\frac{8}{5}$. The ſecond *diminiſhed third* will be expreſſed by $\frac{2}{2}\frac{5}{2}\frac{6}{5} = \frac{1}{1}\frac{6}{5} \times \frac{6}{5}$, which is a comma leſs than the former. See the table in the article INTERVAL.

DIMINISHED *fourth*. See the table in the article INTERVAL.

The *diminiſhed fourth* often occurs in practice, as from C to G ♭ deſcending; and ſometimes, though more rarely, from G ♭ to C aſcending.

DIMINISHED *fifth*, in *Muſic*, is leſs than the true *fifth* by a ſemitone minor, and is therefore equal to two leſſer *thirds*.

Practitioners often confound the *diminiſhed fifth* with the ſemi-diapente, or falſe *fifth*, which is a comma leſs. See INTERVAL.

DIMINISHED *ſixth*. This interval, according to Ozanam, contains two tones and three ſemitones major; or a *fourth* and *diminiſhed third*; or a *diminiſhed fourth* and *third* minor. Thus from C ♭ to A b is a *diminiſhed ſixth*.

But as there are two *diminiſhed thirds*, ſo there may be as many *diminiſhed ſixths*; theſe being the complements of the former to the octave. One of theſe *diminiſhed ſixths* will be expreſſed by $\frac{1}{6}\frac{0}{7}\frac{2}{3}\frac{1}{5} = \frac{4}{3} \times \frac{3}{2}\frac{5}{2}\frac{5}{3}$, and this is a ſemitone major more than the ſemi-diapente; the other *diminiſhed ſixth* will be $\frac{5}{3}\frac{-}{7}\frac{6}{5} = \frac{4}{3} \times \frac{1}{1}\frac{4}{2}\frac{4}{5}$, which is a ſemitone minor leſs than the flat *ſixth*. Practitioners confound theſe two; and, in effect, in temperate ſcales they coincide, as do all other intervals differing only by a comma. See TEMPERAMENT.

DIMINISHED *ſeventh* is of two kinds, differing by a comma. See the table in the article INTERVAL.

That *diminiſhed ſeventh*, which is the complement of the ſuperfluous ſecond to the octave, is the only one in uſe. It is a ſemitone major more than the ſixth minor, as from C ♭ to B b.

DIMINISHED *octave*, is a ſemi-tone minor, leſs than the *octave*, as from C to *c* b. It occurs ſometimes in the baſſes of inſtrumental pieces of muſic. See INTERVAL.

DIMINUTION, in *Architecture*, a contraction of the upper part of a column, whereby its diameter is made leſs than that of the lower part. See *Tab. Archit. fig.* 36.

To attain thoſe two important points in architecture, ſtrength, and the appearance of ſtrength, all architects have made their columns leſſer above than below, which is called their *diminution*. Some have likewiſe made them a little bigger towards the middle than at the bottom, which is called their ſwelling. The Gothic architects, indeed, obſerve neither *diminution* nor ſwelling; their columns are perfectly cylindrical; for which reaſon they are properly called pillars, in contradiſtinction to columns.

The *diminution* generally commences from one third of the height of the column. Some make it begin from the very baſis, and hold tapering to the capital; but that has not ſo good an effect. Vitruvius would have the *diminution* of columns differ according to their height, and not according to their diameter: thus, a column of fifteen feet high, he diminiſhes a ſixth part of its diameter; and another of fifty feet only an eighth part; but we do not find this rule obſerved in the antique. The difference of orders, M. Perrault obſerves, does not infer a difference of *diminution*, there being ſmall and great *diminutions* in different works of the ſame order; excepting, however, the Tuſcan, which Vitruvius diminiſhes by a fourth part, though Vignola only makes it a fifth, and the Trajan column a ninth. The *diminutions* are very differently adjuſted in the different antique buildings, as well as by the different modern authors. For the method of diminiſhing a column, ſee COLUMN.

DIMINUTION, in *Heraldry*, a term uſed by Latin writers for what we more uſually call *differences*, and the French *briſures*. See DIFFERENCE.

DIMINUTION, in *Law*, is where the plaintiff or defendant in a writ of error alleges to the court, that part of the record remains in the inferior court not certified, and therefore prays that it may be certified by certiorari. *Diminution* cannot be alleged of what is fully certified, but of ſomething that is wanting, as the want of an original, or a warrant of attorney.

DIMINUTION, in *Muſic*, is when there are a number of words which are to make tones, and ſeveral haſty motions in the ſpace of a cadence; ſeveral quavers, and ſemi-quavers, correſponding to a crotchet, or minim.

DIMINUTION, in *Rhetoric*, the augmenting and exaggerating what you have to ſay, by an expreſſion that ſeems to weaken and diminiſh it.

As, for inſtance, when a man ſays, with a certain tone, This woman is not ugly; meaning, ſhe is very handſome.

Some authors take *diminution* in a ſtricter ſenſe, viz. for ſaying leſs than a man really means; as, You are not, indeed, to be commended; where a greater reproach is ſecretly meant.

DIMINUTIVE, in *Grammar*, a word formed from ſome other, to ſoften or diminiſh the force and effect thereof; or to ſignify a thing that is little in its kind.

Thus cellule is a diminutive of cell; globule, of globe; hillock, of hill, &c.

The Italians abound in *diminutives*, every author being at liberty to make as many as he pleaſes. The French are a good deal more reſerved in that reſpect, though their old authors were every whit as licentious as the Italians, witneſs Belleau, &c.

In Engliſh we have very few; not that, as ſome have ſaid of the French, our language is hard, and incapable of the ſofteſt expreſſions, but becauſe we lay all our tenderneſs in our ſentiments; or rather, our language is tender, like a perſon of diſcretion, who always ſpeaks ſenſe, even in ſpeaking of his paſſion.

In Latin, Italian, Engliſh, and moſt other tongues, *diminutives* are formed from primitives, by the addition of a few letters, or ſyllables: in French, the caſe is frequently otherwiſe, the *diminutive* being ſometimes ſhorter than the primitive, ſometimes of the ſame length.

They have a pleaſing effect in that celebrated addreſs of Adrian to his departing ſoul, which begins,

Animula, vagula, blandula
Hoſpes comeſque corporis, &c.

Some grammarians call *at leaſt* a *diminutive* conjunction, as ſerving to leſſen or diminiſh the force of what went before.

DIMISSORY *Letters*, *Literæ Dimiſſoriæ*, in the *Canon Law*, a letter given by a biſhop to a candidate for holy orders, having a title in his dioceſe, directed to ſome other biſhop, and giving leave for the bearer to be ordained by him.

When a perſon produces letters of ordination, or tonſure, conferred by any other than his own dioceſan, he muſt at the ſame time produce the letters *dimiſſory* given by his own biſhop, on pain of nullity.

Letters dimiſſory cannot be given by the chapter, *ſede vacante*; this being deemed an act of voluntary juriſdiction, which ought to be reſerved to the ſucceſſor.

DIMNESS *of ſight*, in *Farriery*, a diſorder in horſes, proceeding from blood-ſhotten eyes. If the ball of the eye be ſound, the cure is effected by keeping the horſe warm, with a hood of linen cloth fitted to his head, and anointing the eye-lids twice a day with a compoſition of ſugar-candy, honey, and white roſe-water. In two or three days the eyes will be well, after which the creature ſhould be blooded.

In this diſorder the bladders on any part of the eye ought by

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by no means to be clipped, or meddled with. See SIGHT.

DIMŒRITÆ, a name given to the Apollinarists, who at first held, that the Word only assumed a human body, without taking a reasonable soul like ours; but being at length convinced by formal texts of Scripture, they allowed, that he did assume a soul, but without understanding; the Word supplying the want of that faculty.

From this way of separating the understanding from the soul, they became denominated *dimœrites*, q. d. *dividers*, *separaters*, of δια, and μοιραω, *I divide*.

DIMORPHOTHECA, in *Botany*, a name given by Vaillant to a genus of plants, which Linnæus makes the same with the calendula. See MARYGOLD.

DING, in *Commerce*, a name which the Siamese give in general to all sorts of weights.

DINNAGE. See DUNNAGE.

DINNER, the great meal, or that taken about the middle of the day.

The word is formed from the French *disner*, which Du-Cange derives from the barbarous Latin *disnare*. Henry Stephens derives it from the Greek δειπνειν; and will have it wrote *dipner*. Menage deduces it from the Italian *desinare*, *to dine*; and that from the Latin *desinere*, *to leave off work*.

The grand Tartar, emperor of China, after he has *dined*, makes publication by his heralds, that he gives leave for all the other kings and potentates of the earth, to go to *dinner*; as if they waited for his leave.

In the general, it is agreed to be the most salutary to make a spare supper, and to eat the more plentifully at *dinner*, especially for tender, valetudinary people. This is the sentiment of the Schola Salernitana.

Ex magna cœna stomacho fit maxima pœna:
Ut sis nocte levis, sit tibi cœna brevis.

Yet Bernardinus Paternus, an eminent Italian physician, maintains the contrary, in a treatise expressly on the subject.

The Romans, we are assured, never minded *dinner*; but deferred their good cheer to the evening, which they made their grand meal.

DINUS, in *Medicine*, according to some, is the name of a disease, called more usually *vertigo*. See VERTIGO.

DIOCALLIA, in *Botany*, a name by which Apuleius and some other authors have called the common sweet chamomile.

DIOCESE, or DIOCESS, the circuit, or extent, of the jurisdiction of a bishop. See BISHOP.

The word is formed from the Greek διοικησις, *government*, *administration*, formed of διοικεω, which the ancient glossaries render *administro*, *moderor*, *ordino*: hence διοικησις της πολεως, the *administration*, or *government of a city*.

DIOCESE is also used, in *Ancient Authors*, &c. for the province of a metropolitan. See PROVINCE, and METROPOLITAN.

Diocæsis, διοικησις, was originally a civil government, or prefecture, composed of divers provinces.

The first division of the empire into *dioceses* is ordinarily ascribed to Constantine, who distributed the whole Roman state into four, viz. the *diocese* of Italy, the *diocese* of Illyria, that of the East, and that of Africa. And yet, long time before Constantine, Strabo, who wrote under Tiberius, takes notice, lib. xiii. p. 432, that the Romans had divided Asia into *dioceses*, and complains of the confusion such a division occasioned in geography, Asia being no longer divided by people, but by *dioceses*, each whereof had a tribunal, or court, where justice was administered. Constantine, then, was only the institutor of those large *dioceses*, which comprehended several metropoles and governments; the former *dioceses* only comprehending one jurisdiction, or district, or the country that had resort to one judge, as appears from this passage in Strabo, and, before Strabo, from Cicero himself, lib. iii. Epist. ad Famil. Ep. 9. and lib. xiii. Ep. 67. Thus, at first, a province included divers *dioceses*, and afterwards a *diocese* came to comprise divers provinces. In after-times the Roman empire became divided into thirteen *dioceses*, or prefectures; though, including Rome, and the sub-urbicary regions, there were fourteen. These fourteen *dioceses* comprehended a hundred and twenty provinces; each province had a proconsul, who resided in the capital, or metropolis; and each *diocese* of the empire had a consul, who resided in the principal city of the district.

On this civil constitution, the ecclesiastical one was afterwards regulated; each *diocese* had an ecclesiastical vicar, or primate, who judged finally of all the concerns of the church within his territory.

At present, there is some farther alteration; for *diocese* does not now signify an assemblage of divers provinces, but is limited to a single province, under a metropolitan, or even to the single jurisdiction of a bishop.

England, with regard to its ecclesiastical state, is divided into two provinces, viz. Canterbury and York; the former province contains twenty-one *dioceses*, and the latter three, besides the bishoprick of the isle of Man, which was annexed to the province of York by Henry VIII. Every *diocese* is divided into archdeaconries, of which there are sixty in all; and each archdeaconry into rural deanries, and every deanry into parishes.

Gul. Brito affirms *diocese* to be properly the territory and extent of a baptismal, or parochial church; whence divers authors use the word to signify a simple parish.

DIOCLEIA, Διοκλεια, in *Antiquity*, a solemnity kept in the spring at Megara, in memory of the Athenian hero Diocles, who died in the defence of the youth he loved. Pott. Archæol. Græc. lib. ii. cap. 20.

DIOCLESIAN *Epocha*. See EPOCHA.

DIOCTAHÆDRIA, in *Natural History*, the name of a genus of spars. The word is derived from the Greek δις, *twice*, οκτω, *eight*, and εδρα, a *side*. The bodies of this genus are spars composed of twice eight planes, or two octangular pyramids joined base to base, without any intermediate column. Hill's Hist. of Foss. p. 211.

DIODIA, in *Botany*, the name of a genus of plants, of the *tetrandria monogynia* class, the characters of which are these: the perianthium consists of two leaves, of an oval figure, equal in size, and placed upon the germen; these remain when the flower is fallen. The flower is of the one-leaved labiated kind; its tube is slender and longer than the cup; its upper lip is erect and bifid, and the lower lip is expanded, and divided into two-pointed segments. The stamina are four filaments of the thickness of a bristle; and two of these, which are opposite to one another, are somewhat shorter than the others; the antheræ are oblong, and versatile; the germen of the pistil is roundish, but in some degree four-cornered; this stands under the cup of the flower; the style is capillary, and of the length of the stamina, and the stigma is bifid; the fruit is a capsule, of an oval figure, with four corners, so as to appear square, and is crowned with the cup grown larger; this is composed of two valves, and contains two cells; the seeds are double, of an oval oblong figure, and convex on one side, and plain on the other.

DIOECESIS, Διοικησις, among the Romans, a præfecture of several provinces joined together, under the same governor, called *præfectus*. See PRÆFECT and DIOCESE.

DIOECIA, in *Botany*, a class of plants which have the male and female plants, not in the same, but in different flowers, and those not on the same individual, but on different plants of the same species; either of which, though they are called the male and female plants, from their thus carrying the separate male and female flowers, might have arisen from the same seed. This class comprehends fourteen orders. See *Tab. of Botany*.

The word is formed of the Greek δις, *twice*, and οικος, *habitation*.

Among the plants of this class are the willow, mistletoe, hemp, spinach, &c.

It is a curious observation, that there are no separate male and female plants in the classes of the asperifoliate or stellate plants, nor in the umbelliferous class, or that of the didynamia, tetradynamia, monadelphia, diadelphia, or syngenesia. The reason of which appears very evidently, from an observation of the conduct of the fructification in those classes. Linnæi Gen. Plant. p. 470.

DIOMEDIA, in *Ornithology*, a genus of *anseres*, in the Linnæan system, with a strait bill, the upper mandible hooked at the end, and the lower truncated; including the albatross and Magellanic goose.

DIOMEDIS *Avis*, in *Zoology*, the name of a bird of the web-footed kind, with a slender beak, hooked at the end, and with its hinder toe not connected by the membrane that joins the rest. It is of the size of a common hen, but its neck and legs are much longer; its colour is a dusky, and somewhat greyish brown, and under the belly there is more or less white; its beak is of a fine red, or in some of a yellowish colour, with a black end. It is found in the Insula Diomedea, now called Tremiti, in the Adriatic Sea, and is said to be peculiar to that place.

DIONE, in *Mythology*, a sea-nymph, the daughter of Ocean and Thetis, and the mother of Venus by Jupiter.

DIONYSIA, or DIONYSIACA, solemn feasts, held among the ancients, in honour of Bacchus.

The word is formed from the Greek Διονυσια, of Διονυσος, *Bacchus*; and that of Διος, the genitive of Ζευς, *Jupiter*, and *Nysa*, a city in Egypt, on the frontiers of Arabia, where Bacchus is said to have been educated by the nymphs.

The *Dionysia* are the same with what are otherwise called *Orgia*, and by the Romans BACCHANALIA and LIBERALIA.

There

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There were divers feſtivals under the denomination of Διονυσια, *Dionyſia*; but the chief were two, viz. 1. The ancient αρχαιοτερα, probably the ſame with μεγαλα, or the greater *Dionyſia*, ſometimes alſo called, by way of eminence, Διονυσια, without any other addition, as being the moſt celebrated of all Bacchus's feſtivals at Athens, where it was held, in the month of Elaphebolion. 2. The new Νεωτερα, probably the ſame with μικρα, or the leſſer *Dionyſia*, held in autumn, as a ſort of preparation to the greater. Some will have this the ſame with Διονυσια ληναια, ſo called from ληνος, a *wine-preſs*, and place it in the month Lenæon.

DIONYSIACA, in *Antiquity*, was a deſignation given to plays and all manner of ſports acted on the ſtage; becauſe play-houſes were dedicated to Dionyſius, i. e. Bacchus and Venus, as being the deities of ſports and pleaſure. Potter, Archæol. Græc. lib. i. cap. viii. tom. i. p. 41.

DIONYSIAN, or *Victorian Period*. See PERIOD.

DIONYSIAS *Lapis*, in *Natural Hiſtory*, the name of a ſtone deſcribed by Pliny, and ſome other of the ancients, as a black ſtone, variegated with red ſpots. It is not now known what ſtone was intended by it. Plin. lib. xxxvii. cap. 10.

DIOPHANTINE *Problems*, in *Mathematics*, certain queſtions relating to ſquare and cube numbers, and right-angled triangles, &c. the nature of which was determined by Diophantus, a mathematician of Alexandria, who is believed to have lived about the third century. We have his works, which were publiſhed with notes at Paris, in 1621, by Bachet de Meziriac; and another edition in 1670, with obſervations on every queſtion, by M. Fermat.

In theſe queſtions it is endeavoured to find commenſurable numbers to anſwer indeterminate problems; which bring out an infinite number of incommenſurable quantities. For example, it is propoſed to find a right-angled triangle, whoſe ſides x, y, z, are expreſſed by commenſurable numbers; it is known that $x^2+y^2=z^2$, z being the ſuppoſed hypothenuſe. But it is poſſible to aſſume x and y ſo, that z will be incommenſurable; for if $x=1$, and $y=2$, $z=\sqrt{5}$.

The art of reſolving ſuch problems conſiſts in ſo managing the unknown quantity or quantities in ſuch a manner, that the ſquare or higher power may vaniſh out of the equation, and then by means of the unknown quantity in its firſt dimenſion, the equation may be reſolved without having recourſe to incommenſurables; e. gr. let it be ſuppoſed to find x, y, z, the ſides of a right-angled triangle, ſuch as will give $x^2+y^2=z^2$. Suppoſe $z=x+u$, then $x^2+y^2=x^2+2xu+u^2$; out of which equation x^2 vaniſhes, and $x=\frac{y^2-u^2}{2u}$: then aſſuming y and u equal to any numbers at pleaſure, the ſides of the triangle will be y, $\frac{y^2-u^2}{2u}$, and the hypothenuſe $x+u=\frac{y^2+u^2}{2u}$; if $y=3$, and $u=1$, then $\frac{y^2-u^2}{2u}=4$, and $x+u=5$. It is evident that this problem admits of an infinite number of ſolutions.

For the reſolution of ſuch kind of problems, ſee Saunderſon's Algebra, vol. ii. book 6.

DIOPTER, or DIOPTRA, in *Writers of Aſtronomy*, is frequently uſed for the hole, or index, pierced in the pinnula, or ſight of an alhidade. See SIGHTS.

DIOPTRA, among the *Ancients*, an inſtrument invented by Hipparchus, which ſerved for ſeveral uſes, as to level water; to take the height of towers, or places at a diſtance; to determine the places, magnitudes, and diſtances of the ſtars.

DIOPTRA, among *Surgeons*, denotes an inſtrument whereby to dilate the matrix, or anus, and inſpect any ulcers therein; called alſo SPECULUM *matricis*, and *dilatatorium*.

DIOPTRICS, the doctrine of refracted viſion, called alſo *anaclaſtics*.

The word is originally Greek, formed of δια, *per*, *through*, and οπτομαι, *I ſee*.

Dioptrics is properly the third branch of optics, its office being to conſider, and explain the effects of light refracted by paſſing through different mediums, as air, water, glaſs, &c. and eſpecially lenſes.

The laws of *dioptrics* ſee delivered under the articles REFRACTION, LENS, &c. and the application thereof, in the conſtruction of teleſcopes, microſcopes, and other *dioptrical* inſtruments, under the articles TELESCOPE, and MICROSCOPE.

DIORTHOSIS, διορθωσις, in *Surgery*, an operation, by which crooked or diſtorted members are made even, and reſtored to their primitive and regular ſhape.

DIOSCOREA, in *Botany*, a genus of the *dioecia hexandria* claſs. Its characters are theſe: it hath male and female flowers in different plants; the male flowers have a perianthium cut into ſix parts, and have no petals, but have ſix ſhort hairy ſtamina; the female flowers have the ſame perianthium, have no petals, but have a three cornered germen. The perianthium becomes afterward a triangular capſule with three cells, opening with three valves, containing two compreſſed bordered ſeeds in each. There are five ſpecies, natives of warm climates; which will not thrive here but in the bark ſtove. The YAM, or *yammes*, is one ſpecies of this plant.

DIOSCURIA, Διοσκουρια, from Διος, *Jupiter*, and κουροι, *infants*, in *Antiquity*, a feſtival in honour of the Διοσκουροι, or Caſtor and Pollux, who were reputed to be the ſons of Jupiter. It was obſerved by the Cyrenæans, but more eſpecially by the Spartans, whoſe country was honoured by the birth of theſe heroes. The ſolemnity was full of mirth, being a time wherein they ſhared plentifully of the gifts of Bacchus, and diverted themſelves with ſports, of which wreſtling matches always made a part. Potter, Archæol. Græc. lib. ii. cap. 20. tom. i. p. 384.

DIOSMA, in *Botany*, *African Spiræa*, a genus of the *pentandria monogynia* claſs. The characters are theſe: the flower hath a permanent empalement, which is divided into four acute ſegments, which are plain at the baſe; it hath five obtuſe petals, which ſpread open, and are as long as the empalement; it hath five ſtamina, terminated by oval, erect ſummits, and a five-pointed hollow nectarium, ſitting on the germen, from which ariſes a ſingle ſtyle, crowned by an obſolete ſtigma; the germen afterward becomes a fruit compoſed of five compreſſed capſules, which open lengthways, each incloſing one ſmooth oblong ſeed. The ſeveral ſpecies of theſe plants grow naturally at the Cape of Good Hope.

DIOSPOROS, in *Botany*, a name given by ſome of the ancients to the lithoſpermum or gromwell. Some chooſe to write it *dioſpyros*, but this ſeems erroneous; the plain derivation of the word being from the Greek Διος σπορος, *the ſeed of Jupiter*. It ſeems to have obtained this name from its beauty and hardneſs. Pliny, lib. xxvi.

DIOSPYROS, in *Botany*, the name by which Linnæus calls the guiacana of Tournefort and others. See *Indian Date* PLUM.

DIOTA, among *Chemiſts*, a term uſed for a circulating or DOUBLE *veſſel*.

DIOXIA, Διοξεια, in *Muſic*, a name ſometimes given by the ancients to the DIAPENTE.

DIP *of the horizon*. See DEPRESSION.

DIPHRIS, a ſtone mentioned by the ancient writers; and ſaid, by Pliny, to be of two kinds, the one black, the other white; and that theſe carried each of them the mark of one of the ſexes, deſcribed by a line of the oppoſite colours; they were therefore called the male and female; the white was called the male, and had the character of the male ſex figured in a black line; the other the female, and had the marks of that ſex deſcribed by a white one. We know no ſuch ſtones at this time.

DIPHRYGES, or DIPHRYX, in the *Ancient Pharmacy*, the ſcoria, or calx of melted copper gathered in the furnace, when the metal was run out.

The word is formed from the Greek δις, *twice*; and φρυγειν, *to roaſt*.

Dioſcorides diſtinguiſhes three very different kinds of *diphryges*; one made of a kind of clay, or bole, dried in the ſun; another made of marcaſite, or pyrites, burnt; and a third that of the fæces of copper.

The beſt *diphryges* is what taſtes of copper, is æruginous, aſtringent, and vehemently drying upon the tongue; qualities of which burnt oker, though ſold for *diphryges*, is deſtitute.

It is an aſtringent, a potent cleanſer, abſterſive, and drier, repreſſes excreſcences of fleſh, induces malignant and ſpreading ulcers to cicatrize; and mixed with turpentine or cerate, diſcuſſes an abſceſs. Dioſcorides, lib. v. cap. 120.

DIPHTHERA, διφθερα, among the *Ancients*, a garment made of ſkins, and worn only by ſhepherds and country-labourers.

DIPHTHONG, διφθογγος, in *Grammar*, a double vowel, or the union, or mixture, of two vowels pronounced together, ſo as only to make one ſyllable: as (1) the Latin *ae*, or *æ*; *oe*, or *œ*; (2) the Greek αι, ει; (3) the Engliſh *ai*, *au*, &c. See VOWEL, and SYLLABLE.

The word is Greek, and is compounded of δις, *twice*; and φθογγος, *ſound*.

Ae anſwers to *ai*, the proper; and *æ*, the improper *diphthong* of the Greeks; e. g. Αινειας, *Æneas*; σφαιρα, *ſphæra*, &c. And, on the contrary, the Romans, when they had occaſion to divide their *ae*, changed it into the Greek, *ai*; e. g. *aulai*, for *aulæ*, &c.

Ai, by ſome is made a Latin *diphthong*, as in *aio*, *Caius*, &c. But in *ais*, and *ait*, *i* manifeſtly belongs to

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the latter ſyllable; and the Greeks write not γαι ος, but γα ιος; whence it ſeems plain, that *ai*, in the Latin tongue, is not a *diphthong*, as in the Greek.

The Latins pronounced the two vowels in their *diphthongs* much as we do, with this exception, that the two were not heard equally, but the one was ſomewhat weaker than the other; though the diviſion was made with all the delicacy imaginable; among us moſt of the Latin *diphthongs* are loſt in the pronunciation; their *æ* and *œ* are only ſpoken as *e's*; ſo alſo the Engliſh *ea*, *oa*, &c. though wrote with two characters, are pronounced as ſimple ſounds.

In Engliſh, French, and divers other languages, one may diſtinguiſh *diphthongs* with regard to the eye, from *diphthongs* with regard to the ear.

A *diphthong* with regard to the eye, is formed of two vowels, meeting in the ſame ſyllable, whether the particular ſound of each of them be heard in the pronunciation, or whether the ſound of one of them be drowned; or, laſtly, whether a new ſound, different from either of them, reſult from both. In the two latter caſes, it is with ſome impropriety that we call them *diphthongs*: the firſt, only, are real *diphthongs*, as being ſuch both to the eye and ear.

Diphthongs, with regard to the ear, are either formed of two vowels, meeting in the ſame ſyllable, whoſe ſounds are ſeverally heard; or of three vowels, in the ſame ſyllable, which only afford two ſounds in the pronunciation.

On this laſt occaſion, *diphthongs*, with regard to the ear, are triphthongs with regard to the eye.

Engliſh *diphthongs*, with regard both to the eye and ear, called *proper diphthongs*, are *ai*, as in *fair*; *au*, in *laud*; *ee*, in *bleed*; *oi*, in *void*; *oo*, in *food*; and *ou*, in *houſe*.

Engliſh *improper diphthongs*, or *diphthongs* with regard to the eye, are *aa*, pronounced only like *a*, as in *Aaron*; *ea*, like *a*, as in *ſwear*, *heart*; or like *e*, as *already*; or like *ee*, as *veal*; *eo*, like *e*, in *feoffee*; or like *o*, as in *George*; *eu*, or *ew*, like *u*, as *Deuteronomy*; *ie*, like *e*, as *cieling*, *field*; *ei*, like *a*, in *feign*; or like *e*, in *deceit*; *oa*, as in *cloak*, *doat*; *oe*, as in *doe*, *oeconomy*; *ue*, as in *gueſs*; and *ui*, as in *guile*, *recruit*.

DIPHYES, from δις, and φυειν, *to generate*, in *Natural Hiſtory*, a name given by ſome authors to a kind of ſtone, which repreſents both the male and female parts of generation of the human ſpecies; and owes its figures merely to the accidental conformation of the hinge and protuberances of a ſhell, in which it has been formed. We have a ſpecies of chama, whoſe external form at the mouth repreſents the female pudenda; but the figure of this ſtone is owing to the internal ſhape of the ſhell in which it has been caſt. This is an unknown ſpecies of concha anomia, which has ſuch ridges on one ſhell, and ſuch cavities in the other, that the ſtone caſt or moulded in it, has on one ſide the figure of the female pudenda, and on the other the male; it is uſually of a duſky brown colour, and of a ferrugineous ſubſtance. As the ſame ſhell may, however, have received in different places different ſubſtances into its cavity, all which would neceſſarily be of this form, we hear, among authors, of ſome black, and ſome white ſtones of this kind. Authors have treated of this ſtone in a very idle and fabulous manner; but this is its true hiſtory.

DIPLASIASMUS, from διπλασιαζω, of διπλοος, *double*, in *Medicine*, a reduplication of diſeaſes.

DIPLASIASMUS is alſo uſed for two muſcles of the arm, which ſerve to turn it about.

DIPLOE, from διπλοος, *double*, in *Anatomy*, a ſpongy, medullary ſubſtance, ſeparating the two tables of the cranium, and together with them conſtituting the ſkull.

The ſubſtance of the *diploe* being ſpongious, eaſily imbibes the blood; and is found ſeparated into an infinite number of little cells, of different magnitudes, which receive little branches of arteries from the brain, and give paſſage to the little veins that proceed to the ſinuſes of the dura mater.

DIPLOIS, διπλοις, in *Antiquity*, a double *pallium*, or cloak, worn chiefly by the Cynics.

DIPLOMA, from διπλοος, *double*, an inſtrument given by ſome colleges and ſocieties, on taking a degree, or paſſing examination, as a proof of qualification for any advacement to title, or pre-eminence, or introduction to the exerciſe of a profeſſion.

DIPLOMA, in *Chemiſtry*, denotes a double veſſel. Thus when one veſſel is put into another, the ingredients in the firſt, and the fire under the laſt, the chemiſts call it boiling *in diplomate*.

DIPONDIUS, in the *Scripture Language*, is uſed by St. Luke, to ſignify a certain coin, which was of very little value. Our tranſlation of the paſſage is, *Are not two ſparrows ſold for two farthings?* In St. Matthew, who relates the ſame thing, we read, *Are not two ſparrows ſold for a farthing?* The Greek reads *aſſarion* inſtead of *as*. Now *aſſarion*, as ſome ſay, was worth half an *as*, that is to ſay, four French deniers and $\frac{1}{8}$; and, according to others, two deniers and $\frac{5}{16}$. *Dipondius* ſeems rather to ſignify half an *as*. Calmet, Diction. Bibl. Luke xii. 6. Matt. x. 29.

Dr. Arbuthnot differs in opinion from the author laſt quoted. He ſays, that this coin was at firſt *libralis*, or of a pound weight; and even when diminiſhed it retained the name of *libella*. So that *dipondius* denotes two aſſes.

DIPPING, in *Mineralogy*, a term uſed to expreſs the deviation of the veins of ore, from that regular and ſtrait line in which they uſually run. A great deal of the ſkill of the miners conſiſts in the underſtanding this *dipping* of the veins, and knowing how to manage in it. In Cornwall they have this general rule to guide them in this reſpect: moſt of their tin-loads, which run from eaſt to weſt, conſtantly dip towards the north. Sometimes they underlie; that is, they ſlope down towards the north three foot in eight, perpendicular. This muſt carefully be obſerved by the miners, that they may exactly know where to make their air-ſhafts when occaſion requires; yet, in the higher mountains of Dartmaer, there are ſome conſiderable loads, which run north and ſouth; theſe always underlie toward the eaſt.

Four or five loads may run nearly parallel to each other in the ſame hill; and yet, which is rare, they may meet all together in one hatch, as it were a knot, which well tins the place, and ſo ſeparate again, and keep their former diſtances. Phil. Tranſ. N° 69.

DIPPING-*Needle*, or *Inclinatory Needle*, a magnetical needle, ſo hung, as that, inſtead of playing horizontally, and pointing out north and ſouth, one end *dips*, or inclines to the horizon, and the other points to a certain degree of elevation above it.

Or a *dipping-needle* may be defined, with Mr. Whiſton, to be a long, ſtrait piece of ſteel, repreſented (*Tab. Navigation*, *fig.* 7.) every way equally poiſed on its center, and afterwards touched with a load-ſtone; but ſo contrived, as not to play on the point of a pin, as does the common horizontal-needle, but to ſwing in a vertical plane, about an axis parallel to the horizon; and this in order to diſcover the exact tendency of the power of magnetiſm.

Mr. Nairne, an ingenious inſtrument-maker in London, made a *dipping-needle* in 1772 for the board of longitude, which was uſed in the voyage towards the north-pole. This is repreſented *Tab. Navigation*, *fig.* 8. The needle AA is twelve inches long, and its axis, the ends BB of which are made of gold alloyed with copper, reſts on friction wheels CCCC, of four inches diameter, each end on two friction wheels; which wheels are balanced with great care. The ends of the axes of the friction wheels, are likewiſe of gold alloyed with copper, and moved in ſmall holes made in bell-metal; and oppoſite to the ends of the axes of the needle, and the friction wheels, are flat agates, ſet in at DDD, finely poliſhed. The magnetic needle vibrates within a circle of bell-metal, EEE, divided into degrees and half degrees; and a line, paſſing through the middle of the needle to the ends, points to the diviſions. The needle of this inſtrument was balanced before it was made magnetical; but by means of a croſs, the ends of which are FFFF, (contrived by the reverend Mr. Mitchell) fixed on the axis of the needle, on the arms of which are cut very fine ſcrews to receive ſmall buttons, that may be ſcrewed nearer or farther from the axis, the needle may be adjuſted both ways to a great nicety, after being made magnetical, by reverſing the poles, and changing the ſides of the needle. GG are two levels, by which the line of 0 degrees of the inſtrument is ſet horizontal; by means of the four adjuſting ſcrews LLLL; H is the perpendicular axis, by which the inſtrument may be turned, that the divided face of the circle may front the eaſt or weſt; to this axis is fixed an index I, which points to an oppoſite line on the horizontal plate K, when the inſtrument is turned half round; MMMM are ſcrews which hold the glaſs cover to keep the needle from being diſturbed by the wind. When this needle is conſtructed for ſea, it is ſuſpended by an univerſal joint on a triangular ſtand, and adjuſted vertically by a plumb-line and button above the divided circle and the dove-tail work at the upper 90; and the diviſions on the circle are adjuſted ſo as to be perpendicular to the horizon by the ſame plumb-line, and an adjoining ſcrew; and when it is adjuſted, a pointer annexed to a ſcrew, which ſerves to move the divided circle, is fixed at the loweſt 90. Whenever the inſtrument is uſed to find the *dip*, it muſt be ſo placed that the needle may vibrate exactly in the magnetic meridian. Phil. Tranſ. vol. lxii. art. 35. Phipps's Voyage, &c. Appendix, p. 119. See alſo the deſcription of

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of a new *dipping-needle*, by Mr. Lorimer, of Penſacola, in the Phil. Tranſ. vol. lxv. part i. p. 82.

The inventor of the *dipping-needle*, Mr. Whiſton obſerves, was, without all queſtion, an Engliſhman, Robert Norman by name, a compaſs-maker at Wapping, about the year 1576; this is not only teſtified by his own account, in his New Attractive, but was allowed by Dr. Gilbert, and other writers of that time. The occaſion of the diſcovery he himſelf relates, viz. that it being his cuſtom to finiſh, and hang the needles of his compaſſes, before he touched them, he always found that, immediately after the touch, the north-point would bend, or decline downward, under the horizon; inſomuch that, to balance the needle again, he was always forced to put a piece of wax on the ſouth-end, as a counter-poiſe.

The conſtancy of this effect led him, at length, to obſerve the preciſe quantity of the *dip*, or to meaſure the greateſt angle which the needle would make with the horizon.

This, in the year 1576, he found at London to be 71° 50′. It is not abſolutely certain whether the *dip* varies, as well as the horizontal direction, in the ſame place. Mr. Graham made a great number of experiments with the *dipping-needle* in 1723, and found the *dip* to be between 74 and 75 degrees. Mr. Nairne, in 1772, found it to be ſomewhat above 72°. The trifling difference between the firſt obſervations of Mr. Norman, and the laſt of Mr. Nairne, would lead us to imagine that the *dip* was unalterable; but Mr. Graham, who was a very accurate obſerver, makes the difference more conſiderable. Phil. Tranſ. abr. vol. vii. p. 280. and Phil. Tranſ. vol. lxii. art. 35.

It is certain, however, from a great number of experiments and obſervations, that the *dip* is variable in different latitudes, and that it increaſes in going northward. It appears from a table of obſervations made with the marine *dipping-needle*, already deſcribed, in a voyage towards the north-pole, in 1773, that in lat. 60° 18′, the *dip* was 75°; in lat. 70° 45′, it was 77° 52′; in lat. 80° 12′, it was 81° 52′; and in lat. 80° 27′, 82° 2½′. Phipps's Voyage, &c. p. 122. See alſo the obſervations of Mr. Hutchins, made in Hudſon's Bay and Straits. Phil. Tranſ. vol. lxv. part i. art. 14.

Burrows, Gilbert, Ridley, Bond, &c. endeavoured to apply this diſcovery of the *dip* to the finding of the latitude; and the laſt author, going farther, likewiſe propoſed the finding of the longitude thereby; but for want of obſervations and experiments, he could go no length. Mr. Whiſton, being furniſhed with the farther obſervations of colonel Windham, Dr. Halley, Mr. Pound, Mr. Cunningham, Pere Noel, Pere Feuille, and his own, has improved very much on the doctrine and uſe of the *dipping-needle*; brought it to more certain rules; and endeavoured, in good earneſt, to find the longitude thereby. In order to this, he obſerves, 1ſt, That the true tendency of the north or ſouth end of every magnetic needle, is not to that point of the horizon, to which the horizontal needle points, but towards another, directly under it, in the ſame vertical, and in different degrees under it, in different ages, and at different places.

2dly, That the power by which an horizontal needle is governed, and all our navigation ordinarily directed, is proved to be but one quarter of the power by which the *dipping-needle* is moved; which ſhould render the latter far the more effectual and accurate inſtrument.

3dly, That a *dipping-needle*, a foot long, will plainly ſhew an alteration of the angle of inclination, in theſe parts of the world, in half a quarter of a degree, or 7½ geographical miles; i. e. ſuppoſing that diſtance taken along, or near a meridian; and a needle of four feet, in two or three miles.

4thly, A *dipping-needle*, four feet long, in theſe parts of the world, will ſhew an equal alteration along a parallel; as one of a foot long will ſhew along a meridian; i. e. this will, with equal exactneſs, ſhew the longitude, as that the latitude.

This depends on the poſition of the lines of equal *dip*, in theſe parts of the world, which are found to lie about fourteen or fifteen degrees from the parallels.

Hence he argues, that as we can have needles of five, ſix, ſeven, eight, or more feet long, which will move with ſtrength ſufficient for exact obſervation; and ſince microſcopes may be applied to the viewing the ſmalleſt diviſions of degrees on the limb of the inſtrument, it is evident, the longitude at land may be found thereby to leſs than four miles.

And as there have been many obſervations made at ſea, with the ſame inſtrument, by Noel, Feuille, &c. which have determined the *dip* uſually within a degree, ſometimes within ½ or ⅓ of a degree, and this with ſmall needles, of five or ſix, or at the moſt nine inches long; it is evident, the longitude may be found, even at ſea, to leſs than half a quarter of a degree. Thus much premiſed, the obſervation itſelf follows.

To find the longitude, or latitude, by the DIPPING-*Needle*. If the lines of equal *dip*, below the horizon, be drawn on maps, or ſea-charts, from good obſervations, it will be eaſy, from the longitude known, to find the latitude; and from the latitude known, to find the longitude, either at ſea or land.

Suppoſe, e. gr. you were travelling, or ſailing along the meridian of London, and found the angle of *dip*, with a needle of one foot, to be 75°, the chart will ſhew, that this meridian, and the line of *dip*, meet in the latitude of 53° 11′; which, therefore, is the latitude ſought. See LATITUDE.

Or, ſuppoſe you were travelling, or ſailing along the parallel of London, i. e. in 51° 32′ north latitude, and you find the angle of *dip* to be 74°. This parallel, and the line of this *dip*, will meet in the map in 1° 46′ of eaſt longitude, from London; which is, therefore, the longitude ſought.

DIPSACUS, in *Botany*. See TEASEL.

DIPSACUS, in *Medicine*, according to ſome, is the ſame with a diabetes. See DIABETES.

DIPSAS, a ſort of ſerpent, the biting whereof produces ſuch a thirſt as proves mortal; whence it is called *dipſas*, which in Greek ſignifies *thirſty*. In Latin it is called *ſitula*, a *pail*. Moſes ſpeaks of it in Deut. viii. 15.

The Hebrew word *tzimaon* anſwers very well to the Greek *dipſas*, and expreſſes the thirſt occaſioned by the biting of this ſerpent. Some by the Hebrew *tzimaon* underſtand a deſart or dry place.

DIPTERA, from δις, and πτερον, *wing*, in *Zoology*, an order of inſects, which have only two wings, and under each wing a ſtyle or oblong body, terminated by a protuberance or head, and called a balancer.

DIPTERE, or DIPTERON, in the *Ancient Architecture*, a temple ſurrounded with a double row of columns, which form a ſort of porticos, called wings, or iſles.

The word is Greek, formed from δις, *twice*; and πτερον, *ala*, *wing*.

DIPTOTES, from δις and πτωτος, of πιπτω, *cado*, in *Grammar*, a kind of irregular nouns, having only two caſes; as *fors*, *forte*.

DIPTYCHA, in *Antiquity*, a public regiſter, wherein were written the names of the conſuls, and other magiſtrates, among the heathens; and of biſhops, and defunct as well as ſurviving brethren, among the Chriſtians.

The word *diptycha* is formed from the Greek διπτυχον, or διπτυχα, and that from διπτυξ, a maſculine noun derived from πτυσσω, *I fold*, or *plait*. From its future πτυξω is formed πτυξ, a *fold*, or *plait*, to which adding δις, *twice*, we have διπτυξ, in the genitive διπτυχος, whence the nominative neuter διπτυχον, q. d. *a book folded in two leaves*; though there were ſome in three, and others in four or five leaves. An ingenious author imagines this name to have been firſt given them to diſtinguiſh them from the books that were rolled, called *volumina*. See VOLUME, and BOOK.

It is certain there were profane *diptycha* in the Greek empire, as well as ſacred ones in the Greek church. The former were the matricula, or regiſter, wherein the names of the magiſtrates were entered; in which ſenſe *diptycha* is a term in the Greek chancery.

DIPTYCHA, *ſacred*. The word is plural; *diptycha* being a double catalogue, in one whereof were written the names of the living, and in the other thoſe of the dead, which were to be rehearſed during the office. We meet with ſomething not unlike the *ſacred diptychs* of the Greeks, in the canon of the maſs, according to the Latin uſage; where the people are enjoined to pray once for the living, and once for the dead; ſeveral ſaints are invoked in different times, &c.

In theſe *diptycha* were entered the names of biſhops, who had governed their flocks aright; and theſe were never expunged out of the ſame, unleſs they were convicted of hereſy, or ſome other groſs crime. In the *diptycha* were likewiſe entered the names of ſuch as had done any ſignal ſervice to the church, whether they were living or dead, and mention was made of them in the celebration of the liturgy.

Caſaubon, in his obſervations on Athenæus, lib. vi. cap. 14. ſuppoſes the Chriſtians to have borrowed the cuſtom of writing names in a book, and rehearſing them at maſs, from the heathens, who entered the names of perſons they would do any ſignal honour to, in the verſes of the Salii; as was done to Germanicus and Verus, ſons of the emperor Marcus Aurelius, and long time before, during the age of the republic, to Mamurcus Veturius, and Lucia Volumnia, as we are told by Tacitus, lib. ii. Spartian, Ovid, Feſtus, Plutarch, &c. But Fa. Roſweyd does not approve this notion of Caſaubon. The pretended St: Dionyſius, a very ancient author,

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author, says the contrary, and asserts the first establishment of this usage to have been founded on Scripture, 2 Tim. ii. 19. Psalm cxvi. 15. Rosweyd adds Ecclesiastic. xliv. 1. and takes these to have been the passages the ancient church had a view to, rather than the Salian verses.

The *profane diptycha* were frequently sent as presents to princes, &c. on which occasion they were finely gilt, and embellished; as appears from Symmachus, lib. ii. ep. 81. Those presented were usually of ivory. The first law, De Expens. Ludor. C. Theod. forbids all magistrates below consuls to make presents of *diptycha* of ivory in the public ceremonies.

DIPYRENON, from δις, and πυρην, a *berry*, in *Surgery*, the name of a probe, with a double button at the end, resembling two small berries growing together.

DIRÆ, in *Mythology*. See FURIES.

DIRCA, in *Botany*, a genus of the *octandria monogynia* class. Its characters are these: the flower is tubulous, and has no empalement; it has eight stamina, which are longer than the tube; the flower is succeeded by a berry with one cell, including a single seed. There is but one sort of this genus, called by the French *bois de plumb*, *lead-wood*; and by the English in America leather-wood, from its lightness. It is a low shrub in this country, seldom rising above four or five feet high; and is very nearly allied to the mezereon.

DIRECT, in *Arithmetic*. The *Rule of Three* DIRECT is that opposite to the inverse. See RULE *of proportion*.

DIRECT, in *Astronomy*. We consider the planets in three states; viz. *direct*, *stationary*, and *retrograde*. See PLANET.

They are said to be *direct*, when they appear to move forward, according to the succession of the signs; and *retrograde*, when they go the contrary way.

DIRECT, in *Matters of Genealogy*, is understood of the principal line, or the line of ascendants and descendants; in contradistinction to the collateral line.

Thus the house of Bourbon is said to descend in a *direct* line from St. Louis. The heirs in a *direct* line always precede those in the collateral lines.

A very good historian uses the phrase DIRECT *speech*, or *harangue*, when he introduces any one speaking, or haranguing of himself: when the historian speaks, and only rehearses the chief points of what was delivered by the speaker, it is called an *indirect speech*.

DIRECT { *Erect* / *East* / *West* } *dials*, are those whose planes lie directly open to the east, or west points of the heavens, or parallel to the meridian of the place. See DIAL.

DIRECT *south*, or *north* { *Inclining* / *Reclining* } *dials*. See DIAL.

DIRECT, in *Music*, is a mark set at the end of a staff, especially at the foot of a page upon that line or space where the first note of the next staff is set.

DIRECT, in *Optics*. *Direct vision* is that performed by *direct* rays; in contradistinction to vision by refracted, or reflected rays.

Direct vision is the subject of optics, which prescribes the laws and rules thereof. See VISION.

DIRECT *rays* are those which pass in right lines from the luminary to the eye, without being turned out of their rectilinear direction by any intermediate body, either opaque or pellucid. See RAY.

DIRECT *sphere*. See RIGHT *sphere*.

DIRECTION, in *Astronomy*, the motion, and other phænomena, of a planet, when *direct*. See PLANET.

DIRECTION, in *Astrology*, is a kind of calculus, whereby they pretend to find the time wherein any notable accident shall befal the person whose horoscope is drawn.

For instance, having established the sun, moon, or ascendent, as masters, or significators of life; and Mars, or Saturn, as promisers, or portenders, of death; the *direction* is a calculation of the time wherein the significator shall meet the portender.

The significator they likewise call *apheta*, or giver of life; and the promiser, *anereta*, *promissor*, or giver of death.

They work the *directions* of all the principal points of the heavens, and stars, as the ascendant, mid-heaven, sun, moon, and part of fortune. The like is done for the planets, and fixed stars; but all differently, according to the different authors.

DIRECTION, *line of*, in *Gunnery*, was formerly marked on guns with a slit or cavity at the breech, and a button at the muzzle, so that they were directed in the same manner as fowling-pieces are; but as the platforms on which the cart carriages rest are never laid so exactly level, but that one wheel is always higher than another, this line of *direction* must be false, and has, therefore, in modern practice been laid aside; and the center-line of a piece is found every time it is fired, by a plummet, or instrument, which Mr. Muller complains of as a tedious and uncertain method; and he recommends resuming the line of *direction*, as more expeditious, and more certain than the common practice. System of Math. vol. v. p. 90, and 230.

DIRECTION, or *Line of* DIRECTION, in *Mechanics*, is particularly used for a line passing from the center of the earth through the center of gravity of a body, and the support or fulcrum that bears it.

A man must necessarily fall down as soon as the center of his gravity is out of the *line of direction*.

DIRECTION, *line of*, in *Mechanics*, also denotes that wherein a body moves, or endeavours to proceed.

DIRECTION, *angle of*, in *Mechanics*, is that comprehended between the lines of *direction* of two conspiring powers.

DIRECTION, *quantity of*, in *Mechanics*, is used for the product of the velocity of the common center of gravity in a system of bodies, by the sum of their masses.

In the collision of bodies, the quantity of direction is the same before and after the impulse. Bernouilli, Discours sur le Movement. Oper. tom. iii. p. 32, and 56.

DIRECTION *chamber*, in *Commerce*. See CHAMBER.

DIRECTION *of the load-stone*, that property whereby the magnet, or a needle touched by it, always presents one of its ends towards one of the poles of the world, and the opposite end to the other pole.

The attractive property of the magnet was known long before its *directive*; and the *directive* long before the inclinatory.

DIRECTION, *magnetical*, is also used in the general for the tendency, or turning of our earth, and all magnetical bodies, to certain points.

The *direction* of a load-stone denotes its POLARITY.

The situation of the earth, we know, is such, that its axis is in the axis of the universe; and therefore its poles, and cardinal points, exactly correspond to those thereof. This situation some account for hence, that it is the most commodious with regard to the aspects and influences of the heavenly bodies, and renders it the fittest habitation for man. Others hold this position of the earth an effect of a magnetic virtue; and suppose a celestial pole, endued with a like magnetic virtue; which, extending as far as our earth, draws the correspondent part thereof, the pole, towards itself.

DIRECTION, *number of*, in *Chronology*. See NUMBER.

DIRECTLY. In *Geometry*, we say, two lines lie *directly* against each other, when they are parts of the same right line.

In *Mechanics*, a body is said to strike, or impinge *directly* against another, if it strike in a right line perpendicular to the point of contact.

A sphere, particularly, strikes *directly* against another when the line of *direction* passes through both their centers. See PERCUSSION.

DIRECTOR, in *Commercial Polity*, a person who has the management of the affairs of a trading company: thus we say, the *directors* of the India COMPANY, South-sea COMPANY, &c. See BANK.

DIRECTORS *of Creditors*, in the *Commercial Policy of France*, are persons of ability and property, chosen by votes of the creditors, to inspect and examine the debtor's affairs, and to procure as far as possible, by common methods of justice, the payment of each person's debt. See ASSIGNEES.

DIRECTORS-*general* of the five great farms of the GABELS and AIDS, &c. in France, are chief commissioners, who have the direction of these farms, each in the districts appointed by the general farmers.

DIRECTOR, in *Surgery*, a grooved probe, to direct the edge of the knife or sciffars in opening sinuses or fistulas, that, by this means, the subjacent vessels, nerves, and tendons, may remain unhurt. Sometimes one end is made in form of a spoon, to contain powders to sprinkle upon wounds or ulcers. Sometimes also it is forked at the end to divide the frænum of the tongue. See *Tab.* III. *Surgery*, *fig.* 33. Heister's Surg. Introd. sect. 36.

DIRECTOR *penis*, in *Anatomy*, a muscle of the penis, called more usually *erector*. See *Tab. Anat. (Splanch.) fig.* 15. *lit. e e*. See ERECTOR.

DIRECTORY *of public worship*, was drawn up by the assembly of divines at Westminster, pursuant to an ordinance which passed the house of lords in 1644, repealing the statutes of Edward VI. and of Elizabeth, for uniformity in the common prayer. This *directory* set aside the use of the Liturgy, and allowed of no church-music besides that of singing the Psalms.

DIRECTRIX, in *Geometry*. See DIRIGENT.

DIRECTRIX *of the parabola*. See CONIC *Sections*.

DIRIBITORES, among the Romans, officers appointed to distribute tablets to the people at the *Comitia*. See COMITIA.

DIRIGENT, a term in *Geometry*, expressing the line of motion, along which a describent line, or surface, is carried in the genesis of any plane, or solid figure.

Thus,

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Thus, if the line AB (*Tab.* II. *Geometry*, *fig.* 33.) move parallel to itſelf, and along the line AC, ſo that the point A always keeps in the line AC, a parallelogram, as ABCD, will be formed, of which the ſide AB is the deſcribent, and the line AC the *dirigent*. So alſo, if the ſurface ABCD be ſuppoſed to be carried along the line CE, in a poſition always parallel to itſelf in its firſt ſituation, the ſolid ADEH will be formed, where the ſurface AD is the deſcribent, and the line CE is the *dirigent*.

DIRITTA, in the *Italian Muſic*, a term intimating that the piece is to be played or ſung in conjoint degrees. Thus, *contrapunto alla diritta*, according to Angelo Berardi, is when one is obliged to raiſe or fall the voice by the ſame degrees, i. e. by an equal number aſcending or deſcending, without making a leap, even of the interval of a third. Broſſ. Dict. Muſ. in voc.

DIS, an inſeparable particle prefixed to divers words; the effect whereof is, either to give them a ſignification contrary to what the ſimple words had: as in *diſgrace*, *diſparity*, *diſproportion*, &c. or to intimate a ſeparation, detachment, diſtribution, &c. as in *diſcerning*, *diſcourſing*, *diſtracting*, *diſpoſing*, &c.

DISABILITY, in *Law*, is when a man is made incapable to inherit lands, or take any benefit, which otherwiſe he might do; which may happen four ways; viz. by the act of the anceſtor; by the act of the party; by the act of law; and by the act of God.

DISABILITY *by the act of the anceſtor*, is where a man is attainted of treaſon, or felony; by which attainder his blood is corrupted, and thereby himſelf and his children are *diſabled* to inherit.

DISABILITY *by the act of the party himſelf*, is where a man binds himſelf by obligation, that, upon a ſurrender of a leaſe, he will grant a new eſtate to the leſſee; and afterwards he grants the reverſion to another, which puts it out of his power to perform it.

DISABILITY *by the act of the law*, is when a man, by the ſole act of law, without any thing by him done, is rendered incapable of the benefit of the law: as, an alien born; ſo that if a man born out of the king's liegeance, will ſue an action, the tenant, or defendant, may ſay, he was born in ſuch a country out of the king's liegeance, and demand judgment, if he ſhall be anſwered; for the law is our birth-right, to which an alien is a ſtranger, and therefore *diſabled* from taking any benefit thereby.

DISABILITY *by the act of God*, is when the party is *non compos mentis*, or *non ſanæ memoriæ*, which ſo *diſables* him, that in all caſes, where he gives, or paſſes any thing, or eſtate, from him, after his death it may be annulled, and voided.

There are alſo other *diſabilities* by the common law, as of idiocy, infancy, and coverture, for making of grants, &c. and by ſtatute, as papiſts are *diſabled* for making any preſentation to a church, &c. and officers not taking the oaths for holding offices.

DISABLED, in *Sea Language*, is applied to a ſhip, when by the loſs of her maſts, yards, or rigging, or other damage, ſhe is rendered incapable of proſecuting her voyage, without great difficulty and danger.

DISAFFORESTED. See DEAFFORESTED.

DISARM, in the *Manege*. To *diſarm* the lips of a horſe, is to keep them ſubject, and out from above the bars, when they are ſo large as to cover them, and prevent the true preſſure or *appui* of the mouth, by bearing up the bit, and ſo hindering the horſe to feel the effects of it upon the bars.

DISARMING, the act of depriving a perſon of the uſe or poſſeſſion of arms. See ARMS.

On the concluſion of a peace, it is uſual for both ſides to *diſarm*. We have divers laws for *diſarming* papiſts, and all recuſants. Under king George I. a law was made for *diſarming* the Highlanders; none of whom, except peers, or gentlemen of 400*l*. *per ann.* are to wear any arms in the field, on the road, or at market. 1 Geo. I. ſtat. 2. cap. 54.

The game law has, in effect, diſarmed all the common people of England, having under 100*l*. a year in landed eſtate, except the ſervants of lords of manors. Yet, by the ancient policy of England, the whole nation was obliged to bear arms.

DISBOSCATION, *Diſboſcatio*, a turning wood-ground into arable or paſture, an aſſarting. See ASSART.

DISBURDENING *of trees*, in *Gardening*, the taking off leaves and fruits when too numerous, that thoſe left may grow the larger.

DISC, or DISK, DISCUS, in *Antiquity*, a kind of round quoit, or a piece of ſtone, or metal, about a foot over, uſed by the ancients in their exerciſes.

The *diſcus* of the ancients was flat and round, reſembling the apparent figure of the ſun.

The exerciſe of the *diſcus* was one of thoſe practiſed in the ſolemnities of their public games: it conſiſted in pitching, or throwing a *diſcus* either upward, or ſtrait forward; and he who threw it higheſt, or fartheſt, bore away the prize.

Thoſe who practiſed at this game were called *diſcoboli*, i. e. *throwers of the diſcus*.

The poets tell us, that Hyacinth, a favourite of Apollo, playing at the *diſcus* with that god, was killed by a blow of Apollo's *diſcus*, which his rival Zephyrus diverted from its courſe, and caſt on the boy's head.

The *diſcus* was thrown by means of a little cord made of hair, as appears from Claudian, lib. ii. in Eutrop. carm. 20. ver. 359, & ſeq. Ovid deſcribes this ſport, Metam. lib. x. ver. 175. The Romans learnt the game of the *diſcus* of the Greeks, and practiſed it among themſelves. Dempſter, Paraleip. in Roſin. Antiq. Rom. lib. v. cap. 1. and Pet. Faber, Agoniſticon, lib. ii. cap. 1. treat of the diverſion of the *diſcus*.

DISC, or DISK, in *Aſtronomy*, the body, or face of the ſun, or moon; ſuch as it appears to us. For, though they are really ſpherical bodies, they are apparently circular planes.

The *diſc* is conceived to be divided into twelve equal parts, called *digits*; by means whereof it is, that the magnitude of an eclipſe is meaſured, or eſtimated. Such an eclipſe was ſo many digits, or parts of the ſun, or moon's *diſc*.

In a total eclipſe of either of thoſe luminaries, the whole *diſc* is obſcured, or darkened; in a partial eclipſe, only part of them. See ECLIPSE.

DISC, *illuminated*, *of the earth*. See CIRCLE *of Illumination*.

DISC, DISCUS, in *Botany*, is applied to the central, or middle part of radiated flowers; as being round, and plain like a quoit.

This is ſometimes alſo called the *pelvis*, or *baſin*. The *diſc* is compoſed of ſeveral floſculi perpendicularly placed.

DISC, in *Optics*, the magnitude of a teleſcope glaſs; or the width of its aperture, whatever its figure be, whether a plain, convex, meniſcus, or the like.

DISC, in the Greek *Liturgy*, is nearly the ſame thing with the *patena* in the Latin. See PATENA.

In the Greek church the conſecrated bread is laid on a *diſcus*, as in the Latin church it is on a *patena*. The *diſcus* only differs from the *patena*, in that it is bigger and deeper, as reſembling a plate, which was the proper ſignification of the word *diſcus* among the ancients.

DISCEIT, in our *Old Writers*. See DECEIT and DECEPTIONE.

DISCENT. See DESCENT.

DISCERNING, an act of the mind, whereby it diſtinguiſhes between ideas.

On this faculty of *diſcerning* depends the evidence and certainty of ſeveral, even general propoſitions, which paſs for innate truths; and which in reality flow from this clear *diſcerning* faculty of the mind, whereby it perceives two ideas to be the ſame, or to be different.

In being able nicely to diſtinguiſh one thing from another, where there is the leaſt difference, conſiſts in great meaſure that exactneſs of judgment, and clearneſs of reaſon, which is to be obſerved in one man above another; which is quite oppoſite to wit: this conſiſts moſt in the aſſemblage of ideas, and putting thoſe together with quickneſs and variety, which have the leaſt reſemblance to form agreeable viſions; whereas judgment ſeparates carefully thoſe ideas, wherein can be found the leaſt difference, to prevent error and deluſion. To the well diſtinguiſhing our ideas, it chiefly contributes, that they be clear and determinate; and when they are ſo, there will not ariſe any confuſion, or miſtake, about them, though the ſenſes ſhould convey them from the ſame object differently on different occaſions. See JUDGMENT.

DISCEUS, or DISCIFORMIS *Cometa*. See DISCUS.

DISCHARGE, in *Electricity*. See CHARGE.

DISCHARGE, in *Law*. See CHARGE, in *Law*.

DISCHARGE, in *Military Language*, is the diſmiſſion of a ſoldier from the troop or company to which he belonged, either by his own requeſt, or when after long and faithful ſervice, he is intitled to his majeſty's bounty.

To DISCHARGE, in *Sea Language*, ſignifies to unload a ſhip, or take out her ſtores, ammunition, artillery, &c. When applied to the crew, it implies to diſband them from immediate ſervice.

DISCHARGER, or DISCHARGING *Rod*, in *Electricity*, conſiſts of a handle of glaſs or baked wood, A (*Tab. Electricity*, *fig.* 3.) and two bent metal rods BB, terminating in points, and capable of being ſcrewed into the knobs DD, which move by a joint C, fixed to the handle A. Thus it may be uſed either with the points or balls, as occaſion requires; and by being made moveable

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on a joint, it may be applied to larger or ſmaller jars at pleaſure. By bringing one of theſe knobs or points to one coated ſide of a charged electric, and the other to the other ſide, or to any conductor connected with it, the communication is completed between the two ſides, and the electric is *diſcharged*.

DISCHARGER, *the univerſal*, contrived by Mr. Henly, conſiſts of a flat board A (*Tab.* II. *Electricity*, *fig.* 14.) fifteen inches long, four broad, and about one inch thick, and two glaſs pillars B, B, cemented in two holes upon the board A, and furniſhed at their tops with braſs caps; each of which has a turning joint, and ſupports a ſpring tube, through which the wire DC ſlides. Each of theſe caps is compoſed of three pieces of braſs, connected in ſuch a manner that the wire DC not only ſlides through the ſocket, but may be moved both vertically and horizontally. Each of the wires DC, DC is furniſhed with an open ring at one end, and at the other end with a braſs ball D, which, by a ſhort ſpring ſocket, may be ſlipt on its pointed extremity, or removed from it at pleaſure. E repreſents a ſtrong circular piece of wood, five inches in diameter, in the ſurface of which a ſlip of ivory is inlaid; it reſts on a cylindrical foot, fitting the cavity of the ſocket F, which is faſtened in the middle of the board A, and by means of a ſcrew G, the circular board may be fixed at any required height. To this inſtrument belongs a ſmall preſs H, compoſed of two oblong pieces of board, which may be preſſed againſt each other by two ſcrews *a*, *a*; the lower of theſe boards has a cylindrical foot of the ſame ſize with that of the circular board E; and thus the preſs may be fixed in the ſocket F, in the room of E. Cavallo's Electr. p. 164, &c.

This inſtrument may be uſed in a variety of electrical experiments. Thus, glaſs may be ſtained with metals, by putting a ſmall ſlip of gold, ſilver, or braſs-leaf, between two ſlips of common window-glaſs, about three inches long, and half an inch wide, and preſſing them between the boards of the preſs H; then, if a ſhock be made to paſs through this metallic leaf, a ſmall part of which projects beyond the ſlips of glaſs at each end, the force of the exploſion will ſo fix the metal to the glaſs, that it cannot be wiped off, or even be affected by any of the common menſtrua, which would otherwiſe diſſolve it. If a ſmooth piece of metal, or ſemi-metal, be fixed on each of the wires, that bear the knobs D, D, and their ſurfaces be brought near each other, ſo that the battery may be *diſcharged* through them, by connecting one wire of the *diſcharger* with the outſide of the battery, and the other wire with the inſide of it, each ſurface will be marked with a central ſpot, and concentric circles, which are more or leſs diſtinct, and more or leſs in number, as the metal upon which they are marked requires a greater or leſs degree of heat to melt it, and as a greater or leſs force is employed. If a plain piece of metal be fixed on one of the wires, and a ſharp-pointed needle on the other, directed to the ſurface of the metal, the exploſion of a battery repeatedly paſſed from one to the other, will gradually mark the ſurface of the metal, oppoſite to the point, with circles conſiſting of all the priſmatic colours; the coloured rings will appear ſooner, and be cloſer to one another, as the point is nearer to the ſurface of the metal; and the number of rings depends on the acuteneſs of the point. See CIRCULAR *ſpots*, COLOURS, and FAIRY *Circles*.

DISCIPLE, from *diſco*, *I learn*, one who learns any thing from another. Thus the followers of any teacher, philoſopher, &c. are called *diſciples*. In the Chriſtian ſenſe, they were the followers of Jeſus Chriſt, in general; but in a more reſtrained ſenſe, the *diſciples* denote thoſe alone who were the immediate followers and attendants on his perſon; of which there were ſeventy, or ſeventy-two. The names *diſciple* and apoſtle are often ſynonimouſly uſed in the goſpel hiſtory; but ſometimes the apoſtles are diſtinguiſhed from *diſciples*, as perſons ſelected from them, to be the principal miniſters of his religion; of theſe there were only twelve. The Latins keep the feſtival of the ſeventy, or ſeventy-two *diſciples*, on July 15; and the Greeks on January 4.

DISCIPLINE primarily ſignifies inſtruction and government; but the word is figuratively applied to a ſtated method of living, according to the rules of ſome profeſſion.

We ſay the *military diſcipline*, the *eccleſiaſtic* or *church diſcipline*, the *regular* or *monaſtic diſcipline*, &c.

We do not ſay *civil diſcipline*, but inſtead thereof policy.

DISCIPLINE is alſo uſed in a peculiar ſenſe for the chaſtiſement, or bodily puniſhment, inflicted on a religious, who has been caught delinquent; or even for that which the religious voluntarily undergo, or inflict on themſelves, by way of mortification.

Among all the auſterities practiſed by the ancient monks and ſolitaries, Dupin obſerves, there is no mention made of *diſcipline*: in effect, it does not appear to have been in uſe in antiquity, unleſs to puniſh the monks who had been taken tripping.

It is commonly ſaid to be St. Dominic, and Peter Damian, who firſt introduced the uſe of *diſcipline*; but F. Mabillon notes, that Guy, abbot of Pompoſa, and others, had practiſed it before them. It is pretty certain, the practice was firſt eſtabliſhed in the eleventh century, with deſign to redeem the penances the canons impoſed on divers offences; and at length they came not only to redeem for themſelves, but alſo for others. See F. Mabillon.

DISCIPLINE is alſo frequently uſed for the inſtrument wherewith a monk chaſtiſes, or mortifies himſelf; which is uſually made of ropes, knotted hair, or twiſted parchment; ſometimes of broken rods. St. Jerom is painted with *diſciplines* of iron chains, armed with ſpur-rowels, &c. See FLAGELLATION.

DISCIPLINE, *Book of*, in the *Hiſtory of the Church of Scotland*, is a common order, drawn up by the aſſembly of miniſters in 1650, for the reformation and uniformity to be obſerved in the *diſcipline* and policy of the church. In this book the government of the church by prelates is ſet aſide, church-ſeſſions are eſtabliſhed, the ſuperſtitious obſervation of faſt-days and ſaints days is condemned, and other regulations for the government of the church are determined. This book was approved by the privy-council, and is called the firſt book of *diſcipline*.

DISCIPLINE, *military*, denotes the exerciſe of thoſe laws that are eſtabliſhed for regulating the conduct of military men.

DISCIPLINE, *marine*, ſignifies the training up ſoldiers for ſea-ſervice, in ſuch exerciſes and manœuvres as can be performed on board ſhips of war at ſea.

DISCLAIMER, in *Law*, a plea, containing an expreſs denial, renouncing, or *diſclaiming*, of a thing alleged.

As if the tenant ſue a replevin upon a diſtreſs taken by the lord, and the lord avow the taking, ſaying, that he holds of him as his lord, and that he diſtrained for rent not paid, or ſervice not performed; then the tenant, denying to hold of ſuch lord, is ſaid to *diſclaim*; and the lord proving the tenant to hold of him, the tenant loſes his land.

Alſo a man, denying himſelf to be of the blood, or kindred of another, in his plea, is ſaid to *diſclaim* his blood. If a man arraigned of felony, *diſclaim* goods; being cleared, he loſes them.

Thus likewiſe in chancery, if a defendant by his anſwer renounces having any intereſt in the thing in queſtion, this is a *diſclaimer*: to which may be added, a *diſclaimer* by renouncing an executorſhip of a will, or the right to an adminiſtration.

DISCLOSED, a term uſed for chickens or hawks newly hatched; alſo for buds or flowers juſt blown.

DISCOBOLI, Δισκοβολοι, from δισκος and βαλλω, *I throw*, among the *Ancients*, an appellation given to thoſe who gained the victory at the *diſcus*. See DISCUS.

DISCOIDES *fibula*, in *Natural Hiſtory*, the name of a genus of the echinodermata, or ſea hedge-hogs; the periphery of the baſe of theſe is exactly round, and the body of a convexo-concave figure. The principal ſpecies of this genus is the ſubuclus, which has ſometimes a roſaceous top, the lines being very neat and elegant, ſometimes a plain and ſmooth top; ſometimes it is all over covered with extremely minute and fine ſtriæ, and ſometimes it is much flatter than at others. Klein's Echinoderm.

DISCONTINUANCE, an interruption, intermiſſion, or ceſſation, of the courſe of a thing: as, *diſcontinuance* of poſſeſſion, of a plea, proceſs, &c.

The effect of a *diſcontinuance of poſſeſſion* is, that a man may not enter on his own land, or tenement alienated, whatever his right be to it, of himſelf, or by his own authority; but muſt bring his writ, and ſeek to recover poſſeſſion by law. As if a man alien the lands he holdeth in right of his wife; or a tenant in tail make any feoffment, or leaſe for life not warranted by the ſtat. 32 Hen. VIII. by fine, or livery of ſeiſin; ſuch alienations are called *diſcontinuances*.

The effect of *diſcontinuance of proceſs*, is, that the opportunity of proſecution is loſt, and not recoverable, but by beginning a new ſuit. For to be *diſcontinued*, and to be put off without a day, are the ſame thing; and are nothing leſs than to be finally diſmiſſed the court.

Diſcontinuance of proceſs, at *Common Law*, is helped by appearance; and by ſtatute 32 Hen. VIII. cap. 30. all *diſcontinuances*, miſcontinuances, and negligences therein, of plaintiff or defendant, are cured after verdict.

DISCONTINUANCE *of plea*, is when divers things ſhould be pleaded to in a ſuit or action, and ſome are omitted. If

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a defendant's plea anſwers to part only, it is a *diſcontinuance*; and the plaintiff may take judgment by *nil dicit*, for that which is not anſwered; but if the plaintiff plead over, the whole action is *diſcontinued*.

If a juſtice-ſeat be *diſcontinued* by the not coming of the juſtices, the king commonly renews the ſame by his writ, &c.

DISCORD, in *Muſic*, the relation of two ſounds, which are always, and of themſelves, diſagreeable, whether applied in ſucceſſion or conſonance.

If two ſimple ſounds be in ſuch a relation of tune, that is, have ſuch a difference of tune, as that, being ſounded together, they make a mixture, or compound ſound, which the ear receives with diſpleaſure, it is called a *diſcord*; as, on the contrary, if it receive it with pleaſure, it is called a *concord*; and whatever two ſounds make an agreeable, or diſagreeable compound, they will have the ſame effects reſpectively, if they be applied in ſucceſſion.

As concords are denominated harmonical intervals, ſo may *diſcords* be denominated unharmonical intervals.

Diſcords are diſtinguiſhed into *concinnous*, and *inconcinnous* intervals.

DISCORDS, *concinnous*, by the ancients called *ecmeli*, are ſuch as are apt, or fit for muſic, next to, and in combination with concords. Theſe are relations, which in themſelves are neither very agreeable, nor very diſagreeable; and have only a good effect in muſic by their oppoſition, as they heighten and illuſtrate the more natural and eſſential principles of the pleaſure we ſeek for; or, as by their mixture, and combination with them, they produce a variety neceſſary to our being better pleaſed.

Notwithſtanding this, they are ſtill called *diſcords*; as the bitterneſs of ſome things may help to ſet off the ſweetneſs of others, and yet they may ſtill be bitter.

DISCORDS, *inconcinnous*, by the ancients called *ecmeli*, are ſuch as are never choſen in muſic; as having too great a harſhneſs in them, though even the greateſt *diſcord* is not without its uſe.

The eſſential principles of harmony, harmonical intervals, or concords, are but few, in number only eight; the indefinite number of other ratios are all *diſcords*. Hence Mr. Malcolm ſhews the neceſſity of taking ſome of the leſs untoward of theſe *diſcords* into the ſyſtem of muſic. In order to this, he conſiders the effect of having none but harmonical intervals in the ſyſtem of muſic.

1. With reſpect to a ſingle voice: if that ſhould move always from one degree of tune to another, ſo as every note, or ſound to the next, were in the ratio of ſome concord; the variety, which is the life of muſic, would ſoon be exhauſted. For to move by no other than harmonical intervals, would not only want variety, and ſo weary us with a tedious repetition of the ſame things, but the very perfection of ſuch relations of ſounds would cloy the ear, in the ſame manner as ſweet and luſcious things do the taſte; which, for that reaſon, are artfully ſeaſoned with the mixture of ſour and bitter.

2. With reſpect to muſic in parts, i. e. when two or more voices join in conſonance, the general rule is, that the ſucceſſive ſounds of each be ſo ordered, that the ſeveral voices ſhall be all concords. Now there ought to be a variety in the choice of theſe ſucceſſive concords, and alſo in the method of their ſucceſſions; all which depends on the movement of the ſingle parts. So that, if theſe could only move in an agreeable manner by harmonical diſtances, there are but a few different ways wherein they could move from concord to concord; and hereby we ſhould loſe much of the raviſhment of ſounds in conſonance. As to this part then, the thing demanded is a variety of ways whereby each ſingle voice, or more in conſonance, may move agreeably in the ſucceſſive ſounds, ſo as to paſs from concord to concord, and meet at every note in the ſame, or a different concord, from what they ſtood in at the laſt note.

In what caſes, and for what reaſons, *diſcords* are allowed, the rules of compoſition muſt teach; but only joining theſe two conſiderations, &c. we ſee how imperfect muſic would be without any other intervals than concords.

Beſide the *concinnous diſcords*, uſed deſignedly in muſic, there are ſeveral other *diſcord* relations, which happen unavoidably, in a kind of accidental and indirect manner. Thus, in the ſucceſſion of ſeveral notes, there are to be conſidered not only the relations of thoſe which ſucceed others immediately, but alſo of thoſe betwixt which other notes intervene. Now the immediate ſucceſſion may be conducted ſo as to produce good melody; yet among the diſtant notes there may be very groſs *diſcords*, that would not be tolerable in immediate ſucceſſion, and far leſs in conſonance. And ſuch *diſcords* are actually contained in the ſcale of muſic. Thus, taking any one ſpecies, e. gr. that with the greater third, and marking the degrees betwixt each term and the next; though the progreſſion be melodious, as the terms refer to one common fundamental, yet there are ſeveral *diſcords* among the mutual relations of the terms; e. gr. from 4th to 7th *g*, is 32 : 45; and from 2d *g* to 6th *g*, is 27 : 40; and from 2d *g* to 4th, is 27 : 32; all *diſcords*.

The ſpecies of counterpoint, wherein there is a mixture of *diſcords*, is called *figurative counterpoint*; of which there are two kinds; that wherein the *diſcords* are introduced occaſionally, to ſerve as tranſitions from concord to concord; and that wherein the *diſcord* bears a chief part in the harmony.

Diſcords may tranſiently paſs upon the unaccented parts of the meaſure, without any offence to the ear: this is called *ſuppoſition*, becauſe the tranſient *diſcord* ſuppoſes a concord immediately following.

The harmony of *diſcords* is that wherein the *diſcords* are made uſe of as a ſolid and ſubſtantial part of the harmony. For, by a proper interpoſition of a *diſcord*, the ſucceeding concords receive an additional luſtre. Thus the *diſcords* are in muſic what the ſtrong ſhades are in painting.

The *diſcords* are the 5th when joined with the 6th; the 4th joined with the 5th; the 9th is of its own nature a *diſcord*; ſo is the 7th.

Theſe *diſcords* are always to be introduced into the harmony with due preparation, and muſt be ſucceeded by concords; which is commonly called the *reſolution of the diſcord*. The *diſcord* is prepared by ſubſiſting firſt in the harmony in quality of a concord; that is, the ſame note, which becomes the *diſcord*, is firſt a concord to the baſs-note immediately preceding that to which it is a *diſcord*.

The *diſcord* is reſolved by being immediately ſucceeded by a concord deſcending from it by the diſtance only of greater 2d, or leſſer 2d.

DISCORD, *apple of*, *pomum diſcordiæ*, a phraſe uſed to ſignify the ſubject, or occaſion of ſome miſunderſtanding in a ſociety. It is borrowed from the heathen mythology: the poets feign, that at the marriage of Thetis and Peleus, the goddeſs of *diſcord* threw a golden apple, whereon were written theſe words, *To the faireſt*; which immediately ſtirred up a diſſenſion between Juno, Pallas, and Venus, each pretending a title to the apple.

DISCOVERT, in *Law*, denotes an unmarried woman.

DISCOVERY, in *Law*, the act of revealing or diſcloſing any matter by the defendant, in his anſwer to a bill filed againſt him in a court of equity.

DISCOVERY *of accomplices* is provided for in the caſes of robbery, burglary, houſe-breaking, and larceny, to the value of five ſhillings, from ſhops, warehouſes, ſtables, and coach-houſes, by 4 and 5 W. and M. cap. 8. 10 and 11 W. III. cap. 23. and 5 Anne, cap. 31. which enact, that if any ſuch felon, being out of priſon, ſhall diſcover two or more perſons who have committed the like felonies, ſo that they may be convicted, he ſhall in moſt caſes receive a reward of 40*l.* and in general be entitled to a pardon of all capital offences, excepting only murder and treaſon. And if any ſuch perſon, having felonioufly ſtolen any lead, iron, or other metals, ſhall *diſcover* and convict two offenders of having illegally bought or received the ſame, he ſhall by ſtat. 29 Geo. II. cap. 30. be pardoned for all ſuch felonies committed before ſuch *diſcovery*.

DISCOVERY *by bankrupt*. See CERTIFICATE *of Bankrupt*.

DISCOVERY, in *Dramatic Poetry*, a manner of unravelling a plot, or fable, very frequent in tragedies, comedies, and romances; wherein, by ſome unforeſeen accident, a *diſcovery* is made of the name, fortune, quality, and other circumſtances, of a principal perſon, which were before unknown.

A *diſcovery* ſhould never be in vain, by leaving thoſe who thus diſcover one another in the ſame ſituation and ſentiments they were in before: in effect, thoſe *diſcoveries*, which are immediately followed by a peripetia, or change of fortune of ſome principal character, whereon the unravelling depends, are always the moſt beautiful.

One of the fineſt *diſcoveries* ever brought upon the ſtage, is that of Oedipus in Sophocles; for the minute he finds himſelf the ſon of that Jocaſta, who was then his wife, he becomes of the moſt happy, the moſt miſerable of all men.

There are three ſorts of *diſcoveries:* the firſt by certain marks in the body, either natural, or accidental: ſuch is that of Ulyſſes, who having received a wound in the thigh by a boar, before the Trojan war, is diſcovered by the old nurſe, upon waſhing his legs after his return home incognito.

The ſecond by tokens: as the caſket of things, which the prieſts found with Ion when he was expoſed, diſcovers Creuſa, whom he was going to kill, to be his mother.

The

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The third is made by remembrance: that is, when the ſight or hearing of any thing occaſions us to recollect our misfortunes. Thus, when Ulyſſes heard Demodocus ſing his actions at Troy, the memory of them ſtruck him, and drew tears from his eyes, which diſcovered him to Alcinous.

But the fineſt ſort is, that which ariſes from the ſubject, or incidents of the fable; as that of Oedipus from his exceſſive curioſity, and the letter that Iphigenia ſent by Pylades.

DISCOUNT, in *Commerce*, a ſum deducted, or retained in hand, upon paying a greater. See DEDUCTION.

The term is much uſed among mechanics, and manufacturers, who keep workmen, journeymen, labourers, &c. for the ſums advanced them before-hand, which are diſcounted when the payments are made in courſe.

DISCOUNT is more particularly uſed for an allowance made on a bill of exchange, or any other debt not yet become due; to induce the acceptor, or debtor, to advance the money.

In the uſual mode of calculating this *diſcount*, it is ſuppoſed that the whole intereſt which might be made of the debt till it becomes payable, ſhould be *diſcounted:* but this is not juſt; for though it be true, that from this time to the time when the debt becomes due, ſuch intereſt might be made of it, yet it is not true, that by paying the whole debt without *diſcount*, the debtor loſes ſo much at this time as that intereſt; becauſe he cannot be ſaid to have loſt it, till the time comes when he ſhould receive it; and therefore he cannot be ſaid to loſe any more at this time than ſuch a ſum, as being laid out at intereſt from this time till the time of payment of the debt would amount to the intereſt of the debt for the ſame time: in order to obtain this ſum, find the amount of 1*l.* for the given time, which, at the rate r and for the time t, will be $1+rt$. See INTEREST. And rpt is the intereſt of the principal p for the ſame time; therefore $1+rt : 1 :: rpt : \frac{rpt}{1+rt}$, which is the *diſcount* required. Or, otherwiſe, find a principal, which, being laid out at a certain rate of intereſt for the given time of *diſcount*, will amount to the debt: this principal is its preſent worth, and the difference between this and the debt is the true *diſcount*. Thus $1+rt : 1 :: p : \frac{p}{1+rt}$: and $p-\frac{p}{1+rt}=\frac{prt}{1+rt}$ the true *diſcount* as before. Hence we have the following rule: divide the continual product of the debt, rate and time by the ſum of 1 and the product of the rate and time. To find the annual *diſcount* at 3 *per cent.* divide .03 by 1.03; at $3\frac{1}{2}$ *per cent.* .035 by 1.035; at 4 *per cent.* .04 by 1.04, &c. and the ſeveral quotients will be the *diſcounts* required. Thus,

At	3	*per cent.* the *diſcount* is	.0291,2621,3592.
	$3\frac{1}{2}$	- - -	.0338,1642,5121.
	4	- - -	.0384,6153,8462.
	$4\frac{1}{2}$	- - -	.0430,6220,0957.
	5	- - -	.0476,1904,7619.
	6	- - -	.0566,0377,3585.
	8	- - -	.0740,7407,4074.
	10	- - -	.0909,0909,0909.

The *diſcount* of 1*l.* for one year multiplied by any principal will give the annual *diſcount* of that principal: e. g. the *diſcount* of 100*l.* for a year at 5 *per cent.* is 4.7619*l.* &c. or 4*l.* 15*s.* 2*d.* $\frac{3}{4}$: and 95*l.* 4*s.* 9*d.* $\frac{1}{4}$ will amount to 100*l.* in a year at this intereſt: whereas it is the common practice to allow 5*l.*

The *diſcount* on any debt for one year being found equal to $\frac{pr}{1+r}$, as $t=1$, Dr. Harris in his Lexicon directs to find the *diſcount* of the ſame debt for any part of one year, by taking the proportional part anſwering to the time, as the 365th part of the whole *diſcount* for that of a day, &c. But it is eaſy to perceive the erroneouſneſs of this rule, as well as of the tables which he has given founded upon it. By his rule $1 : \frac{pr}{1+r} :: t : \frac{prt}{1+r}$, inſtead of $\frac{prt}{1+rt}$ the *diſcount* required: the former quantity is evidently leſs than the latter, if t be a fraction, but greater when t is a whole or mixt number. The following rule, by which Mr. Smart has conſtructed his tables, which are the moſt accurate of this kind, will give a ſimilar reſult with the theorem already propoſed. Find the intereſt of 1*l.* for any day or number of days, at any given rate; then divide unit by the ſum of 1*l.* and its intereſt; and the arithmetical complement of the quotient will be the required *diſcount*. Example at 5 *per cent.*

1*l.* with its intereſt for 1 day is 1.0001,3699
2 - 1.0002,7397, &c.

Then divide unit by	The quotients are,	And arithmetical complements,	Diſcounts of 1*l.* for
1.0001,3699	.9998,6303	.0001,3697	1 day
1.0002,7397	.9997,2610	.0002,7390	2
1.0004,1096	.9995,8921	.0004,1079	3
1.0005,4795	.9994,5235	.0005,4765	4
1.0006,8493	.9993,1554	.0006,8446	5
1.0008,2192	.9991,7876	.0008,2124	6
1.0009,5890	.9990,4202	.0009,5798	7
1.0010,9589	.9989,0531	.0010,9469	8
1.0012,3288	.9987,6864	.0012,3136	9
1.0013,6986	.9986,3201	.0013,6799	10
1.0136,9863	.9864,8649	.0135,1351	100
1.0273,9726	.9733,3333	.0266,6667	230

Thus a table of *diſcount* may be formed for any number of days. See ſuch a table at twelve ſeveral rates in Smart's Tables, 4to edit. See alſo on this ſubject Malcolm's Arithm. book vi. chap. 10.

Diſcounts are alſo frequently given for the payment of dubious, or bad debts.

DISCOUNT is alſo uſed among merchants when they buy commodities on truſt, with a condition, that the ſeller ſhall *diſcount* ſo much with him *per cent.* for each payment made before the time expired. See PROMPT *payment.*

The Sieur de la Porte diſtinguiſhes between theſe two kinds of *diſcount:* the firſt, or that upon bills of exchange, is reckoned like the exchange, at the rate of ſo much *per cent.* E. gr. At 2 *per cent. diſcount* on a hundred pounds, there is only ninety-eight pounds to pay: whereas that on commodities, is not only laid on the hundred pounds, but on the hundred and *diſcount* added together. So that *diſcounting* for goods at 10 *per cent.* there is only eight abated on a hundred and eight, and not on the hundred. This laſt, he ſays, is the true *diſcount.*

DISCOUNT is alſo uſed with leſs propriety for the tare, or waſte of any commodity, ſum, &c.

DISCOURSE, in *Logic*, from *diſcurro, I run over*, an operation of the human mind, whereby it paſſes, or proceeds from one thing to another, that is, from a known thing to an unknown.

The ſchoolmen define it an act of cognition, whereby the mind deduces one thing from another: this it does, when, in conſequence of an aſſent given to one propoſition, it yields aſſent to another: ſo that *diſcourſe* conſiſts in a dependency of aſſents; and ſuppoſes ſuch an order between the acts, that that belonging to the conſequent ariſes from that belonging to the antecedent. So that the intellect is then ſaid, *diſcurrere, to diſcourſe*; when, from an aſſent to one or more propoſitions, it infers or draws an aſſent to another.

The object of *diſcourſe*, therefore, or that about which the intellect is employed in *diſcourſing*, is the connexion of extremes conſidered with regard to ſome third, or medium: thus, when it judges, that every reaſonable animal is riſible, affirming, that there is a connexion between riſibility and rationality; and then finds, there is likewiſe a connexion betwixt man and reaſonable animal; and afterwards gathering from the connexion found between riſible and man, with rational, that man and riſible have likewiſe a connexion, as both are connected with rational; it is ſaid to *diſcourſe.*

Hence it appears, that *diſcourſe*, whereon men uſe to value themſelves, does really betray the infirmity of the human underſtanding; as it denotes a chain or ſcale of ſeveral ſucceſſive acts of cognition neceſſary to arrive at a truth. So that there is no *diſcourſe* in God, who underſtands all things originally and truly. See REASONING.

DISCOURSE, in *Rhetoric*, is uſed in the ſame ſenſe with ORATION.

DISCOUS *Flower.* Botaniſts reckon two claſſes of plants with a *diſcous flower.* 1. Such as have the flower compounded, and the ſeed pappous, but the leaves and ſtalks not milky when broken. 2. The corymbiferous plants, whoſe flowers are compounded into a *diſcous* figure, but their ſeeds not pappous. Of the former kind are the flea-banes, ragweeds, groundſels, &c. and of the latter are daiſies, chamomile, tanſy, wormwood, &c. Theſe are diſtinctions founded by Mr. Ray, but not regarded by the later botaniſts.

DISCRETE, or DISJUNCT, *Proportion*, is, when the ratio between two or more pairs of numbers, or quantities, is the ſame, and yet there is not the ſame proportion between all the four numbers.

Thus, if the numbers 6 : 8 : : 3 : 4 be conſidered; the ratio between the firſt pair, 6 and 8, is the ſame as that between 3 and 4, and therefore theſe numbers are proportional: but it is only *diſcretely*, or *disjunctly*; for 6 is not to 8, as 8 to 3; that is, the proportion is broken off between

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between 8 and 3, and is not continued all along, as it is in theſe following, which are called *continual proportionals*, viz. 3 : 6 :: 12 : 24.

DISCRETE *Quantity*, is ſuch as is not continued and joined together.

Such is a number, whoſe parts, being diſtinct units, cannot be united into one *continuum*; for in a *continuum* there are no actual determinate parts before diviſion, but they are potentially infinite; wherefore it is uſually and truly ſaid, that continued quantity is diviſible *in infinitum*. See CONTINUITY.

DISCRETION, in *Law*, the faculty of diſcerning between right and wrong; and therefore whoever hath power to act at *diſcretion*, is bound by the rule of reaſon and law. 2 Inſt. 56. 298. Infants, &c. under the age of *diſcretion*, are not puniſhable for crimes; and want of *diſcretion* is a good exception againſt a witneſs. 2 Hawk. 434. See AGE, and INFANCY.

DISCRETIONE, in the *Italian Muſic*, is uſed to direct the ſinger or player to execute his part with care diligently.

DISCRETIVE *Propoſitions*, are thoſe where various judgments are made, and denoted, by the particles *but*, *notwithſtanding*, or by words of the like nature either expreſſed, or underſtood. Thus, fortune may deprive me of my wealth, *but* not of my virtue; they, who croſs the ſeas, change their climate, *but* not their diſpoſition; are called *diſcretive propoſitions*.

DISCUS, among the *Ancients*, a name given to a round ſhield, conſecrated to the memory of ſome famous hero, and hung up in the temples of their gods, as a trophy of ſome great action.

From the figure of this *diſcus*, or rather of that which the Greeks and Romans uſed to divert themſelves with, eſpecially at their public games, and which was a round quoit of braſs, comes the word ſo much in uſe among aſtronomers, viz. the *diſc* of the ſun, or moon. See DISC.

DISCUS, DISCEUS, or DISCIFORMIS *Cometa*, a comet or fiery meteor reſembling a round diſh or platter. The chief of this kind is called a ſolar comet, from the likeneſs of its rays to thoſe of the ſun; it is called alſo *roſa* and *chryſeus*, from its bright ſilver colour mixed with a golden or amber one.

DISCUSSION, in matters of literature, ſignifies a clear treating, or handling of any point, or problem. The word imports a ſhaking off, or diſpelling the difficulties and obſcurities with which a thing was embarraſſed. We ſay, ſuch a point was well *diſcuſſed*, when it was well treated of, and cleared up.

DISCUSSION is alſo uſed, in a medicinal ſenſe, for a diſperſing the matter of any tumour, or ſwelling, through the pores of the body; or an evacuation of ſome thin matter gathered in any part, by inſenſible perſpiration.

DISCUSSORIA, *Diſcutientia*, διαφορητικα, *diſcutients*. See DISCUTIENTS.

DISCUTIENTS, in *Medicine*, either repellers or remedies proper to open the pores, and evacuate the redundant or peccant humours of the body by inſenſible perſpiration or otherwiſe.

Diſcutients are in this laſt ſenſe the ſame with what we otherwiſe call *diaphoretics*.

DISDIAPASON, in *Muſic*, a compound concord, in the quadruple ratio of 4 to 1, or of 8 to 2.

The *diſdiapaſon* is produced when the voice goes from the firſt tone to the fifteenth, and may be called a *fifteenth*.

The voice ordinarily does not go further than from its firſt tone to the *diſdiapaſon*; i. e. it does not go beyond the compaſs of a double octave; for the *diſdiapaſon* is an octave doubled. It may ſometimes riſe ſeveral tones above a *diſdiapaſon*, but the effort or ſtruggle diſfigures it, and makes it falſe. In reality, the ancient ſcale, or diagramma, only extended to a *diſdiapaſon*.

DISDIAPASON-*Diapente*, in *Muſic*, a concord in a ſextuple ratio of 1 to 6.

DISDIAPASON-*Diateſſaron*, a compound concord in the proportion of 16 to 3.

DISDIAPASON-*Ditone*, a compound conſonance in the proportion of 10 to 2.

DISDIAPASON-*Semiditone*, a compound concord in the proportion of 24 to 25.

DISEASE, in *Medicine*, that ſtate of a living body, wherein it is prevented the exerciſe of any of its functions, whether vital, natural, or animal. See *Acute* and *Chronic* DISEASE.

Or, *diſeaſe* is an indiſpoſition contrary to nature, whereby the action of ſome part is immediately injured.

Or, *diſeaſe* is a depraved and diſorderly ſtate of the ſolid, and fluid parts; whereby all, or ſome of the functions, either of the body, or mind, or both, are either aboliſhed, or impaired.

An ingenious author of a late Latin treatiſe, De Purgatione, holds the eſſence of a *diſeaſe* to conſiſt in a want of that equilibrium between the ſolid and fluid parts, which is neceſſary to the maintenance of health: others add, that all *diſeaſes* ariſe either from too lax, or too ſtrict a tenſion of the fibres.

Of all animals, man is ſubject to the moſt *diſeaſes*; and of men, the ſtudious and ſpeculative are moſt expoſed thereto. Other animals have their *diſeaſes*; but they are in ſmall number: nor are plants without them; though their maladies ſcarce exceed half a ſcore. The ancients deified their *diſeaſes*: Voſſius De Idolol. lib. viii. cap. 5. Some *diſeaſes* only impair the uſe of the part immediately affected; as the ophthalmia, gout, &c. Others deſtroy it entirely; as the *gutta ſerena*, palſy, &c. Some affect the whole body; as the fever, apoplexy, epilepſy, &c. Others only impair a part; as the aſthma, colic, dropſy, &c. Some only affect the body; as the gout: others diſturb the mind; as melancholy, delirium, &c. Laſtly, others affect both the body and mind; as the mania, phrenſy, &c.

The colder the country, in general, the fewer and the leſs violent are the *diſeaſes*. Scheffer tells us, that the Laplanders know no ſuch thing as the plague, or fevers of the burning kind, nor are ſubject to half the diſtempers we are. They are robuſt and ſtrong, and live to eighty, ninety, and many of them to more than a hundred years; and, at this great age, they are not feeble and decrepid, as with us, but a man of ninety is able to work or travel as well as a man of ſixty with us. They are ſubject, however, to ſome *diſeaſes* more than other nations: thus they have often diſtempers of the eyes, which is owing to their living in ſmoke, or being blinded by the ſnow. Pleuriſies and inflammations of the lungs are alſo very frequent among them; and the ſmall-pox often rages with great violence. They have one general remedy againſt theſe, and all other internal *diſeaſes*: this is the root of that ſort of moſs, as Scheffer expreſſes it, which they call *jerth*. They make a decoction of this root in the whey of rein-deer milk, and drink very large doſes of it warm, to keep up a breathing ſweat; if they cannot get this, they uſe the ſtalks of angelica boiled in the ſame manner: they have not ſo great an opinion of this as of the other remedy; but the keeping in a ſweat, and drinking plentifully of diluting liquors, may go a great way in the cure of their *diſeaſes*, whether either the one, or the other of the drugs, have any virtue or not. They cure pleuriſies, by this method, in a very few days; and get ſo well through the ſmall-pox with it, that very few die of it.

It has been always obſerved, that people of particular places were peculiarly ſubject to particular *diſeaſes*, which are owing to their manner of living, or to the air, and effluvia of the earth and waters. Hoffman has made ſome curious obſervations on *diſeaſes* of this kind. He obſerves, that ſwellings of the throat have always been common to the inhabitants of mountainous countries: and the old Roman authors ſay, Who wonders at a ſwelled throat in the Alps? The people of Swiſſerland, Carynthia, Styria, the Hartz foreſt, Tranſylvania, and the inhabitants of Cronſtadt, he obſerves, are all ſubject to this *diſeaſe* from the ſame cauſe. See BRONCHOCELE.

The French are peculiarly troubled with fevers, with worms, and with hydroceles and ſarcoceles; and all theſe diſorders ſeem to be owing originally to their eating very large quantities of cheſnuts. The people of our own nation are peculiarly afflicted with hoarſeneſſes, catarrhs, coughs, dyſenteries, conſumptions, and the ſcurvy: and the women with the *fluor albus*, or whites; and children, with a *diſeaſe* ſcarce known elſewhere, which we call the rickets. In different parts of Italy, different *diſeaſes* reign. At Naples, the venereal *diſeaſe* is more common than in any other part of the world. At Venice, people are peculiarly ſubject to the bleeding piles. At Rome, tertian agues and lethargic diſtempers are moſt common. In Tuſcany, the epilepſy, or falling ſickneſs. And in Apulia they are moſt ſubject to burning fevers, pleuriſies, and to that ſort of madneſs which is attributed to the bite of the TARANTULA, and which, it is ſaid, is only to be cured by muſic.

In Spain, apoplexies are common, as alſo melancholy, hypochondriacal complaints, and bleeding piles. The Dutch are peculiarly ſubject to the ſcurvy, and to the ſtone in the kidneys. Denmark, Norway, Sweden, Pomerania, and Livonia, are all terribly afflicted with the ſcurvy: and it is remarkable, that in Denmark, Sweden, and Norway, fevers are very common; but in Iceland, Lapland, and Finland, there is ſcarce ever ſuch a *diſeaſe* met with; though peripneumonies are very common in theſe places, as alſo *diſeaſes* of the eyes and violent pains of the head. The Ruſſians and Tartars are afflicted with ulcers, made by the cold, of the nature of what

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we call chilblains, but greatly worſe; and in Poland and Lithuania there reigns a peculiar *diſeaſe*, called the *plica polonica*, ſo terribly painful and offenſive, that ſcarce any thing can be thought of worſe.

The people of Hungary are very ſubject to the gout and rheumatiſm: they are more infeſted alſo with lice and fleas than any other people in the world, and they have a peculiar *diſeaſe* which they call *cremor*.

The Germans, in different parts of the empire, are ſubject to different reigning *diſeaſes*. In Weſtphalia, they are peculiarly troubled with peripneumonies and the itch. In Sileſia, Franconia, Auſtria, and other places thereabout, they are very liable to fevers of the burning kind, to bleedings at the noſe, and other hæmorrhages; and to the gout, inflammations, and conſumptions. In Miſnia they have purple fevers; and the children are peculiarly infeſted with worms. In Greece, Macedonia, and Thrace, there are very few *diſeaſes*; but what they have, are principally burning fevers and phrenſies. At Conſtantinople the plague always rages; and in the Weſt Indian iſlands, malignant fevers, and the moſt terrible colics. Theſe *diſeaſes* are called endemic.

As the actions, or conditions of the body, ſo alſo the *diſeaſes*, or defects thereof, may be reduced to three general heads; viz. 1. *Diſeaſes* of the ſolid parts. 2. Thoſe of the fluid parts. And, 3. *Diſeaſes* compounded of both.

A popular ſyllabus of *diſeaſes* may be given, as follows: the ſolid parts, i. e. the bones, and fleſh, may be diſordered five ways; viz. they may be rendered turgid by tumours; cut with wounds; corroded by ulcers, or carieſes; removed out of their place, as in hernias, prolapſuſes, and diſlocations; or diſcontinued by fractures, and contuſions.

Diſeaſes of the fluids are either in the maſs of the blood, or the ſpirits: thoſe of the blood are reducible to two kinds; thoſe that thicken, and inſpiſſate, or, which amounts to the ſame, retard its motion; and thoſe which attenuate, and diſſolve, and of conſequence accelerate it. To this latter kind belong fevers, and feveriſh affections alone: all the other *diſeaſes* of the blood belong to the former.

In too thick a ſtate of the blood, its principles are too craſs, and its molecules too big; whence a lentor, lazy motion, and even ſtoppage, particularly in the ſinous paſſages of the glands; and hence obſtructions, inflammations, ſchirrhuſes, ſarcomas, verrucæ, puſtules, œdemata, impetigines, and other tumours, and congeſtions, both in the viſcera, and habit of the body: and hence, again, drowſineſs, melancholy, hypochondriacal affections, &c. If this thick blood be too much replete with ſharp acid ſalts, it will deſtroy the texture of the parts, and break out in ulcers; as in phthiſical, ſcrophulous, ſcorbutic, and venereal *diſeaſes*, gangrenes, carboes, cancers, and other eroſive tumours, according to the quality and degree of ſaltneſs and acrimony; and from the ſame ſource ariſe cephalalgias, cardialgias, colics, gouts, rheumatiſms, pleuriſies, &c. which, by abrading the ſolid ſubſtance, frequently emaciate the body.

The *diſeaſes* of the animal ſpirits ariſe either, 1. From an intermiſſion, or retardation of their motion; or a diminution of their quantity: or, 2. From a diſorder in their craſis, or quality.

To the firſt claſs are reduced the catalepſis, apoplexy, coma, carus, palſy, ſtupor, tremor, &c. To the ſecond belong the mania, phrenſy, delirium, fooliſhneſs, melancholy, vertigo, ſpaſms, epilepſy, hyſteric affections, horror, &c. Add, that, as all *diſeaſes* of the blood ariſe from external cauſes, viz. ſome one, or more, of the non-naturals, as food, air, evacuation, &c. ſo thoſe of the ſpirits generally proceed from diſorders of the blood.

Laſtly, the *diſeaſes* of the fluids, whether thoſe in the blood, or ſpirits, are ſeldom confined long thereto; but they preſently come to diſturb and impede ſome of the functions of the ſolid parts; and, at laſt, corrupt the ſubſtance of the ſolids themſelves. Hence compound, or complicated *diſeaſes*, which are infinitely various.

The learned Boerhaave furniſhes us a much more accurate and ſcientifical diviſion of *diſeaſes*, into thoſe of the ſolids and fluids.

DISEASES *of the ſolids* he conſiders, either as of the ſimple and ſimilar parts, or of the organical.

DISEASES, *Similar*, are, 1. Thoſe of the laſt and ſmalleſt fibres; which are reducible to too great tenſion, and laxneſs, too great ſtrength, or weakneſs, and a ſolution of their continuity.

2. Thoſe of the membranes, which, being only aſſemblages of the fibres juſt mentioned, are ſubject to the ſame diſorders.

3. Thoſe of the laſt and ſmalleſt canals, which are formed of ſuch membranes.

4. Of the membranes compoſed of ſuch canals.

5. Of canals, compoſed of ſuch membranes, which are all the greater veſſels of the body.

6. Of the ſolid parts, which are compoſed of canals, compreſſed and grown together, ſo as to be void of humour to diſtend them; or canals growing into one conſiſtent part, the humour hardening together with the veſſel that contained it.

Laſtly, Suppoſing theſe parts all ſound, *diſeaſes* may befal them, with reſpect to their ſtructure, from a vice, or vicious application, of the matter of nutrition.

DISEASES, *Organical*. An organical part, conſiſting of the ſeveral ſimple parts above mentioned, and fitted to perform any office, by means of ſome humour contained in it, may be conſidered, either in itſelf, as a ſolid part, or with reſpect to the humour it contains. In the firſt view, *organical diſeaſes* are reducible to four claſſes.

1. Diſorders in the figure, and the circumſtances thereof; as roughneſs, ſolidity, cavity, &c. To this belong the *αναστομωσις*, when one veſſel opens into another; the *διαπλησις*, when a rupture is made; *διαιρεσις*, when a breach is occaſioned by corroſion; the *εμφραξις*, which is a total obſtruction of the cavity, by a viſcous, grumous matter; the *στενοχωρια*, or narrowneſs of the paſſage; the *θλιψις*, or compreſſion of the ſides of the cavity; *συμφυσις*, when the ſides are quite joined; and *συνιζησις*, when the veſſel is ſo emptied, that, the ſides falling together, the cavity is loſt. See DIAPEDESIS, DIÆRESIS, &c.

2. In the number, where it is either deficient or redundant: but the parts ſeldom err in this reſpect, ſo as to occaſion a *diſeaſe*.

3. In magnitude, to which belong nodes, exoſtoſes, and and calluſes.

4. In the ſituation, and connexion; as, when the ligaments are too long, or too ſhort, when broken, or depraved; alſo, diſtortions, luxations, ſubluxations, herniæ, or ruptures in the groin, ſcrotum, bladder; procidentiæ of the womb, bladder, and rectum; diſorders of the tendons, and muſcles, particularly their flying out of their places; the relaxation, or rupture of the membranous ligament that ſhould retain them.

Laſtly, There is a *diſeaſe*, common both to ſimilar and organical parts, called ſolution of continuity.

DISEASES *of the fluids*, conſidering thoſe fluids ſimply, and in themſelves, may be reduced to diſorders in reſpect of quantity and quality: but conſidering them as contained in ſolids, they may err, too, in place and proportion.

As to the firſt, ſuch an abundance of the humours as diſturbs the animal functions, is called a plethora: as to *diſeaſes* from the defect of humours, we ſcarce know of any.

As to the ſecond, ſuch quality of the humours as diſturbs the animal functions, is called cacochymia. Now, this is either in the fluids, conſidered in themſelves, their own parts, and compoſition; or conſidered as they concur towards conſtituting ſome part of the body.

If the morbid quality be conſidered in the particles of the humour, it muſt either conſiſt in an augmentation of bulk, whence the emphraxis, atrophy, ſymphyſis, and ſynyzeſis; or in the diminution thereof, as in the diapnæ, and ceneangeia; or an increaſe of ſolidity, whence too great an attenuation; or a decay thereof, whence a lentor, ſtagnation, and coheſion; or in the figure, as when of ſpherical it becomes angular, and conſequently, with reſpect to the part it is applied to, ſharp; whence acrimonies, both acid, alkaline, muriatic, ammoniac, ſaponaceous, vitriolic, &c. and oleoſities; or in rigidity, and flexibility; or in elaſticity; or in coheſion, and diviſibility. See ATROPHY, &c.

Again, all the juices being conſidered together, the principal diſorders they are ſubject to, are, too great fluidity, or tenacity; or too much velocity in their veſſels, or too little.

Laſtly, conſidering the fluids as contained in the ſolids, there ariſe divers *diſeaſes*, merely from their changing of place: theſe may be reduced to two claſſes, viz. the groſſer humours, intruding themſelves into the finer canals; and the humours, extravaſating, or getting out among the ſolid parts; whence inflammations, aneuryſms, varices, enchymoſes, œdemas, puſtules, dropſy, ſpongious ſwellings of the head, breaſt, abdomen, and uterus; and emphyſemas.

Add, that the humours collected, and ſtagnating among the parts, grow putrid, purulent, ichorous, eroſive, and ſharp; and thus deſtroy the tender ſtamina, or ſolids; whence ſinuſes, fiſtulas, ulcers, gangrenes, ſphaceluſes, cancers, and the like.

Theſe are the prime differences of the *diſeaſes* of the body; and from theſe ariſe moſt of the reſt; ſo that they may be regarded, not only as *diſeaſes*, but as the cauſes of *diſeaſes*. See each farther explained under its reſpective article in this work.

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There is alſo another diviſion of *diſeaſes*, in uſe among phyſicians, taken from certain external accidents, which are common to a great many different *diſeaſes*; which diſtinction, too, has its uſe, though they generally run it too far. *Diſeaſes* are by this diſtinguiſhed, 1. With reſpect to their cauſe, into idiopathy, ſympathy, protopathy, deuteropathy, hereditary, connate, and acquired. 2. With reſpect to their ſubject, into *diſeaſes* of old age, children, adults, men, women, maids, pregnant, parturient; and into endemical, epidemical, &c. 3. With reſpect to ſeaſons, into vernal, autumnal, continued, and intermitting. 4. With reſpect to their effects, into benign, malignant, curable, incurable, mortal, and contagious. 5. With reſpect to their ſtate, into beginning, progreſs, ſtate, declenſion, and end. And laſtly, With reſpect to duration, into moſt acute, which terminate in four days; acute, in twenty; and chronical, which are all thoſe of longer continuance.

DISEASE, *Acute*, is that which terminates, or comes to its period, in a few days; or, as the phyſicians expreſs it, *cito & cum periculo terminatur*.

In this ſenſe, the word ſtands oppoſed to *chronical*. All *diſeaſes* which hold above forty days, are reputed chronical.

Dr. Quincy thinks an *acute diſeaſe* may be defined, that which is attended with an increaſed velocity of blood.

Acute diſeaſes are the more dangerous, in that, beſide the violence of the ſymptoms, if there be not time to empty the *primæ viæ*, it is very difficult to ſtop their progreſs, and ſave the patient.

Acute diſeaſes are uſually divided into thoſe ſimply called *acute*; and thoſe which, by reaſon of the vehemence of the ſymptoms, are called *moſt acute*.

DISEASES, *Chronic*, ſtand in oppoſition to acute *diſeaſes*, which are ſpeedy, and haſten to a criſis; as fevers, ſmall-pox, &c.

Chronic diſeaſes are uſually owing either to ſome natural defect in the conſtitution, or to an irregular manner of living; and evacuation of one kind or another, is nine parts in ten of their remedy, according to Dr. Cheyne.

The ſources of chronical diſtempers, ſays the ſame author, are, 1. Viſcidity in the juices, or the over-largeneſs of their conſtituent particles; which not being ſufficiently broken by the concoctive powers, ſtop, or retard the circulation. Or, 2. Too great abundance of ſharp acrimonious ſalts; whereby the juices themſelves are rendered ſo corroſive, as to burſt or wear out the ſolids. Or, 3. A relaxation, or want of due force and ſpringineſs of the ſolids themſelves.

An exceſs in the quantity of our meat and drinks begets the firſt; the bad condition of the ſame foods, the ſecond; and both together, with want of due exerciſe, the third.

Several authors have given us very compendious theories of *diſeaſes*; reducing them all to ſome one general diſaffection. Bontekoe deduces all the *diſeaſes* of the human frame from the ſcorbutus; Muſgrave, from the arthritis; Dr. Woodward, from the bile. Others imagine all *diſeaſes* the effects of a virus, which has lurked in the ſeed ever ſince the ſin of Adam: Helmont, and Serenus the Dane, take them to depend on ſome extraneous ferment, formed in or out of us. Laſtly, it appearing from the obſervations of Pliny, Kercher, Langius, and Bonomo, that there are little worms in feveriſh blood, puſtules, carboes, and the itch, divers phyſicians have taken occaſion to ſuſpect, that all *diſeaſes* ariſe from inſects.

DISEASES *of ſoldiers*. See DIET, and SOLDIERS.

DISEASES, *Feigned*. The cheat of feigning *diſeaſes*, for idleneſs, or profit ſake, or for other occaſional purpoſes, has been too common in all ages, and is too difficult to be diſcovered in all caſes; though, in many, there are ways of coming at the truth. We have had a very late inſtance of a young lady, who puzzled ſeveral of our beſt phyſicians, to account for the nature of a *diſeaſe*, which ſhowed itſelf in a ſingular kind of excoriations; and the ſecret perhaps had never been diſcovered, had not a bottle of *aqua fortis* been accidentally found in her chamber; the touching the arms, &c. with which, had occaſioned all the appearances, which ſome ſtrange fault in the juices had been before accuſed of.

Diſſimulation in regard to *diſeaſes*, may be reduced to three kinds. In the firſt, the ſickneſs is pretended by words only, and really is not: of this nature are the pretended head-ach, colic, and the like; which, as the patient can only know, the phyſician may always be deceived. In the ſecond, there are not only words for teſtimonies of the ſickneſs, but there appear ſigns and marks of it on the body, which yet are only counterfeited to ſerve certain purpoſes. Scabbineſs, leproſy, and even the exulceration of the lungs may be thus counterfeited; the laſt by a pretended ſpitting of blood. Gravidation is often pretended alſo. Our beggars often contrive the means of theſe to excite compaſſion. In the third kind of diſſimulation of *diſeaſes*, we are to include the concealing a *diſeaſe*, which really exiſts, inſtead of the owning one which does not.

In the diſcovery of theſe deceits, on which the credit of the phyſician often depends, it is not mere medical knowlege that will ſucceed, but there muſt be added to it a ſagacity in exploring all circumſtances and outward accidents, and eſpecially thoſe things which relate to the genius, temper, and ſtate of the perſon ſuſpected. The DÆMONIACS of former ages, exorciſed by prieſts who wanted to propagate the credit of their religion, or their own ſanctity, have generally been cheats of this kind, and might have been diſcovered by any who had talents and opportunities for the proper examinations. Sylvaticus, an Italian author, has given an excellent ſet of rules for the diſcovery of theſe frauds, and all others of pretended ſickneſſes, to which we refer the curious reader.

DISEASES *of infants*. See INFANTS.

DISEASES, *Peſtilential* or *epidemic*. Many think that the cauſe of all theſe is in the air, and is exhaled in vapours through the pores of the earth.

It is generally obſerved, that *peſtilential diſeaſes* ſeize firſt the cattle; which is not wonderful, ſince they naturally carry their noſes near the ground, and ſuck in the vapours as they riſe, or feed on the herbage that is infected by them. It often happens, that the vapours do not riſe ſo high as to affect men at all; but though in this caſe the plague would be naturally confined to the cattle alone, yet it gets among men by means of the food eaten by them, and before tainted with the contagion.

There is no doubt but that the fleſh of animals that die of *diſeaſes*, partakes ſomewhat of the nature of theſe *diſeaſes*; and when they are peſtilential, may ſpread a peſtilence among us, which, perhaps, would otherwiſe never have reached us.

The plague once begun, frequently joins itſelf with ſuch other *diſeaſes* as the people it attacks are moſt ſubject to; hence, in the northern nations, where the ſcurvy is frequent, it is often ſeen that the plague and ſcurvy appear mixed. Theſe two *diſeaſes*, in their nature, ſomewhat agreeing, make each other the worſe and more violent; but, on the contrary, there are other *diſeaſes*, depending on ſuch contrary cauſes, that the plague, if the patient ſurvives, proves a cure to them.

Dr. Hodges inſtances the conſumption, and the king's evil, as two *diſeaſes* of this kind; which, though in themſelves of the moſt terrible kind, and when in an advanced ſtage uſually baffling all remedies, yet he ſaw perſons in the plague that laſt raged in London, cured of both by the plague; the ſymptoms of the *diſeaſe* appearing more mild in theſe than in other caſes, and the patients at once recovering of both complaints.

He alſo tells us of ſome people terribly afflicted with the gout for many years, who being at that time affected by the contagion, had the plague with leſs violent ſymptoms than others; and were, on its going off, cured of the gout alſo.

A fever is uſually a concomitant ſymptom of the plague, but it is not an inſeparable ſign of it. A palpitation of the heart is another of the uſual, but not conſtant ſymptoms; where this comes on, it is uſually very violent, and often is ſo loud, that it may be heard at a conſiderable diſtance.

The plague is leſs contagious than is uſually ſuppoſed, and thoſe who eſcape the terror of it, often eſcape it wholly. Hodges gives us an inſtance of a poor woman who had the plague ſoon after her delivery, and ſuckled her young child as ſhe lay ill of it. She had a carbuncle on her breaſt, near the nipple which the child ſucked at, and yet the mother recovered, and the child never caught the infection at all; though this ſeemed a circumſtance under which there could be no eſcaping.

Hodges, treating of the prognoſtics of an imminent plague, tells us, that one very remarkable one is the change of chronic diſtempers in general into acute ones, and thoſe attended with very violent ſymptoms; and a murrain among the cattle happening at the ſame time, form together a prognoſtic not eaſily to be got over, without the terrible ſequel of a general peſtilence.

If the plague is very terrible at its firſt appearance, it never is of long duration; and on the contrary, when it comes, from a ſcarce perceptible beginning, more and more violent, it is generally of a long continuance. What time it takes from the beginning to the height, the ſame it takes from the height to the final period.

The moſt fatal ſymptoms in the laſt plague in London, and which uſually preſaged death very near, were hæmorrhages from the noſe or ears, fluxes of the menſtrua in women, diarrhœas, dyſenteries, and greenneſs and blackneſs of the excrements.

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The firſt ſweats coming on without giving eaſe, and long nauſeouſneſs continuing afterwards, are alſo terrible ſymptoms. The pulſe and urine, which are the two great things to judge by in moſt illneſſes, in theſe preſage nothing at all. The pulſe is fallacious in the higheſt degree; and the urine often appears as well in the height of the plague, as while the perſon was in health.

Among the ſeveral preſervatives for particular places, the two beſt are the burning ſweet-ſcented woods in the time, and ſome of the reſins, ſuch as frankincenſe and the like; the other is the firing a number of cannon every morning and evening. Hodges de Peſt. See EPIDEMIC, and PLAGUE.

DISEASES *of Plants.* M. Tournefort, in an expreſs diſſertation on this ſubject, in the Memoires de l'Academie des Sciences, refers all the *diſeaſes* of plants to the following cauſes:

1. The too great abundance of the nutritious juice. 2. The defect, or want of this juice. 3. Some ill qualities it acquires. 4. Its unequal diſtribution in different parts of the plant. And, 5. External accidents.

The *diſeaſes*, principally obſerved by our gardeners, are,

1. Barrenneſs, when the tree, though ſeeming freſh and healthy, bears no bloſſoms; or, if it does, they ſoon fall; or, if they ſet, the fruit drops before it comes to maturity.

2. Blaſting of the buds, occaſioned by a froſt happening when the leaves and bloſſoms are wet; by this means the pores are ſhut, and the vital juices ſuffocated; when, if the ſun break out on a ſudden, they turn yellow, with round fiery ſpecks growing on them; whence frequently proceed tumours, like warts, which, rotting, grow full of maggots. Mr. Mortimer adds, that the want of rain in bloſſoming-time often occaſions the dropping off of the bloſſoms, for want of ſap; he, therefore, recommends the watering them.

3. Conſumption, proceeding from a want of ſuſtenance, through the failure of the nouriſhing juices, or from obſtructions of the veins and roots; or ill digeſtion, and ſecretion of humours, &c.

4. The moſs; an account of which ſee under the article Moss.

5. The jaundice, which, though it does not hinder the tree from appearing ſound, yet, when it begins to ſprout, the leaves become of a whitiſh green, and, as they grow bigger, turn yellow: this frequently ariſes from external cauſes, as the mildew; but, chiefly, from a ſtony or chalky ſoil, impregnated with an acid ſalt.

6. Mildew, a kind of epidemical *diſeaſe*, moſt frequent and fatal in the ſpring ſeaſon: it is properly a corroſive and nipping dew, proceeding from pent up vapours now exhaled, and returned back on the tender opening buds, which infects them by its acrimony, and obſtructs the circulation of the nutritive juices; by which means the leaves begin to fade and wither, and both the bloſſoms and fruit are much prejudiced.

7. A thick fog, or too abundant dew, Agricola aſſures us, occaſions the ſame *diſeaſes* as the mildew, only in a leſs degree.

8. Falling of the leaves; which happens when the trees, ſprouting too ſoon, are either ſurpriſed by exceſſive heat, or violent cold.

9. Uredo, or ſcorching: of which there are two kinds; the firſt happening upon the fall of a ſubtil dew, or ſmall rain, immediately followed by the piercing beams of the ſun, which ſuddenly cloſes the pores, before dilated, and burns up the leaves: the ſecond happening from the like fervour in the internal parts of the tree, viz. in the pith, occaſioned by ſome inward failing: Agricola imputes it to the fault of the gardeners, who, in tranſplanting trees, frequently cut off the leſſer filaments and roots, as alſo the greater roots, without covering the wounds with wax, or the like.

10. Scurf, or leproſy; a *diſeaſe* chiefly of the bark, cauſed by a too great dilatation of the pores, whereby too much perſpirable matter tranſuding, it hangs and hardens on the bark, which, by this means, chaps and cracks; and thus a ſort of lepra is formed, perſpiration is obſtructed, &c. Add, that this ſcurfy ſkin proves a harbour for vermin, which live both on the bark and tree.

11. The worm, a little animal, generated in the corrupted ſubſtance of the bark, bloſſoms, fruit-leaves, pith, and roots. M. Gentle mentions another kind, called cockchaffers, which ſtick to the roots of young tender trees, and bark, and kill them. There is a third ſort, called breezes, or gad-flies, which gnaw the bark. The worm is a very frequent *diſeaſe*, whereby young hopeful trees are, all of a ſudden, brought to languiſh and decay.

12. Rotten roots, occaſioned chiefly by their being planted too deep. This *diſeaſe* is incurable.

13. Blights; a particular account whereof, ſee under the article BLIGHT.

Some diſorders ariſe in the tree itſelf, and others in the ſoil and other things about it. Of the laſt kind are weeds, which are of the utmoſt ill conſequence to all ſorts of trees while young, and ſhould be pulled up by hand after rain: if they are too ſtrong rooted for this, they muſt be dug up; and this will have a double advantage, as the ſtirring the earth about their roots will do the trees very great good. When the trees are grown to any tolerable height, they require no care about weeds, for they kill them with their own droppings. Suckers are another diſtemperature of trees ariſing from the tree itſelf: they muſt be pulled off, or cut up cloſe to the place where they come out, opening the earth to come at them there. Over-much wet often is a very great prejudice to trees, and eſpecially to thoſe kinds which naturally love a dry ſoil. This is to be remedied by cutting drains: and if a drip fret the body of the tree by the head (which will certainly decay it), the place muſt be firſt cut ſmooth, and then ſome loam or clay, mixed well with horſe-dung, is to be applied to the place, which will defend it from miſchief till a new bark is formed over it. All wounds made in trees in winter are much harder to cure than thoſe made in ſummer; and for theſe it is proper to add ſome tallow to the mixture of loam and dung.

When trees are bark-bound, which is eaſily ſeen by the unnatural tightneſs and ſtraining of the bark over them, it is to be remedied by cutting through the bark with a knife from the top to the bottom of the tree. This may ſeem a dangerous remedy to thoſe who have not experienced it, but it never was found to do any injury to trees. It is to be done in February or March; and if the wound gape very much, it may be filled up with cow-dung, which will defend the tree from injury till it heals. The digging about the root of the tree is a very good practice alſo on this occaſion, and the cutting off the dead or withered branches.

The grubs of beetles called teredines and coſſi, which get between the bark and the tree, do great miſchief: if the places can be found out where they lie, it is proper to pierce into the bark with a pointed inſtrument upon them, and then to open a ſmall hole below to let out whatever moiſture may be there. When trees of the fruit kind are burnt up and bliſtered on the bark with hot and dry ſeaſons, and this is followed by a vaſt number of the pucerons or tree-lice, which feed on the juices, ſome recommend the boring a large hole in the main root, and pouring in ſome brandy, then ſtopping up the hole with a pin of the ſame wood. The tree ſuffers nothing by this, but the juices are ſo much altered for the preſent by it, that theſe animals do not like them, and conſequently quit their habitation. See PUCERON.

If a tree is by any accident barked or ſtripped all round, ſo that it cannot grow any longer, the proper method is to cut it off juſt above ſome principal branch; the ſtump muſt be cut off ſlanting and covered with clay, and the branch will ſoon become the body of a tree in the place of the other: the place where the ſtump is cut off being covered with a bark in the manner of a tree that is grafted.

Deer and hare, as alſo rabbits, are apt to bark trees, and do them great miſchief. The defences againſt deer are by paling them round, or painting the lower part of the tree, but the firſt is much the better method. The hares and rabbits may be kept off by tying bands of ſtraw round the foot of every tree as far as they can reach. Evelyn recommends the rubbing them over with human dung made into a ſoft paſte with urine, ſo that it may be laid on with a bruſh; but this is attended with great trouble, as it muſt be renewed after every hard rain. Some uſe tar and lime mixed together, but this always damages the tree more than theſe creatures would have done; and in general ſtraw-bands, where any thing is neceſſary, do beſt.

DISEMBARK, ſignifies to land goods from on ſhip-board.

DISEMBOGUE. When a ſhip paſſes out of the mouth of ſome great gulf, or bay, they call it *diſemboguing*. They ſay, alſo, of a river, that at ſuch a place, or after it has run ſo many leagues, it *diſembogues* itſelf into the ſea.

DIS-ERGOT, in the *Manege*. See ERGOT.

DISFIGURING, in *Law*. See MAYHEM.

DISFRANCHISING, the taking away one's freedom, or privilege. See FRANCHISE.

DISGORGE, in the *Manege*, is uſed for diſcuſſing or diſperſing an inflammation or ſwelling: thus, if a horſe's legs are gorged or ſwelled, we ſay he muſt be walked out to *diſgorge* them.

DISGUISE. Perſons doing unlawful acts in *diſguiſe*, are by our ſtatutes ſometimes ſubjected to great penalties, and even declared felons. Thus perſons convicted of hunting in *diſguiſe* in foreſts, parks, or warrens, or of unlawful hunting in the night, are to ſuffer as felons.

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But the principal act of parliament in this reſpect is that commonly called the BLACK *act*.

DISH, in *Mining*, is a trough made of wood, about twenty-eight inches long, four inches deep, and ſix inches wide; by which all miners meaſure their ore. If any be taken ſelling their ore, not firſt meaſuring it by the barmaſter's *diſh*, and paying the king's duties, the ſeller forfeits his ore, and the buyer forfeits for every ſuch offence forty ſhillings to the lord of the field, or farmer.

DISHERISON, an old word, of the ſame import as diſinheriting.—Our lord the king, conſidering his own damage, and *diſheriſon* of the crown, &c. Stat. 8 Richard II. Henry IV.

DISHERITOR, a perſon who diſherits, or puts another out of his inheritance.—The ſheriff ſhall, forthwith, be puniſhed as a *diſheritor* of our lord the king, and his crown. Stat. 3 Edw. I.

DISJUNCT *Proportion*. See DISCRETE *Proportion*.

DISJUNCTIVE, ſomething that ſeparates, or disjoins.

Thus, *or*, *neither*, &c. are called *disjunctive* CONJUNCTIONS; which, in connecting a diſcourſe, do yet ſeparate the parts thereof. E. gr. *Aut Cæſar*, *aut nullus*; *either Cæſar*, *or nothing*. He *neither* advanced, *nor* gave back.

Disjunctive conjunctions may alſo be called *partitive*, *diſtributive*, and *alternative*.

DISJUNCTIVE *propoſitions*, in *Logic*, are compound propoſitions, conſiſting of two members, or parts, connected by a *disjunctive* conjunction.

The firſt propoſition of a dilemma is uſually a *disjunctive* propoſition:

You muſt either obey the king, or be a rebel.
But you muſt not be a rebel.
Therefore you muſt obey the king.

DISK. See DISC, and DISCUS.

DISLOCATION, the putting a bone out of joint, by ſome violence, uſually called by the phyſicians, *luxation*. See LUXATION.

We have an inſtrument of Mr. Freke's invention for the reduction of *diſlocated* ſhoulders, deſcribed in the Philoſophical Tranſactions, N° 470.

DISMASTED, in *Sea Language*, denotes the ſtate of a ſhip, when ſhe has loſt her maſts by engagement or bad weather.

DISMEMBERED, in *Heraldry*, is applied to birds that have neither feet nor legs; as alſo to lions, and other animals, whoſe members are ſeparated. See MEMBERED.

DISMES, *Decimæ*, in our *Law Books*, tithes. See TITHE.

DISMISSION *of a bill*, in *Chancery*. If the plaintiff does not attend on the day fixed for the hearing, his bill is *diſmiſſed* with coſts. It may be alſo *diſmiſſed* for want of proſecution, which is in the nature of a NON-SUIT at law, if he ſuffers three terms to elapſe without moving forward in the cauſe.

DISMOUNTING, in the *Military Art*, the act of unhorſing. Thus, to *diſmount* the cavalry, the dragoons, or the like, is to make them alight.

To DISMOUNT *the cannon*, is to break their carriages, wheels, and axletrees, ſo as to render them unfit for ſervice.

Horſes are alſo *diſmounted* when they are rendered unfit for ſervice.

DISORDERLY *Houſes*. See NUSANCE.

DISORDERLY *Perſons*. See VAGABONDS.

DISORIENTATED, from *dis*, and *oriens*, *eaſt*, a term applied to a thing that is turned, or removed from the eaſt, to which it was originally directed.

But the word is moſt frequently uſed in a figurative ſenſe, for the diſconcerting, or putting a man out of his way or element. Speak of law to a phyſician, or of phyſic to a lawyer, and they will both be *diſorientated*.

Andrew Marvel uſes the word *diſoccidentated*, inſtead of *diſorientated*: Geneva had *diſoccidentated* our geographer.

DISPARAGEMENT, in *Law*, is uſed for the matching an heir, &c. in marriage, below his or her degree or condition; or againſt the rules of decency.

The word is a compound of the privative particle *dis*, and *par*, *equal*.

DISPART, in *Gunnery*, is uſed for ſetting a mark on the muzzle-ring of a piece of ordnance; ſo that a ſight-line taken upon the top of the baſe ring againſt the touch-hole, by the mark ſet on or near the muzzle, may be parallel to the axis of the concave cylinder. The common way of doing which, is, to take the two diameters of the baſe ring, and of the place where the *diſpart* is to ſtand, and divide the difference between them into two equal parts, one of which will be the length of the *diſpart*, which is ſet on the gun with wax or pitch, or faſtened there with a piece of twine or marlin: but an inſtrument may be made to do it to all poſſible nicety. See *Line of* DIRECTION.

DISPART *Frontlet*. See FRONTLET.

DISPATCH, a letter on ſome affair of ſtate, or other buſineſs of importance, ſent with care and expedition, by a courier expreſs.

The buſineſs of *diſpatches* lies on the ſecretaries of ſtate, and their clerks. The king gives directions to his miniſters abroad by *diſpatches*.

The word is alſo uſed for the packet, or mail, containing ſuch letters.

The French, during the reign of Lewis XIV. had a *conſeil des depêches*, *council of diſpatches*, held in the king's preſence, at which the dauphin, the duke of Orleans, the chancellor, and four ſecretaries of ſtate, aſſiſted.

DISPAUPER. When any perſon, by reaſon of his poverty, is admitted to ſue in FORMA *pauperis*; if afterwards, before the ſuit be ended, the ſame party have any land or perſonal eſtate fall to him, or that the court, wherein his ſuit is depending, think fit for that, or ſome other reaſon, to take away the privilege from him, he is then ſaid to be *diſpaupered*.

DISPENSARY, or DISPENSATORY, a name given to divers collections of recipes for compound medicines, wherein are ſpecified the ingredients, proportions, and circumſtances, of the preparation and mixture; the ſame with what we otherwiſe call a *pharmacopœia*, or *antidotary*. Such are the *Diſpenſaries* of Meſue, Cordus, that of the College of Phyſicians at London, and Edinburgh, Quincy, &c.

The apothecaries, in and about London, are obliged to make up their compound medicines according to the formulas preſcribed in the College *Diſpenſary*, and are enjoined to keep always ready in their ſhops, all the medicines there enumerated.

DISPENSARY is likewiſe uſed for a magazine or office of medicines, kept ready to be *diſpenſed* at the prime coſt of the ingredients, for the benefit of the ſick poor.

Of which kind we have had two or three in London, maintained by the college of phyſicians; one at the college itſelf, firſt begun in the year 1696; another in St. Peter's ally, Cornhill; and a third near Covent-garden: where the beſt medicines were ſold for their intrinſic value, and patients were adviſed every day, but Sunday, at one of the three places. There are at this time ſeveral ſupported by voluntary contribution.

DISPENSATION, in *Law*, *&c.* a permiſſion to do ſomething contrary to the ſtanding laws; or a relaxation, or ſuſpenſion of a law, on ſome juſt occaſion.

Some confound *diſpenſation* with equity; but they are very different things; for equity is only the correction, or modification, of a law which is too general; but a *diſpenſation* ſuſpends the obligation of the law itſelf, and can, therefore, be only given by the legiſlative power.

The king of France grants *diſpenſations* of age to ſome officers, to be admitted before the legal age: but the greateſt dealer in *diſpenſations* is the pope, who claims the office, *jure divino*, and extends it to every thing: indeed, the more ſober of the Romaniſts themſelves deny, that he can give a *diſpenſation* for a thing contrary either to the divine law, or the law of nature, and confine him to what is contrary to poſitive laws, as to things relating to faſts, marriages, holding ſeveral benefices, &c. And even in theſe things they ſet bounds: thus, ſay they, a *diſpenſation* in the firſt degree of affinity, as that of father and daughter, brother and ſiſter, would be abuſive and null. But it is certain the papal ſee does not apprehend itſelf under any ſuch ſevere reſtrictions.

The right of giving *diſpenſations* they thus prove. It is certain the church has power to make laws; a power which the apoſtles themſelves exerciſed, and which their ſucceſſors have continued to exerciſe after them. Whoever can make a law, can annul it; and much more, can he diſpenſe with it in certain caſes: the church, then, may diſpenſe with the laws itſelf has made, and we find it to have done accordingly in all ages. See PREMUNIRE.

The archbiſhop of Canterbury has a power, by ſtat. 25 Hen. VIII. c. 21. of *diſpenſing* in any caſe, within the realm, wherein *diſpenſations*, not contrary to the law of God, were formerly granted by the ſee of Rome, as well to the king as to his ſubjects: but in extraordinary matters, or in a caſe that is new, the king and council are to be conſulted; and the *diſpenſation* muſt be confirmed under the broad ſeal: and during the vacancy of the archbiſhop's ſee, the guardian of the ſpiritualities may grant *diſpenſations*. Every biſhop, of common right, has the power of *diſpenſing* in common caſes.

DISPENSATIONS *for pluralities*. See CHAPLAIN.

DISPENSATION *of the king*, makes a thing prohibited lawful to be done by the perſon that has it, though a thing evil in itſelf will not admit of a *diſpenſation*. When an offence wrongs none but the king, or if the ſuit is only the king's for the breach of a penal law, that is not to the damage

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of a third perſon, the king may *diſpenſe:* but in caſe the ſuit is the king's, for the benefit of another, he cannot. It was formerly held that the king might in many caſes *diſpenſe* with penal ſtatutes, and the exerciſe of this *diſpenſing* power was one of the moſt ignominious badges of ſlavery and engines of tyranny, which ever diſgraced and harraſſed this country; but by 1 W. and M. ſtat. 2. c. 2. it is declared, that the ſuſpending or *diſpenſing* with laws by regal authority, without the conſent of parliament, is illegal: it is alſo a maxim in law, that it requires the ſame ſtrength to diſſolve, as to create an obligation. See Blackſt. Com. vol. i. p. 142, 185, 342. and vol. ii. p. 429, 432. See PREROGATIVE.

DISPENSATION *by non-obſtante.* See NON-OBSTANTE.

DISPENSATION, in *Pharmacy*, the diſpoſition and arrangement of ſeveral medicines, either ſimple or compound, all weighed in their proper doſes, or quantities; in order to be employed in the making a compoſition.

DISPERSION, in *Dioptrics. Point of* DISPERSION, is a point from which refracted rays begin to diverge, when their refraction renders them divergent.

It is called *point of diſperſion*, in oppoſition to the *point of concourſe*, which is the point wherein converging rays concur after refraction.

But the latter is more uſually called *focus*, and the former, *virtual focus.*

DISPERSION *of light*, occaſioned by the REFRANGIBILITY of the rays, or the nature of the refracting MEDIUM. See ABERRATION, and INFLECTION.

DISPERSION *of Mankind*, in the *Hiſtory of the World*, was occaſioned by the CONFUSION *of tongues*, and took place in conſequence of the overthrow of Babel at the birth of Peleg; whence he derived his name: and it appears by the account given of his anceſtors, Gen. chap. xi. 10—16, to have happened in the 101ſt year after the flood, according to the Hebrew chronology, and by the Samaritan computation in the 401ſt. However, various difficulties have been ſuggeſted by chronologers concerning the true æra of this event. Sir John Marſham and others, in order to reconcile the Hebrew and Egyptian chronologies, maintain a *diſperſion* of mankind before the birth of Peleg: others, unable to find numbers ſufficient for the plantation of colonies in the ſpace of 101 years, according to the Hebrew computation, fix the *diſperſion* towards the end of Peleg's life, thus following the computation of the Jews: Petavius aſſigns the 153d year after the flood; Cumberland, the 180th; and Uſher, though he generally refers it to the time of Peleg's birth, in one place aſſigns the 131ſt after the flood for this event. Mr. Shuckford ſuppoſes the *diſperſion* to have been gradual, and to have commenced with the ſeparation of ſome companies at the birth of Peleg, and to have been completed thirty-one years after. According to the calculation of Petavius, the number of inhabitants on the earth at the birth of Peleg amounted to 32,768; Cumberland makes them 30,000; Mr. Mede ſtates them at 7000 men, beſides women and children; and Mr. Whiſton, who ſuppoſes that mankind now double themſelves in four hundred years, and that they doubled themſelves between the deluge and the time of David in ſixty years at a medium, when their lives were ſix or ſeven times as long as they have been ſince, by his computation, produces about 2389, a number much too inconſiderable for the purpoſes of ſeparating and forming diſtinct nations. This difficulty induced Mr. Whiſton to reject the Hebrew, and to adopt the Samaritan chronology, as many others have done; which, by allowing an interval of 401 years between the flood and the birth of Peleg, furniſhes, by the laſt mentioned mode of computation, more than 240,000 perſons. Marſh. Can. Chron. ſec. 1. Petav. Doctrin. Temp. lib. ix. c. 14. Cumb. Orig. Gent. Antiq. p. 142—154. Uſher ad A. M. 1757 & 1787. Whiſton's View Chron. O. T.

As to the manner of the *diſperſion* of the poſterity of Noah from the plain of Shinar, it was undoubtedly conducted with the utmoſt regularity and order. The ſacred hiſtorian informs us, that they were divided in their lands, every one according to his tongue, according to his family, and according to his nation; Gen. x. 5, 20, 31: and thus, as Mr. Mede obſerves, they were ranged according to their nations, and every nation was ranged by their families, ſo that each nation had a ſeparate lot and each family in every nation. The following abſtract will ſerve to give a general idea of their reſpective ſettlements: Japhet, Noah's eldeſt ſon, had ſeven ſons, viz. Gomer, whoſe deſcendants inhabited thoſe parts of Aſia, which lie upon the Ægean ſea and Helleſpont northward, containing Phrygia, Pontus, Bithynia, and a great part of Galatia: the Galatians, according to Joſephus, were called Gomeræi; and the Cimmerii, according to Herodotus, occupied this tract of country: and from theſe Gomerians, Cimmerii or Celts, Mr. Camden derives our ancient Britons, who ſtill retain the name Cymro or Cymru: Magog, the ſecond ſon of Japhet, was probably the father of the Scythians on the eaſt and north-eaſt of the Euxine ſea: Madai planted Media, though Mr. Mede aſſigns Macedonia to his ſhare: Javan was the father of the Grecians about Ionia, whoſe country lies along upon the Mediterranean ſea; the radicals of Javan and Ionia being the ſame יון: to Tubal and Meſhech belonged Cappadocia and the country which lies on the borders of the Euxine ſea; and from them, migrating over the Caucaſus, it is ſuppoſed the Ruſſians and Muſcovites are deſcended: and Tiras occupied Thrace. The ſons of Shem were five: Elam, whoſe country lay between the Medes and Meſopotamians, and was called by the Gentile writers Elymais; and Joſephus calls the Elamites the founders of the Perſians: Aſhur, who was driven out of Shinar by Nimrod, afterwards ſettled in Aſſyria, and there built Nineveh and other cities: Arphaxad, who gave name to the country which Ptolemy calls Arraphacitis, a province of Aſſyria, though Joſephus makes him the father of the Chaldees: Lud, who inhabited and gave name to the country of Lydia about the river Mæander, remarkable for its windings, in Aſia Minor: and Aram, the father of the Syrians. Ham, the youngeſt ſon of Noah, had four ſons, viz. Cuſh, whoſe poſterity ſpread into the ſeveral parts of Arabia, over the borders of the land of Edom, into Arabia Felix, up to Midian and Egypt: Mizraim, the father of them, who inhabited Egypt and other parts of Africa: Phut, to whom Bochart aſſigns the remaining part of Africa, from the lake Tritonides to the Atlantic ocean, called Lybia: and Canaan, to whom belonged the land of Canaan, whence the Phœnicians derived their origin. Mede's Works, vol. i. diſc. 50. p. 276, &c. Bochart, Phaleg. lib. iii. & iv. Patrick in loc. Shuckford's Conn. vol. i. book 3. and Un. Hiſt. vol. i. part 1. book 1. chap. 2. § 6.

Dr. Bryant has advanced a new hypotheſis on this ſubject, and ſupported it with his uſual acuteneſs and learning: he maintains, that the *diſperſion* as well as the CONFUSION *of tongues* was local, and limited to the inhabitants of the province of Babel; that the ſeparation and diſtribution recorded to have taken place in the days of Peleg, Gen. x. 25, 31, 32, which was the reſult of divine appointment, occaſioned a general migration; and that all the families among the ſons of men were concerned in it: the houſe of Shem, from which the Meſſiah was to ſpring, was particularly regarded in this diſtribution; the portion of his children was near the place of ſeparation; they in general had Aſia to their lot; as Japhet had Europe, and Ham the large continent of Africa. But the ſons of Chus would not ſubmit to the divine diſpenſation; they went off under the conduct of Nimrod, and ſeem to have been for a long time in a roving ſtate: however, at laſt they arrived at the plains of Shinar, and having ejected Aſhur and his ſons, who were placed there by divine appointment, ſeized his dominions, and laid there the foundation of a great monarchy. But afterwards fearing leſt they ſhould be divided and ſcattered abroad, they built the tower of Babel, as a land-mark, to which they might repair, and probably to anſwer the purpoſes of an idolatrous temple, or high altar, dedicated to the hoſt of heaven, from which they were never long to be abſent. They only, viz. the ſons of Chus or the Cuthites, and their aſſociates from other families, who had been guilty of rebellion againſt divine authority, and of wicked ambition and tyranny, were puniſhed with the judgment of confounded ſpeech through a failure in labial utterance, and of the *diſperſion* recorded in Gen. x. 8, 9: in conſequence of which they were ſcattered abroad from this city and tower, without any certain place of deſtination. The Cuthites invaded Egypt or the land of Mizraim, in its infant ſtate, ſeized the whole country, and held it for ſome ages in ſubjection: and they extended likewiſe to the Indies and Ganges, and ſtill farther into China and Japan. From them the province of Cuſhan or Goſhen in Egypt derived its name; here they obtained the appellation of royal ſhepherds; and when they were by force driven out of the country, after having been in poſſeſſion of it for two hundred and ſixty or two hundred and eighty years, the land which they had been obliged to quit was given to the Iſraelites, who were alſo denominated ſhepherds, but ſhould not be confounded with the former or the antecedent inhabitants of Goſhen. Bryant's Analyſis of Ancient Mythol. vol. iii. p. 16, &c.

DISPERSION *of inflammations*, in *Medicine*. See INFLAMMATIONS.

DISPLANTING, among *Gardeners*, is the plucking up a tree or plant out of the ground.

DISPLANTING *ſcoop*, an inſtrument for taking up plants with earth about their roots.

DISPLAYED,

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DISPLAYED, in *Heraldry*, is underſtood of the poſition of an eagle, or other bird, when it is erect, with its wings expanded, or ſpread forth.

DISPONDEE, in the *Greek* and *Latin Poetry*, a double ſpondee; or a foot conſiſting of four long ſyllables: as *jūrāmēntūm, dēlēctāntēs*, θαυμαζόντων.

DISPOSITION, from *dis*, and *pono*, *I place*, in *Architecture*, is the juſt placing of all the ſeveral parts of an edifice, according to their proper nature and office. See BUILDING.

DISPOSITION, in *Logic*, is that operation of the mind, whereby we put the ideas, propoſitions, and arguments which we have formed concerning one ſubject, into ſuch an order as is fitteſt to gain the cleareſt knowlege of it, to retain it longeſt, and to explain it to others in the beſt manner: the effect of this is called METHOD. Watts's Logic.

DISPOSITION, in a *Military Senſe*, is the arrangement of an army or body of men upon the moſt advantageous ground, and in the beſt ſituation for a vigorous attack or defence.

DISPOSITION, in *Rhetoric*, is defined, by Cicero, the act of diſtributing the things, or arguments, invented or found out, into a proper order; or a due placing, or ranging, the ſeveral parts of a ſpeech, or diſcourſe.

The *diſpoſition* makes one of the great branches, or diviſions, of rhetoric. Iſocrates was the firſt among the Greeks, that made them ſenſible of the beauty of *diſpoſition*; and Cicero among the Romans.

The *diſpoſition* is of the ſame neceſſity in oratory, as the marſhalling of an army in order to a battle; or a beautiful compoſition in architecture, painting, &c. Horace enjoins it expreſsly in poetry: *Singula quæque locum teneant ſortita decenter*. The *diſpoſition*, then, is the order, or arrangement, of the parts of an oration; which parts are uſually reckoned four, viz. the *exordium*, or *beginning*; the *narration*; the *confirmation*; and the *peroration*, or *concluſion*. Though ſome make them ſix, viz. the *exordium*, *diviſion*, *narration*, *confirmation*, *confutation*, and *peroration*; as indicated in that popular verſe:

Exorſus, narro, ſeco, firmo, refuto, peroro.

But the diviſion is more naturally referred to the exordium; and the confutation to the confirmation.

The *diſpoſition* is either *natural* or *artificial*. *Natural*, is the order the parts are above rehearſed in. *Artificial*, is when, for ſome particular reaſon, we recede from the order of nature. See each part under its proper article, EXORDIUM, &c.

DISPROPORTION, a term of relation implying a want of proportion, or ſymmetry.

DISPROVING, in *Rhetoric*. See REFUTATION.

DISPUTE, or DISPUTATION, from *dis*, and *puto*, *I think*, in the *Schools*, *&c.* a conteſt, or combat, either by word or writing, on ſome point of learning or religion, for a degree, prize, exerciſe, or even for the mere ſake of truth, or advantage of a party, or the honour of a triumph. See THESIS.

The Port royaliſts take occaſion to obſerve, that nothing gives ſo many different lights and openings, for diſcovering the truth, as *diſputation*. The movements of a mind, employed ſingly in the examination of any ſubject, are uſually too cool and languid; the mind needs a certain degree of heat to awake its ideas. Now, by the oppoſitions in a *diſpute*, we come to find wherein the difficulty lies, and the vigour the mind has acquired enables us to ſurmount it.

DIQUISITION, from *dis*, and *quæro*, *I enquire*, an enquiry into the nature, kinds, and circumſtances of any problem, queſtion, or topic; in order to gain a right notion of it, and to diſcourſe clearly about it.

DISSECTION, from *dis*, and *ſeco*, *I cut*, in *Anatomy*, the operation of cutting and dividing the parts of an animal body, with a knife, ſciſſars, &c. in order to ſee and conſider each of them apart.

The ancients made *diſſections* of living men: as we read of Herophilus and Eraſiſtratus; and, in our own times, of Carpus and Veſalius.

Yet, Le Gendre obſerves, that the *diſſection* of a human body, even dead, was held a ſacrilege till the time of Francis I. And the ſame author aſſures us, he has ſeen a conſultation held by the divines of Salamanca, at the requeſt of Charles V. to ſettle the queſtion, whether or no it were lawful, in point of conſcience, to *diſſect* a human body, in order to learn its ſtructure? See ANATOMY.

DISSEISIN, in *Law*, an unlawful diſpoſſeſſing a man of his land, tenement, or other immoveable and incorporeal right.

Diſſeiſin is of three ſorts; viz. *ſimple diſſeiſin*, committed by day, without force and arms: and *diſſeiſin by force*; for which ſee DEFORCEOR, and FRESH *diſſeiſin*. See alſo RE-DISSEISIN and POST-DISSEISIN. *Wrongful force* makes no deſcent in law.

Aſſiſes are called *writs of diſſeiſin*, which lie againſt diſſeiſors in any caſe: whereof ſome are termed *little writs of diſſeiſin*, as being vicontial, that is, ſuable before the ſheriff in the county-court, becauſe determinable by him without aſſiſe.

DISSEISOR, he who *diſſeiſeth*, or puts another out of his land: as *diſſeiſee* is he who is put out.

If a *diſſeiſor*, after he has expelled the right owner, gains peaceable poſſeſſion of the lands five years without claim, and continues in poſſeſſion, ſo as to die ſeiſed, and the land deſcends to his heirs, they will have a right to the poſſeſſion till the owner recovers at law; and the owner ſhall loſe his eſtate for ever, if he doth not proſecute his ſuit within the time limited by the ſtatute of limitations.

DISSEMINATE *vacuum*. See VACUUM *diſſeminatum*.

DISSENTERS, a general denomination of equal import with non-conformiſts.

It expreſſes certain ſects, or parties, in England, who, in matters of religion, church-diſcipline, and ceremonies, *diſſent* from, or diſagree with the church of England, and have a TOLERATION by law for the ſame.

Such, particularly, are the preſbyterians, independents, anabaptiſts, and quakers. See PRESBYTERIANS, &c.

At the Revolution, a law was enacted, that the ſtatutes of queen Elizabeth, and king James I. concerning the diſcipline of the church, ſhould not extend to proteſtant *diſſenters*: but the perſons *diſſenting* are to ſubſcribe the declaration of 30 Car. II. c. 1. and take the oaths or the declaration of fidelity, &c. And they muſt not hold their meetings until their place of worſhip is certified to the biſhop, &c. or to the juſtices at their quarter ſeſſions, and regiſtered there; alſo they are not to keep the doors of their meeting-houſes locked, &c. If any perſon diſturbs them at their worſhip, on conviction at the ſeſſions, he ſhall forfeit 20*l.* Stat. 1 W. and M. And there are many ſtatutes relating to *diſſenters* beſide the Toleration act: as 5 and 6 Edw. VI. c. 1. 23 Eliz. c. 1. 3 Jac. I. c. 4. 13 Car. II. c. 1. 17 Car. II. c. 2. 22 Car. II. c. 1. 1 W. and M. c. 18. 10 Anne, c. 2. 1 Geo. I. c. 6. &c.

DISSEPIMENTUM, among *Botaniſts*, the thin ſeptum ſeparating the cells of the fruit of plants.

DISSIDENTS, a denomination applied in Poland to thoſe of the Lutheran, Calviniſtic, and Greek profeſſion. The king of Poland engages by the *pacta conventa* to tolerate them in the free exerciſe of their religion, but they have often had reaſon to complain of the violation of theſe promiſes.

DISSIMILAR *leaves*, denote the two firſt leaves of any plant at its firſt ſhooting out of the ground.

They are thus called, becauſe they uſually are of a different form from the common leaves of a grown plant.

Theſe Dr. Grew obſerves to be nothing but the very lobes of the ſeed thus expanded, and thus advanced.

Their uſe is for the protection of the plume; which being young and tender, is thus guarded on each ſide, and has alſo ſome rain and dew gradually conveyed down to it by this means. See PLUME.

DISSIMILAR, in *Anatomy*. Authors divide the parts of the body into *ſimilar*, and *diſſimilar*.

Diſſimilar parts, by ſome called alſo *compound*, and *organical* parts, are ſuch as may be divided into various parts, of different ſtructure, &c. Thus the hand is diviſible into veins, muſcles, bones, &c. whoſe ſubdiviſions are neither of the ſame nature nor denomination.

DISSIMILITUDE, in *Geometry*, *&c.* See SIMILITUDE.

DISSIMILITUDE, or DISSIMILI, in *Rhetoric*, *&c.* an argument, wherein, from *diſſimilar*, or unlike things, other *diſſimilars* are deduced.

Thus Cicero, *Si barbarorum eſt in diem vivere*; *noſtra conſilia ſempiternum tempus ſpectare debent*. Catullus furniſhes a very beautiful argument from *diſſimilitude*.

Soles occidere & redire poſſunt.
Nobis cum ſemel occidit brevis lux,
Nox eſt perpetua una dormienda.

DISSIMULATION, in *Morals*, the act of diſſembling, by fallacious appearances, or falſe pretenſions.

Good princes regard *diſſimulation* as a neceſſary vice; but tyrants conſider it as a virtue.

It is apparent that ſecreſy is often neceſſary, to oppoſe thoſe who may be willing to circumvent our lawful intentions. But the neceſſity of precaution would become very rare, were no enterprizes to be formed, but ſuch as could be avowed openly. The frankneſs with which we could then act, would engage people in our intereſts. Marſhal Biron would have ſaved his life, by dealing ingenuouſly with Henry IV.

With reſpect to *diſſimulation*, three things are to be obſerved; 1. That the characters of thoſe are not to be eſteemed,

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eſteemed, who are reſerved and cautious without diſtinction. 2. Not to make ſecrets of unimportant matters. 3. To conduct ourſelves in ſuch manner, as to have as few ſecrets as poſſible.

DISSIPATION, in *Phyſics*, an inſenſible loſs, or conſumption, of the minute parts of a body; or, more properly, that flux whereby they fly off, and are loſt. See EFFLUVIA.

We do not ſay *diſſipation*, but loſs of blood, in ſpeaking of the blood diſcharged at a wound, or in any other ſenſible manner: on the contrary, we ſay *diſſipation*, or expence, of ſpirits: this is more copious than that of the ſolid parts; and, conſequently, the reparation ought to be more copious.

DISSIPATION, *Circle of*, or ABERRATION, in *Optics*, denotes that circular ſpace upon the retina of the eye, which is occupied by the rays of each pencil in indiſtinct viſion: thus, if the diſtance of the object, or the conſtitution of the eye be ſuch, that the image falls beyond the retina, as when objects are too near; or before the retina, when the rays have not a ſufficient divergency, the rays of a pencil, inſtead of being collected into a central point, will be *diſſipated* over this circular ſpace: and all other circumſtances being alike, this circle will be greater or leſs, according to the greater or leſſer diſtances from the retina of the focuſes of refracted rays. But this circle cauſes no perceptible difference in the diſtinctneſs of viſion, while that circle is not greater than ſome determinate magnitude; as ſoon as it exceeds that magnitude, we begin to perceive an indiſtinctneſs, which increaſes as the circle of *diſſipation* increaſes, and at length the object is loſt in confuſion. This circle is alſo greater or leſs, according to the greater or leſs magnitude of the viſible object: and though it is not eaſy to aſſign the diameter of the ſaid circle, it ſeems very probable, that viſion continues diſtinct for all ſuch diſtances, or ſo long, as theſe circles or the pencils of light from them do not touch one another upon the retina; and the indiſtinctneſs begins, when the ſaid circles begin to interfere. It has been often obſerved, that a preciſe union of the reſpective rays upon the retina is not neceſſary to diſtinct viſion; but the firſt author that aſcertained the fact beyond all doubt, was Dr. Jurin. See a variety of obſervations and experiments on this ſubject, in his Eſſay on Diſtinct and Indiſtinct Viſion, in Smith's Optics, Appendix. See MOON, and VISION.

DISSIPATION, *Radius of*, is the radius of the circle of DISSIPATION.

DISSOLVENT, ſomething that *diſſolves*, i. e. divides, and reduces a body into its ſmalleſt parts. See DISSOLUTION.

Thus, AQUA *regia* is the *diſſolvent* of gold; AQUA *fortis* of ſilver, and other metals; water, of ſalts and gums; ſpirit of wine, of reſins; ſpirit of vinegar, of pearls, corals, &c.

Sea-ſalt is found the proper *diſſolvent* of gold. This, in almoſt any form, whether as a fluid, or a ſolid, or a ſpirit, does the buſineſs: accordingly, this is a baſis, or fundamental ingredient, of *aqua regia*.

So nitre is the proper *diſſolvent* of ſilver, and has that effect, in whatever form it is applied: and, accordingly, it is the baſis of *aqua fortis*.

Spirit of nitre, added to that of ſea-ſalt, makes it *diſſolve* gold the better: but ſpirit of ſea-ſalt, added to ſpirit of nitre, diſables it from having any effect on ſilver. Yet Mr. Homberg furniſhes an inſtance of a *diſſolution* of ſilver made by the *diſſolvent* of gold. An *aqua regia* may be compoſed of ſpirit of ſalt, and ſpirit of nitre, only in ſuch ſmall quantity each, that they may float ſeparately in a third liquor, and not meet often enough to unite, at leaſt not in any quantity. This water may be made ſo weak as not to *diſſolve* gold, but only extract a ſlight yellow tincture from it, that ſcarce takes off any thing of the weight of the metal: nor will it *diſſolve* ſilver, as being too weak; ſo that both metals are ſafe from it. But this *aqua regia*, after it has *diſſolved* gold as far as it can do; that is, after it has extracted a yellowiſh tincture from it, is ſtill in a condition to *diſſolve* ſilver.

This phenomenon Mr. Homberg accounts for hence: that ſpirit of ſalt, whether alone, or joined with ſpirit of nitre, being employed in keeping thoſe few particles of gold *diſſolved*, will not meddle with the ſilver: which, by this means, receiving the impreſſion of the greater quantity of ſpirit of nitre alone, is *diſſolved* thereby. But the experiment cannot be inverted, i. e. *aqua regia* cannot begin with *diſſolving* ſilver lightly firſt, and afterwards *diſſolve* gold; becauſe ſpirit of nitre does not hinder ſpirit of ſalt from acting on gold, as ſpirit of ſalt does ſpirit of nitre from acting on ſilver.

Diſſolvents are uſually called by the chemiſts, *menſtruums*.

DISSOLVENT, *Univerſal*. See ALCAHEST.

DISSOLUTION, in *Chemiſtry*, *Pharmacy*, and *Phyſics*, a diſcontinuation, or analyſis, of the ſtructure of a mixed body; whereby, what was one, and contiguous, is divided into little parts, either homogeneous, or heterogeneous. See ANALYSIS, and DIVISION.

Diſſolution, then, is a general name for all reductions of concrete bodies into their ſmalleſt parts, without any regard either to ſolidity or fluidity: though, in the uſual acceptation of the word among authors, it is reſtrained to the reduction of ſolid bodies into a ſtate of fluidity, by the action of ſome fluid MENSTRUUM or *diſſolvent*; in which caſe an union is formed between the integrant parts of one body, and thoſe of another of a different nature; ſo that it is nothing elſe than an act of COMBINATION: this is more properly expreſſed by SOLUTION, as a branch of *diſſolution*.

According to the opinion of F. Tertius-de Lanis, adopted by the learned Boerhaave, in his Chemiſtry, the power, or faculty, of diſſolving, is lodged in fire alone.

Other fluids, commonly ſuppoſed diſſolvents, only produce their effect by means of the fiery ſpicula they abound with. Even air, which is judged a powerful menſtruum, owes all its force to the rays of light diffuſed therein.

Sir Iſaac Newton accounts for all *diſſolutions*, and the ſeveral phenomena thereof, from the great principle of attraction; and, in effect, the phenomena of *diſſolution* furniſh a great part of the arguments and conſiderations, whereby he proves the reality of that principle.

A ſpecimen of that great author's way of philoſophiſing on the ſubject of *diſſolution*, take as follows:

When ſalt of tartar diſſolves by lying in a moiſt place, is not this done by an attraction between the particles of the ſalt of tartar, and thoſe of the water which float in the air in form of vapours? And why does not common ſalt, or ſaltpetre, or vitriol, do the like, but for want of ſuch an attraction? And when *aqua fortis*, or ſpirit of vitriol, poured on ſteel filings, diſſolves the filings, with a great heat and ebullition, is not this heat and ebullition effected by a violent motion of the parts? And does not that motion argue, that the acid parts of the liquor ruſh towards the parts of the metal with violence, and run forcibly into its pores; till getting between the outermoſt particles and the main maſs of metal, they looſen them therefrom, and ſet them at liberty to float off into the water? When a ſolution of iron, in *aqua fortis*, diſſolves *lapis calaminaris*, and lets go the iron; or a ſolution of copper diſſolves iron immerſed in it, and lets go the copper; or a ſolution of mercury in *aqua fortis*, poured on iron, copper, tin, or lead, diſſolves the metal, and lets go the mercury; does not this argue, that the acid particles of the *aqua fortis* are attracted more ſtrongly by the *lapis calaminaris*, than by iron; by iron, than by copper; by copper, than by ſilver; and by iron, copper, tin, and lead, than by mercury? And is it not for the ſame reaſon, that iron requires more *aqua fortis* to diſſolve it, than copper; and copper, more than the other metals; and that of all metals, iron is diſſolved moſt eaſily, and is moſt apt to ruſt; and next after iron, copper? When *aqua fortis* diſſolves ſilver, and not gold; and *aqua regia* diſſolves gold, and not ſilver; may it not be ſaid, that *aqua fortis* is ſubtile enough to penetrate the pores of gold as well as of ſilver, but it wants the attractive force to give it entrance; and the ſame of *aqua regia*, and ſilver? And when metals are diſſolved in acid menſtruums, and the acids, in conjunction with the metal, act after a different manner; ſo as that the taſte of the compound is milder than that of the ſimples, and ſometimes a ſweet one; is it not becauſe the acids adhere to the metallic particles, and thereby loſe much of their activity? And if the acid be in too ſmall a proportion to make the compound diſſoluble in water; will it not, by adhering ſtrongly to the metal, become unactive, and loſe its taſte; and the compound become a taſteleſs earth? For ſuch things as are not diſſoluble by the moiſture of the tongue are inſipid. Newt. Opt. in Calce.

Dr. Freind gives us a mechanical account of *diſſolution*, in the inſtance of ſalt diſſolved in water, which is the moſt ſimple operation that falls under this head. This motion he aſcribes to that attractive force, which is ſo very extenſive in natural philoſophy, that there is no kind of matter but what is under its influence. It may be obſerved, he ſays, that the corpuſcles of ſalts, which are the moſt ſimple of any, are withal very minute, and, for their bulk, very ſolid; and therefore they exert a very ſtrong attractive force, which, *cæteris paribus*, is proportional to the quantity of matter. Hence it comes to paſs, that the particles of water are more ſtrongly attracted by the ſaline particles than they are by one another: the particles of water, therefore, cohering but looſely, and being eaſily moveable, approach the corpuſcles of ſalts, and run, as it were, into their embraces; and the motion of them is quicker, or ſlower, according

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to their leſs or greater diſtances; the attractive force, in all bodies, being ſtrongeſt at the point of contact. Therefore, if ſalt be thrown into the middle of a diſh full of water, we ſhall find the aqueous particles, which are in the middle of the diſh, ſharp and pungent to the taſte; but the water upon the ſides of the veſſel almoſt inſipid: ſo that, when ſuch a motion once ariſes, the aqueous particles are carried with the ſame force towards the ſalts; and the moment of them is to be eſtimated from the ratio of their weight, and celerity, conjunctly. By the force of this impulſe, they open to themſelves a paſſage into the pores of the ſalts, which are very numerous; and, at length, they ſo break and divide its texture, that all cohesion of the parts is deſtroyed: hereupon, being ſeparated and removed to a convenient diſtance from one another, they are diſperſed, and float here and there about the water.

M. Geoffroy furniſhes ſome curious experiments on *cold diſſolutions:* it is nothing ſurpriſing, that a ſimple *diſſolution* ſhould be cold; that common water, for inſtance, wherein ſea-ſalt, or ſal ammoniac, or vitriol, has been caſt, ſhould become the colder by the mixture of ſuch ſalts; it being obvious, that the ſalts, being of themſelves deſtitute of motion, and coming to ſhare that which the fluidity gives the water, muſt diminiſh it, when they become intimately mixed therewith by *diſſolution*; and it is generally agreed, among philoſophers, that heat is a motion, and cold a ceſſation, or, at leaſt, a diminution of motion.

Yet, notwithſtanding this general principle, it is no great wonder all *diſſolutions* are not cold, as thoſe are of all volatile alcalies in common water; but that ſome are hot, as thoſe of all fixed alcalies. This difference may be accounted for hence, that all fixed alcalies having been calcined by a vehement fire, they have impriſoned and retained in their pores ſome of the particles thereof. But it is ſurpriſing, that *diſſolutions*, accompanied with fermentation, &c. where the matters boil and ſwell, and that with a great noiſe, ſhould be cold, and make the thermometer fall, when immerged therein.

This coldneſs, with ſo conſiderable an augmentation of motion, is ſomewhat extraordinary. But this is not all; for of theſe cold fermentations, there are ſome that emit hot vapours. Thus it is with a mixture of oil of vitriol, and ſal ammoniac; for a thermometer being plunged in the mixture, and another a little higher, to receive only the fumes thereof; the firſt thermometer is ſeen to fall very haſtily, through the coldneſs of the fermentation; and the latter to riſe, through the heat of the vapours. M. Geoffroy adds an experiment, ſhewing that cold water is rendered ſtill colder, for a few moments, by throwing a large quantity of live coals therein.

DISSOLUTION *of metals, &c.* by fire, is particularly called *fuſion*.

DISSOLUTION *of the blood*, is an affection of that humour, directly oppoſite to coagulation.

The *diſſolution* is ſuch a comminution of the fibrous parts of the blood, as indiſpoſes it for that ſeparation of the craſſamentum from the ſerous part, which always enſues in healthy blood on its cooling out of the body.

This *diſſolution* is frequently the conſequence of malignant and peſtilential fevers, and ſhews itſelf in petechiæ, or purple ſpots; alſo of certain poiſons, particularly the bites of venomous beaſts, &c.

DISSOLUTION *of parliament*. See PARLIAMENT.

DISSONANCE, or DISCORD, in *Muſic*, a falſe conſonance, or concord.

A *diſſonance* is properly the reſult of a mixture, or meeting, of two ſounds, which are diſagreeable to the ear: ſuch are *ditones*, *tritones*, *falſe fifth*, *redundant fourth*, *ſeventh*, &c.

Diſſonances are ſometimes uſed in muſic, and have a good effect therein, though it be only occaſionally. See DISCORD.

DISSYLLABLE, a word of two ſyllables; as *fortune*, *lament*, &c.

The ſpondee, trochee, iambus, and pyrrhichius, are *diſſyllabic* feet. See SPONDEE, &c.

DISTAFF, an inſtrument about which flax is tied, in order to the ſpinning it.

DISTAFF-*thiſtle*, a name ſometimes given to the *atractylis* of authors. See THISTLE.

DISTANCE, properly denotes the ſhorteſt line between two points, objects, &c.

Diſtance, according to an ingenious author, cannot of itſelf and immediately be ſeen. For *diſtance* being a line directed endwiſe to the eye, it projects only one point in the fund of the eye, which point remains invariably the ſame, whether the *diſtance* be longer or ſhorter. Dr. Berkeley, Eſſay on Viſion.

A late eminent mathematician obſerves, that the *diſtance* here ſpoken of, is *diſtance* from the eye; and that what is ſaid of it muſt not be applied to *diſtance* in general. The apparent *diſtance* of two ſtars is capable of the ſame variations as any other quantity or magnitude. Viſible magnitudes conſiſt of parts into which they may be reſolved, as well as tangible magnitudes; and the proportions of the former may be aſſigned, as well as thoſe of the latter: ſo that it is going too far to tell us, that viſible magnitudes are no more to be accounted the object of geometry, than words; and that the ideas of ſpace, and things placed at a diſtance, are not, ſtrictly ſpeaking, the object of ſight, and are not otherwiſe perceived by the eye than by the ear. Mr. Maclaurin, in his Account of Sir Iſaac Newton's Diſcoveries, p. 225.

The word is alſo uſed figuratively for an interval, not only in reſpect of place, but alſo of time, or quality. Thus, we ſay the *diſtance* of the creation of the world, from the nativity of Jeſus Chriſt, is upwards of four thouſand years: the *diſtance* between the Creator and creature is infinite.

For the diviſion of DISTANCES, or the manner wherein we come by the idea of *diſtance* in objects, ſee VISIBLE.

DISTANCE, in *Aſtronomy*. The *diſtance* of the ſun, planets, and comets, is found from their PARALLAX.

The proportional or relative *diſtances* of the planets are deduced with great exactneſs from the theory of gravity: for Kepler has long ſince diſcovered, that the ſquares of their periodical times are as the cubes of their diſtances. Epit. Aſtron. lib. iv. See alſo Greg. Aſt. book i. prop. 40. If we, therefore, ſuppoſe the mean *diſtance* of the earth from the ſun to be 100000, we ſhall obtain by the preceding analogy, from the periodical times which are known, the relative *diſtances* of the other planets: thus,

The periodical revolutions to the ſame fixed ſtar in days and decimal parts of a day.

Mercury.	Venus.	Earth.	Mars.	Jupiter.	Saturn.
87,9692	224,6176	365,2564	686,9785	4332,514	10759,275

Relative mean *diſtances* from the Sun.

38710	72333	100000	152369	520096	954006

In order to find the real *diſtance* of the earth, and for an account of the real *diſtances* of the other planets; ſee PARALLAX, and PLANETS.

For the *diſtances* of the ſecondary planets from the centers of their reſpective primaries; ſee SATELLITES.

That of the fixed ſtars, as having no ſenſible parallax, we can do little more than gueſs at.

Dr. Hook, by exact obſervation with a teleſcope of ſixteen feet perpendicularly placed, firſt diſcovered, that the *diſtances* of the ſtars from the zenith is not the ſame at all times of the year: particularly the bright ſtar in the Dragon's Head he found twenty-ſeven or thirty ſeconds nearer the zenith of Greſham college, in the winter ſolſtice, than in the ſummer: and, after him, Mr. Flamſteed obſerved the like variations in the Pole ſtar. See LIGHT.

DISTANCE *of the ſun from the moon's node*, or *apogee*, is an arch of the ecliptic intercepted between the ſun's true place, and the moon's node, or apogee. See NODE.

DISTANCE, *Curtate*. See CURTATE.

DISTANCE *of the baſtions*, in *Fortification*, is the ſide of the exterior polygon.

DISTANCES, in *Geometry*, are meaſured by the chain, decempeda, and the like. See CHAIN, &c.

DISTANCES, *Inacceſſible*, are found by taking bearings thereto from the two extremes of a line whoſe length is given. See PLAIN-TABLE, THEODOLITE, &c.

DISTANCE, in *Geography*, is the arch of a great circle interſected between two places.

To find the *diſtance* of two places A and B (*Tab. Geogr. fig.* 4.), far remote from each other. Aſſume two ſtations, C and D, from which both the places A and B may be ſeen; and with a proper inſtrument find the angles A D C, C D B, A C D, and D C B; and meaſure the *diſtance* C D.

Then in the triangle A C D we have two angles given, A C D and A D C, together with a ſide; from which, by an eaſy rule in trigonometry, delivered under the article TRIANGLE, we find A D.

So alſo, in the triangle C D B, the baſe D C, and the angles at the ſame, being given; D B is found.

Laſtly, in the triangle A D B, having the ſides A D and D B, together with the included angle A D B; the *diſtance* required, A B, is found by the rules given for the reſolution of triangles.

The height of a remote object being known, to find its *diſtance*, when the eye firſt deſcries it; and, again, the height of the eye being given, to find the *diſtance* to which the eye can reach on the ſurface of the ſea, or land. Add the height of the eye A B (*fig.* 9.) to the ſemi-

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ſemidiameter of the earth BC, by which you have AC; and ſince in the rectangled triangle ADC the ſides AC and DC are given, the angle DCA is found by the common rule for reſolution of triangles, the quantity of which angle forms the arch DB; which arch, converted into feet, or the like, gives the *diſtance* required.

Suppoſe, e. gr. the height of the eye AB five feet, which is ſomewhat leſs than in a man of ordinary ſtature: ſince BC is 19695539, AC will be 19695544; and the angle DAB will be found 89° 57′ 43″: conſequently DCB, or the arch DB, is 2′ 17″, or 137″; and therefore, ſince 1°, or 3600″, make 343752 Paris feet; DB is 13081⅓ feet.

After the ſame manner we find the *diſtance* DB, to which an object of a given altitude AB may be ſeen; and, conſequently, we know what *diſtance* we are off from an object of a given altitude, when we firſt diſcover the top thereof. See HORIZON.

DISTANCE, *Apparent*, in *Optics*, that *diſtance* which we judge an object to be from us when ſeen afar off, being commonly very different from the true *diſtance*; becauſe we are apt to think that all very remote objects, whoſe parts cannot well be diſtinguiſhed, and which have no other object in view near them, to be at the ſame *diſtance* from us, though perhaps the one is thouſands of miles nearer than the other, as is the caſe with regard to the ſun and moon.

M. De la Hire enumerates five circumſtances, which aſſiſt us in judging of the *diſtance* of objects; viz. their apparent magnitude, the ſtrength of the colouring, the direction of the two eyes, the parallax of the objects, and the diſtinctneſs of their ſmall parts. Dr. Smith maintains, that we judge of *diſtance* principally, or ſolely, by the apparent magnitude of objects; and concludes univerſally, that the *apparent diſtance* of an object ſeen in a glaſs, is to its *apparent diſtance* ſeen by the naked eye, as the apparent magnitude to the naked eye is to its apparent magnitude in the glaſs: but Alhazen long ſince obſerved, that we do not judge of *diſtance* merely by the angle under which objects are ſeen; and Mr. Robins clearly ſhews the hypotheſis of Dr. Smith to be contrary to fact, in the moſt common and ſimple caſes. Thus, if a double convex glaſs be held upright before ſome luminous object, as a candle, there will be ſeen two images, one erect, and the other inverted: the firſt is made ſimply by reflexion from the neareſt ſurface; the ſecond, by reflexion from the farther ſurface, the rays undergoing a refraction from the firſt ſurface both before and after the reflexion. If this glaſs has not too ſhort a focal *diſtance*, when it is held near the object, the inverted image will appear larger than the other, and alſo nearer; but if the glaſs be carried off from the object, though the eye remain as near to it as before, the inverted image will be diminiſhed ſo much faſter than the other, that it will, at length, appear very much leſs than it, but ſtill nearer. Here, ſays Mr. Robins, two images of the ſame object are ſeen under one view, and their *apparent diſtances* immediately compared; and it is evident that thoſe *diſtances* have no neceſſary connexion with the apparent magnitude. This experiment may be made ſtill more convincing, by ſticking a piece of paper on the middle of the lens, and viewing it through a ſhort tube. He obſerves farther, that the apparent magnitude of very diſtant objects, is neither determined by the magnitude of the angle only under which they are ſeen, nor is the exact proportion of that angle compared with their true *diſtance*, but is compounded alſo with a deception concerning that *diſtance*; ſo that if we had no idea of difference in the *diſtance* of objects, each would appear in magnitude proportional to the angle under which it was ſeen; and if our apprehenſion of the *diſtance* was always juſt, our idea of their magnitude would be, in all *diſtances*, unvaried; but in proportion as we err in our conception of their *diſtance*, the greater angle ſuggeſts a greater magnitude. By not attending to this compound effect, Mr. Robins apprehends, that Dr. Smith was led into his miſtake.

Montrula alſo, without being appriſed of what Mr. Robins had written, made ſimilar objections to the hypotheſis of Dr. Smith. Dr. Porterfield has made ſeveral remarks on the five methods of judging concerning the *diſtance* of objects above recited from M. De la Hire; and he has added to them, the conformation of each eye. See *Circle of* DISSIPATION. This, he ſays, can be of no uſe to us, with reſpect to objects that are placed without the limits of diſtinct viſion. But the greater or leſs confuſion with which the object appears, as it is more or leſs removed from thoſe limits, will aſſiſt the mind in judging of its *diſtance:* the more confuſed it appears, the farther will it be deemed. However, this confuſion hath its limits; for when an object is placed at a certain *diſtance* from the eye, to which the breadth of the pupil bears no ſenſible proportion, the rays proceeding from a point in the object may be conſidered as parallel; in which caſe, the picture on the retina will not be ſenſibly more confuſed, though the object be removed to a much greater *diſtance*. The moſt univerſal, and often the moſt ſure means of judging of the *diſtance* of objects, he ſays, is the angle made by the optic axes: our two eyes are like two different ſtations, by the aſſiſtance of which, *diſtances* are taken; and this is the reaſon, why thoſe perſons who have loſt the ſight of one eye, ſo frequently miſs their mark in pouring liquor into a glaſs, ſnuffing a candle, and ſuch other actions as require that the *diſtance* be exactly diſtinguiſhed. With reſpect to the method of judging by the apparent magnitude of objects, he obſerves, that this can only ſerve, when we are otherwiſe acquainted with their real magnitude. Thus he accounts for the deception to which we are liable in eſtimating *diſtances*, by any extraordinary magnitudes that terminate them; as, in travelling towards a large city, caſtle, or cathedral, we fancy them to be nearer than they really are. Hence alſo animals and ſmall objects ſeen in a valley, contiguous to large mountains, or on the top of a mountain or high building, appear exceeding ſmall. Dr. Jurin accounts for the laſt recited phenomenon, by obſerving, that we have no diſtinct idea of *diſtance* in that oblique direction, and therefore judge of them merely by their pictures on the eye. Dr. Porterfield obſerves, with reſpect to the ſtrength of colouring of different objects, that if we are aſſured they are of a ſimilar colour, and one appears more bright and lively than the other, we judge the brighter object to be the nearer. When the ſmall parts of objects appear confuſed, or do not appear at all, we judge that they are at a great *diſtance*, and *vice verſa*; becauſe the image of any object, or part of an object, diminiſhes as the *diſtance* of it increaſes. Finally, we judge of the *diſtance* of objects by the number of intervening bodies, whereby it is divided into ſeparate and diſtinct parts; and the more this is the caſe, the greater will the *diſtance* appear. Thus *diſtances* upon uneven ſurfaces appear leſs than upon a plane, becauſe the inequalities do not appear, and the whole *apparent diſtance* is diminiſhed by the parts that do not appear in it: and thus the banks of a river appear contiguous to a diſtant eye, when the river is low and not ſeen. Accidens de la Vue, p. 358. Smith's Optics, vol. i. p. 52. and Rem. p. 51. Robins's Tracts, vol. ii. p. 230, 247, 251. Porterfield on the Eye, vol. i. p. 105. vol. ii. p. 387, &c. See Prieſtley's Hiſt. of Viſion, p. 205, and p. 689, &c.

DISTANCE, in *Navigation*, is the number of miles, or leagues, that a ſhip has ſailed from any point. See SAILING.

DISTANCE, *Line of*, in *Perſpective*, is a right line drawn from the eye to the principal point. Such is the line OF (*Tab. Perſpective, fig.* 12.), drawn between the eye O, and the principal point F.

This, as it is perpendicular to the plane, or table, can only be the *diſtance* of the eye from the table.

DISTANCE, *Point of*, in *Perſpective*, is a point in the horizontal line at ſuch *diſtance* from the principal point, as is that of the eye from the ſame.

Such are the points P, and Q (*Tab. Perſpective, fig.* 12.), in the horizontal line PQ; whoſe *diſtance* from the principal point F, is equal to that of the eye from the ſame F.

DISTASTE, or DISGUST, a loſs of appetite, or an averſion, or repugnance, to foods which are commonly eaten.

Diſtaſte is held, by phyſicians, one of the principal diſorders of the ſtomach. It ariſes from a want of ſenſation in the upper orifice of the ventricle, which may be occaſioned various ways: as, by a too great abundance of food; thick, heavy humours in the ſtomach; fat, viſcid aliment; obſtructions of the lacteals; ſuppreſſions of the uſual evacuations; intermiſſions of the ordinary exerciſes; a defect in the nerves, in having their natural faculty aboliſhed, or ſuſpended, as in a lethargy, and apoplexy; and, according to Sylvius, by a groſs viſcid ſaliva, or a thick bile, aſcending out of the ſmall guts into the ſtomach.

DISTEMPER, in *Medicine*. See DISEASE.

DISTEMPER is alſo uſed, in *Painting*, for the working up of colours with ſomething elſe beſides bare water, or oil.

If the colours be prepared with the former of theſe, that kind of painting is called *limning*; and if with oil, it is called *painting in oil*, or ſimply *painting*.

If the colours be mixed with ſize, whites of eggs, or any ſuch proper glutinous, or unctuous ſubſtance, and not with oil, they then ſay, it is done in *diſtemper*; as thoſe of the admirable cartoons formerly at Hampton court

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The beſt method of compounding the colours with the vehicles, is to mix the ſize in water; then to levigate the colours in part of it, and afterwards to put each kind into a proper pot, adding as much more of the melted ſize as will bring it to a due conſiſtence, and mixing the whole well together in the pot, with a proper bruſh or wooden ſpatula. Warm water may be afterwards added, if neceſſary, for grinding the colours, or for working. The pots muſt be tied with bladders. This method of painting is chiefly confined to ſcenes, and groſſer works, where the effect depends more on the perſpective art, and oppoſition of the colours, than on their brightneſs.

DISTENSION, the act of ſtretching a thing; alſo the ſtate of a thing violently ſtretched, and diſtended. See TENSION.

DISTENSION, *Diſtenſio*, Διαταϛις, in the *Ancient Muſic*, was uſed for the differences of ſounds with relation to acute and grave. Wallis's Append. ad Ptolem. Harm. p. 154.

Nature in this reſpect, ſtrictly ſpeaking, aſſigns no limits. But, with regard to our uſe, the ancient muſicians held, that the nature of what ſounded, and alſo of what was to judge, that is, the human ear, was to be conſidered: for, neither the human voice, nor even any inſtrument, can give intervals or *diſtenſions* immenſely great or ſmall, nor could the ear judge of ſuch. Ariſtoxenus fixes the leaſt interval or *diſtenſion* in practice, to the *dieſis enharmonica*. As to the greateſt, he thinks it does not exceed two octaves, and a fourth, or a fifth, if we conſider any human voice; or three octaves, if we conſider one and the ſame inſtrument. He does not deny that the extent of the voice, conſidered in different ſubjects, as in men and children, may go even beyond four octaves. Ariſtoxen. p. 21. edit. Meibom.

DISTICH, Δiϛιχον, a couplet of verſes; or a piece of poetry, the ſenſe whereof is comprehended in two lines. There are excellent morals in Cato's *diſtichs*. See Vigneul de Marville on the *diſtichs* of Cato, tom. i. p. 54, 55.

Hexameter and pentameter verſes, otherwiſe called elegiacs, are diſpoſed in *diſtichs*.

DISTICHIASIS, in *Medicine*, a diſorder of the eye-lids; wherein, inſtead of one, they have two rows of cilia, or hairs.

The word is formed of Δiϛ, *twice*, and ϛiχος, or ϛoiχος, *order*, *rank*.

In the *diſtichiaſis*, over the common, and natural hairs, there grows another extraordinary row, which frequently eradicates, and tears up the former; and, pricking the membrane immediately inveſting the eye, occaſions pain, and draws defluxions upon it.

It is cured by plucking up the ſecond rows of hairs with nippers, and cauteriſing the pores out of which they iſſued.

DISTICHOUS *Stalk*, in *Botany*. See STALK.

DISTILLATION, or DESTILLATION, in *Chemiſtry* and *Pharmacy*, the art, or act, of ſeparating, or drawing off the ſpirituous, aqueous, oleaginous, or ſaline parts of a mixed body from the groſſer and more terreſtrial parts, by means of fire; and collecting and condenſing them again by cold.

The uſe of *diſtillation* is very great; it being by means hereof that waters, ſpirits, eſſences, and extracts, are chiefly made.

Diſtillation is uſually performed by means of fire raiſed to a greater or leſſer degree, as circumſtances require.

The fire is either applied immediately to the veſſels wherein the matters are to be *diſtilled*; or it is applied mediately, by means of water, ſand, iron filings, &c. Theſe different methods of applying the fire, are called *baths*, *balnea*; *balneum Mariæ*, or *maris*; *balneum arenoſum*, &c. They are alſo called *heats*; as ſand-heat, water-heat, &c.

Diſtillation is twofold: 1. *Per aſcenſum*, *by aſcent*; when the matter to be *diſtilled* is above the fire, and the ſpirit, or other principle, is raiſed from it.

2. *Per deſcenſum*, *by deſcent*; when the matter which is to be *diſtilled* is below the fire, and the vapour drawn from it is precipitated to the bottom of the veſſel.

Diſtillation by aſcent is either *right*, or *oblique*.

DISTILLATION, *Right*, is performed with a common ALEMBIC, or cucurbit; wherein the liquor is raiſed, and deſcends again, in form of drops, into a receiver. This is chiefly uſed when the texture of the body is ſuch as allows of an eaſy aſcent, as in vegetables.

DISTILLATION, *Oblique*, is performed ſideways, and in crooked veſſels, as RETORTS. This has been called *diſtillation per latus*. Its uſe is, for ſuch bodies as conſiſt of heavier particles, and which cannot be raiſed without a ſtrong impulſe, nor even by the ſtrongeſt ſo high as the top of the alembic; of which kind are almoſt all minerals and metals.

Mr. Woulfe, F. R. S. has contrived an apparatus for *diſtilling* a variety of ſubſtances, by which the fumes of vapours, that uſually eſcape in the ordinary method of *diſtillation*, and are often injurious to the lungs, are condenſed by paſſing into water, or ſome other fluid. See *Tab. Chemical Veſſels*, *fig.* 7. A is a retort, in the room of which may be ſubſtituted, on ſome occaſions, an iron pot with a ſtone-ware head, having its neck inſerted into the receiver. B is a receiver, into the neck of which that of the retort is inſerted; this has a ſpout at its bottom, through which the diſtilled liquor paſſes into the bottle C, and an opening in the ſide at D, into which one end of a tube bent at right angles is inſerted: the other end of the tube paſſes into a veſſel H, open at both ends, having its lower opening cloſed with a glaſs ſtopple. Through the upper mouth of the veſſel H, one end of another tube I, bent twice at right angles, paſſes, while the other end is inſerted into a bottle F, and immerſed in the water or other fluid contained in that bottle. The crooked tubes are fitted into the mouth of the veſſel H by means of a cock, in which are two ſemicircular notches, through which the tubes paſs, and by lute. The tube which paſſes into the bottle F is fitted into its mouth by means of a cock, with a ſemicircular notch, but without lute. The vapour that is raiſed from the ſubſtance expoſed to heat in the retort, paſſes into the receiver B, where part of it is condenſed, and flows into the bottle C, while the reſt of it paſſes through the tube at D into the veſſel H. From this veſſel, the vapour that remains ſtill uncondenſed paſſes through the crooked tube I into the water contained in the bottle F, by which it is all condenſed excepting ſome elaſtic air, which is extricated in almoſt all *diſtillations*. This elaſtic air riſes through the water, and eſcapes at the ſemicircular notch of the cock in the mouth of the veſſel, which on this account is not accurately cloſed with lute. In moſt *diſtillations*, a quantity of air is abſorbed at different times during the proceſs; and in this caſe the external air will preſs on the liquor in the bottle F, and force it through the tube I into the veſſel H, from which it may be taken by opening the ſtopple L. The uſe of the veſſel H is to receive the liquor that may be thus raiſed from the bottle F, and to prevent it from paſſing into the receiver B, and from thence into the bottle C, where it might ſpoil the diſtilled liquor. By *diſtilling* 12 lb. of Britiſh ſal ammoniac with 26 lb. of quick-lime and two gallons of water, Mr. Woulfe obtained 8 ¼ lb. of volatile alcaline ſpirit, ſtrong enough to make eau de luce, which was collected in the bottle joined to the receiver; and on adding two other gallons of water, he obtained 7 lb. of weak volatile ſpirit. Two ſtone gallon bottles, with three quarts of water in each, were ſucceſſively made uſe of to condenſe the vapour; as the one was heated by the fumes, the other was ſubſtituted in its room; and by the condenſed vapour the ſix quarts acquired an increaſe of 2 ½ lb. in weight: and it appeared from experiments, made with a view to compare the ſtrength of the alcali thus condenſed by water with that of the ſtrongeſt alcaline liquor firſt obtained, that a pound of the former was to a pound of the latter as 140 to 76; ſo that the quantity ſaved was nearly equal to 5 lb. of volatile alcali, which would have been loſt by the common method of *diſtillation*. Mr. Woulfe obſerved a ſingular differenee betwixt the alcaline liquor collected in the bottle joined to the receiver, and that condenſed by the water in the bottle F; a conſiderable heat was excited by mixing the latter with the vitriolic acid, whereas there was no heat in a mixture of the former with the ſame acid.

Mr. Woulfe likewiſe *diſtilled* 14 lb. of common ſalt with an equal quantity of oil of vitriol, diluted with 7 lb. of water; and collected 9 lb. 5 ½ oz. of ſpirit of ſalt in the bottle C, and 6 lb. 12 ½ oz. of the ſame ſpirit condenſed in ſix quarts of water in the bottle F; and the reſiduum weighed 18 lb. 6 oz. ſo that there was a loſs of 8 oz. or $\frac{1}{76}$th of the whole, moſt of which was probably elaſtic air. The ſtrength of the acid condenſed in water was found to be to the ſtrength of that collected in the bottle C, as 200 to 109; ſo that the 6 lb. 12 ¼ oz. of the former is equal to near 13 lb. 1 oz. of the latter; and ſo much was ſaved by this method of *diſtillation*.

He obſerves, that the ſlower the *diſtillation* was conducted, the more concentrated were the acid vapours condenſed in water: and that the moſt concentrated portion of the acid of ſea-ſalt is the moſt volatile; and that in ſtrength it is to the vitriolic acid, whoſe ſpecific gravity was to that of water as 24 to 13, in the proportion of 44 ¼ to 31: and moreover, that the vapour of ſpirit of ſalt condenſed in water contained no vitriolic acid, though the ſpirit collected in the bottle C contained ſome of that acid. Mr. Woulfe formed a marine ÆTHER, by applying the vapour of rectified ſpirit of wine to this very concentrated vapour of ſpirit of ſalt, and

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and condenſing the combined vapours in ſpirit of wine. The proceſs for this purpoſe was briefly as follows: the necks of two retorts, one of which contained the ſpirit of wine, and the other the ſea-ſalt and vitriolic acid, from which the marine acid was to be diſtilled, opened into one receiver, where the vapours meet; from this receiver the vapours paſſed through a tube into ſpirit of wine contained in a bottle; and thoſe which were not there condenſed, paſſed through another tube into ſpirit of wine contained in a ſecond bottle. By a farther *diſtillation* and cohobation, with ſlaked lime, of the ſeveral liquors collected in the receiver, and in the ſpirit of wine in which the vapours were condenſed, a very ſubtle penetrating æther was produced. The apparatus for this purpoſe is repreſented in *fig.* 8. B is a glaſs tubulated retort, coated with loam up to B, and placed in the furnace A: D is another tubulated retort fixed in a veſſel with ſand in the furnace C. E is a ſtone veſſel, in which the vapours of B and D are combined together; F is the bottle for receiving the liquor which diſtils; G is a tube about three quarters of an inch bore fitted to E, and H a crooked pipe about a quarter of an inch bore; I and K are glaſs veſſels containing ſpirit of wine, and L is a crooked glaſs tube.

Mr. Woulfe apprehends that his method of condenſation may be applied to the *diſtillation* of vitriolic acid, to the rectification of phoſphorus, the vapours of both which ſubſtances ſhould be condenſed by means of water; to the rectification or *diſtillation* of vitriolic æther, the vapours of which ſhould be condenſed in ſpirit of wine; and to many other *diſtillations*. Phil. Tranſ. vol. lvii. for 1767. art. 50. or Dict. Chem. vol. iii. ad fin.

DISTILLATION *by deſcent*, is where the fire is applied on the top, and all around the veſſel, whoſe orifice is at the bottom; and, conſequently, the vapour not being able to riſe upwards, it is forced to precipitate, and diſtil down to the bottom. This method of *diſtillation* has many faults, is abſolutely unneceſſary, and is entirely neglected.

There is a ſecond kind of *diſtillation* by deſcent, called *per deliquium*; which is a natural liquefying, or reſolving, of ſalts into a liquor, by means of moiſture.

In the reſolution of ſimples, an excellent method to preſerve their virtues is, in lieu of fire, or any other foreign heat, which might alter or deſtroy theſe virtues, to make uſe of the heat of a dunghil made of putrefied herbs.

The proceſs and meaſures of *diſtillation* are very different, according to the different ſubjects to be diſtilled. Care ſhould be taken that no greater heat is applied than is juſt neceſſary to raiſe the ſubſtances to be diſtilled: this is proper both for the ſucceſs of the operation, and for preventing the breaking of the veſſels.

Acid ſpirits are uſually drawn into a *reverberatory* FURNACE, and with a vehement fire; ponderous woods, as guaiacum, box, &c. are diſtilled in a retort, after the ſame manner. In theſe, firſt comes a little phlegm, and then, the fire increaſing, the ſpirits fly out in white clouds: when they ceaſe to come, the matter in the receiver is filtrated through a tunnel, which lets paſs the ſpirits, leaving a black fetid oil behind. See CONCENTRATION.

Odoriferous plants, as baum, wormwood, ſage, hyſſop, &c. are diſtilled by the CUCURBIT, or veſica; firſt pouring a ſtrong decoction of the ſame plant hot upon the plant itſelf bruiſed, or adding common water to the plant, whether dry or freſh, cut with ſheers into ſmall pieces, and letting the whole digeſt in a cloſe veſſel two days: then about half the water, or ſpirit, is drawn away by *diſtillation*; and what remains, being preſſed, filtrated, and evaporated, to the conſiſtence of honey, is the extract of the plant. Laſtly, drying what remained in the cloth after expreſſion, and burning it, they make a lixivium of its aſhes; which being filtrated, and evaporated to dryneſs, what remains is the fixed ſalt of the plant.

Plants not odoriferous, are ſometimes managed thus: the plant, being pounded, and two thirds of the alembic, or retort, filled with it; they pour a good quantity of the expreſſed juice of the ſame plant upon it, ſo as the bruiſed matter may float therein, without ſticking any where to the veſſel; then they draw off about half as much water as there was juice, which is the diſtilled water of that plant: what remains, being preſſed in a cloth, and the juice ſettled, they filtrate, and evaporate it to two thirds; and, ſetting it in a cool place, the eſſential ſalt ſhoots into cryſtals.

There is a method of DISTILLING *cold*; which is thus performed: they take, for inſtance, four pounds of flowers, more or leſs, and put them in three or four pints of water, and put the whole in a limbec, which they lute exactly; then place it in a veſſel half filled with ice, beaten and ſalted, as if they meant to freeze the water; then fit on a receiver, and lute it well: then, wetting a linen cloth in hot water, they cover the limbec-head therewith, repeating this ſeveral times; by which means, the fineſt parts are raiſed from the flowers. But care muſt be taken, that all the ſuperfluous water hath been firſt emptied out of the limbec.

Dr. Beal, in the Philoſophical Tranſactions, mentions an extraordinary kind of cold *diſtillation*, viz. made by froſt and cold air: his thermometer being expoſed out of doors, during the ſevere froſts of 1665, fine clear drops, like dew, aſcended to the top of the tube, which afterwards, in time, re-deſcended into the ſtem, and filled the ſpace of half an inch; and, though the ſpirit of wine itſelf was tinged very deep, yet this ſecond ſpirit was clearer and brighter than any cryſtal. The like he did by expoſing his thermometer to the hot air in the middle of ſummer; and hence takes occaſion to recommend a farther proſecution of this pſychrotechnia.

The aſcent of fluids, we are taught by philoſophy, is effected two ways: 1. By their ſpecific gravity; and, 2. By impulſe.

The firſt way of elevation is manifeſt, from this lemma, viz. that particles of bodies which ſwim in any fluid, if they be ſpecifically lighter, muſt be borne upwards by that fluid: hence, as diſtilled liquors are carried upwards through the air, it is to be inquired, how they come to be ſpecifically lighter than air.

Now, a fluid will be ſpecifically lighter than another, when, under a larger ſurface, it has an equal, or a leſs gravity: according to this proportion, the bulk of the fluid ought to be increaſed in *diſtillation*; and how eaſily, by the help of fire, it may be increaſed, or, which is the ſame thing, rarefied, will appear, from what we have ſaid under the articles HEAT, and RAREFACTION. It is known, by computation, that the proportion of the ſpecific gravity of water to that of air, is ſomething more than as eight hundred to one: ſince, therefore, ſimilar ſpheres, or ſolids, are as the cubes of their diameters; and the ſpecific gravity decreaſes reciprocally in the very ſame proportion as the cubes of their diameters increaſe; in order to make a particle of water lighter than a particle of air, no more is neceſſary than to rarefy it till its diameter becomes ten times greater; which, in this caſe, is but a very ſmall degree of rarefaction: for the cube of the diameter, in a particle ſo rarefied, is 1000: if the diameter be made eleven times greater, the cube will be 1331; and if twelve, 1728: ſo that water, when rarefied but twelve degrees, will be above doubly lighter than air; and, if the rarefaction be carried on farther, it may eaſily be collected, from the increaſe of the numbers, that a particle of water may be rendered almoſt infinitely lighter than air. Now, the elevation of bodies equally fluid, and heavy, is always proportionable to their different aptitude to be rarefied; that is, they aſcend quicker, upon the application of any force, the more ſuſceptible they are of rarefaction: but, in bodies whoſe aptitude to rarefy is equal, the time of aſcent is to be determined by their ſpecific gravity.

But it is not only ſpecific gravity that ſerves to elevate bodies in *diſtillation*; but an external impulſe may alſo cauſe their aſcent: the impulſe we have here to do with, comes from the fire; whoſe particles, though extremely ſmall and light, yet may raiſe bodies much heavier than themſelves, by acting upon them with a certain degree of force. For ſince the moment of a body, or that force by which it acts upon another, is in a compound ratio of the quantity of matter, and celerity; the celerity may be ſo increaſed, as to give a ſufficient force to the body, though the quantity of matter in it be ever ſo ſmall. Let ſome heavy body, therefore, be ſuppoſed to deſcend, with no other moment than what it receives from its own gravity; in this caſe, then, the air, which is much lighter, may be moved with ſuch celerity, as not only to ſuſtain that body, but to mount it up higher: and the more rapid the impetus of the air is, or the ſurface of the body more diffuſed, the higher and ſwifter will the elevation be.

So fire, though it be a body of the minuteſt ſize, may be moved with that rapidity, as to acquire and communicate what force can be deſired towards removing any obſtacles. When, therefore, the moment of fire is augmented in the manner explained, ſo as to exceed the force of the diſtilled body, it will remove it from its former ſituation; or, what is here the ſame thing, becauſe the direction of its motion tends upwards, it will carry it up. And thus, particles ſpecifically heavier than the air contained in the retort, as thoſe of acid ſpirits are, aſcend by a more violent impulſe of the fire uſed in *diſtillation*.

Another thing to be noted, is, that the ſame quantity of matter is elevated ſo much the eaſier, in proportion as the

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the ſurface is enlarged: for the more this is diffuſed, the more particles of fire it receives. Having, therefore, this united force to drive it up, it more eaſily aſcends; ſo that, by the ſame degree of fire, bodies will not equally ariſe, though they are equally heavy, if there be that difference in their ſurfaces already ſuppoſed.

The air, alſo, has no ſmall ſhare in the buſineſs of an impulſe: for, being rarefied by the fire, it is not only impelled upwards itſelf, but it carries other particles up with it: and it may be learned, by many very familiar experiments, what impetus bodies, ſo rarefied, exert. Whoſoever, therefore, well conſiders theſe things, viz. ſpecific levity, an impelling force, and the extent of ſurface; and what may be effected by them; and how many ways, and in what proportions, all of them may be changed; will very eaſily account for all the variety which is found in the ſeveral proceſſes of *diſtillation*.

DISTILLATION, *Combinatory*, a term introduced into uſe by Dr. Shaw, in his Eſſay on Diſtillation, to expreſs that ſort of rectification of diſtilled ſpirits which is done with ADDITIONS, and which he otherwiſe calls improper rectification, by way of diſtinction from that proper rectification, which is the only method of reducing a ſpirit to its utmoſt degree of purity and perfection.

In the *combinatory diſtillation*, many ingredients are added in order to rectify the ſpirit, as the diſtillers expreſs it; and ſome part of theſe actually come over and mix themſelves along with the ſpirit ſo intimately, as not to be ſeparable again without great difficulty. This is done with a deſign to alter, improve, or aboliſh the natural flavour of the ſpirit; but inſtead of rectifying it, they only obſcure and pervert its true qualities. In the buſineſs of rectification, properly ſo called, of the malt ſpirit, all that is neceſſary is the re-diſtilling the low wines procured from the waſh; the again diſtilling over the ſpirit thus obtained, and called proof-ſpirit, into a totally inflammable liquor called alcohol. This is done by the common proceſſes, only taking care not to increaſe the fire by ſudden ſpurts, ſo as to raiſe the oil with the ſpirit, which if once mixed will not be eaſily ſeparated again, and ſcarce ever perfectly, whatever care is uſed.

The methods of combinatory rectification, on the other hand, are very numerous, every diſtiller having his peculiar noſtrum about it. Malt ſpirit is the general ſubject of this proceſs, and the means uſed to rectify it on this plan may be reduced to three heads: 1. That by fixed alkaline ſalt alone. 2. That by fixed alkaline ſalts and acid ſpirits. And, 3. That by ſaline bodies and flavouring additions. The general method is that by fixed alkaline ſalts alone; but it is ſurpriſing to ſee in how careleſs and ſlovenly a manner this is done by the generality of our diſtillers, though we are allowed to excel all other nations in it. The effect of this operation, when carefully performed, is to attenuate and thin the ſpirit, and to keep back a part of its groſs and fœtid oil, and ſo far to alter the part of the oil which comes over, as ſcarce to leave the ſpirit diſtinguiſhable for a malt ſpirit. This end is greatly promoted by a prudent and ſteady management of the fire, and by leaving out the faints; but this is a thing our diſtillers never attend to: they hurry over the operation, working the ſtill in its full force, and by this means raiſe and carry over the oil; though the whole buſineſs of the proceſs is to keep it back; and they even ſuffer the fulſome bitter oil, made into a kind of liquid ſoap with the ſalt in this proceſs, to run among the ſpirit with the faints; by this the whole intent of the proceſs is fruſtrated, and the ſpirit rendered much harder to clean than it was before.

This operation is uſually performed upon proof-ſpirit, and the quantity allowed is from eight to fourteen pounds of ſalt of tartar, fixed nitre, pot-aſh, or more commonly calcined tartar, to the piece. The tartar being only roaſted to a blackneſs in this laſt proceſs, is ſold under the abſurd notion of a vinous ſalt; and the dealers will often praiſe the vinoſity of their ſpirit, becauſe diſtilled from this ſalt: but the truth is, that this ſalt never fails to give, inſtead of a vinoſity, a ſaponaceous, urinous, or lixivial taſte and ſmell. This is the great misfortune that attends the method of rectifying by means of fixed ſalt, for they all of them become volatile in part during the operation; and this volatile portion paſſes over the helm with the ſpirit, and impregnates it, uniting itſelf alſo with that portion of oil yet retained in the ſpirit, and much more firmly combining it and the ſpirit together than they were before; ſo that in reality the ſpirit thus rectified is no other than an alkaline or tartariſed ſpirit, as the chemiſts call it, a thing extremely different from a true vinous ſpirit.

This method, therefore, though it were practiſed to the utmoſt perfection, would never do what was intended by it, but would alter, inſtead of rectifying the ſpirit. Hence there appears the neceſſity of ſome acid to deaden the force of the alkali thus uſed in the rectification. The neceſſity of this, gave occaſion to the method of mixing acids and alkalies together for theſe purpoſes. The acids uſed by our diſtillers on this occaſion, are thoſe of the mineral kingdom, becauſe of their cheapneſs; and the moſt common in uſe among them are oil of vitriol, ſpirit of nitre, oil of ſulphur, and the like. The moſt celebrated rectifiers in the malt way have got their reputation by the uſe of theſe acids. There is ſome choice, however, to be made of the ſpirits, according to the greater or leſſer foulneſs and need of rectification, and they muſt not only be well proportioned, but carefully introduced, and regularly mixed; and indeed without ſome ſkill and judgment in the management of theſe corroſives, no diſtiller ought to attempt to meddle with them.

Theſe ſtrong and violent acids at beſt are not ſo well adapted to the work as the milder ones, particularly the ſulphureous ſpirit of vitriol, which comes over in the rectification of the oil; to this may be added the common *ſpiritus nitri dulcis*, and Mr. Boyle's acid ſpirit of wine well prepared.

Some of our rectifiers, inſtead of the fixed ſalt, uſe quick-lime, which cleanſes and dephlegmates conſiderably: but this method requires the aſſiſtance of acids alſo afterwards, to take off not only the alkaline diſpoſition, but alſo the ſtinking flavour it leaves behind it. Some alſo uſe chalk, virgin earth calcined, and burnt animals bones. Theſe are of conſiderable uſe in the rectifying brandy without rendering the ſpirit any more unfit for the purpoſe of the compounders than before, or requiring much acid afterwards.

The great art of uſing the flavouring ingredients in rectification, is the proper admixture of ſalts in the operation, for without theſe the flavours added by this means do very little. The ſalts uſed on this occaſion are either the fixed alkalies, as pot-aſh and calcined tartar, or decrepitated common ſalt, or calcined vitriol, alum, or ſandiver. The flavouring ingredient is to be applied afterwards, and the whole quantity of the ſpirit either drawn over again, or not, as the occaſion and nature of the addition requires. But theſe ſaline bodies perform ſo very little, that the ſpirit is uſually left impregnated with a flavour from its own oil, which is but badly hidden, or overpowered by the other ingredients. The moſt common flavourers, as they call them, are theſe; mace, orrice-root, parſnip, artichoak, rhodium, raiſin-ſtalks, damaſk-roſes, wine-lees, rape or grape-huſks, and the oil of wine. The laſt of theſe is infinitely preferable to all the others, but is not ſo well known. Theſe and the like ingredients judiciouſly mixed, will, when the ſpirit is very well purified firſt, give the flavour of foreign brandies with ſome tolerable exactneſs; but if this is not attained, their flavour will be loſt in the original one, and the general taſte reſulting from the whole will be like nothing at all. The ultimate perfection aimed at in all the proceſſes of *combinatory diſtillation*, is the depurating the Engliſh malt ſpirit at one operation, ſo as to render it taſteleſs and inodorous, and yet vinous; or elſe to make it reſemble the French brandy, arrack, or ſome other low-flavoured vinous ſpirits.

This is certainly practicable, though not uſually practiſed to the perfection that it might be: the principal thing to be endeavoured after, is the obtaining a taſteleſs ſpirit, capable of receiving any impreſſion, and then the buſineſs of flavouring is eaſy. The method of rectifying, by fixed alkaline ſalts, is capable of great improvement, as by ſteeping the ſpirit firſt brought near to the ſtate of alcohol, upon a well-dried ſalt of tartar, or any other cheaper, but pure fixed alkali; by this means it will be almoſt totally freed of its oil without volatiliſing much of the ſalt, as it does in the way of *diſtillation*; by this means a weak tincture of ſalt of tartar may be procured, and an acid added to this, to take off the effects of the alkali in the ſpirit; the whole is then to be diſtilled, and the fire being well managed, a very clean ſpirit will be thus procured at one operation, ſuch as can no way elſe be obtained at once.

The uſe of the compound neutral ſalts in rectification ſeems not yet to be ſufficiently known; what is meant by theſe ſalts is a fixed alkaline ſalt ſaturated with an acid one. Such a ſalt has indeed been expected from the *caput mortuum*, or white ſaline cake, remaining upon the *diſtillation* of the ſpirit of nitre with oil of vitriol; but it proves too hard, ſtony, and inſoluble, to be of any great uſe on this occaſion: a much better effect may be expected from ſoluble tartar, carefully prepared, and properly uſed; though even this is apt to render the ſpirit a little ſaponaceous. Some compound neutral ſalts have been made, however, upon this foundation, that would rectify common malt ſpirit from proof at a ſingle operation,

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tion, much better than all the other more perplexed and tedious methods in uſe. A prudent uſe of fine dry ſugar may alſo be of ſome ſervice, as it readily unites with the eſſential oil, and detains and fixes it, without imparting any urinous or other nauſeous flavour to the ſpirit rectified upon it. Another hint to this purpoſe, which may be made to turn to very good account, is that given by the ingenious method invented by Dr. Cox, of taking all the oil out of the volatile ſalts, by firſt bringing them to a neutral ſtate with ſpirit of ſalt, and then ſubliming them with ſalt of tartar, which does the buſineſs to perfection. In the caſe of ſpirits the acid may be varied, and virgin-earth, chalk, calcined flints, or the like abſorbents uſed inſtead of ſalt of tartar, and yet the general effect will be the ſame. Shaw's Eſſay on Diſtillery.

DISTILLATION, *Brewing for.* See BREWING.

DISTILLATION *of ſalt-water*, in order to obtain freſh. See *Salt*-WATER.

DISTILLED *Juice of tar.* See TAR-*water.*

DISTILLED *Waters.* The waters *diſtilled* from plants and other medicinal things, may receive ſomething from the veſſels in which they are *diſtilled*, which may in ſome degree alter their properties. Even water alone *diſtilled* in glaſs veſſels, and in thoſe of metal, differs ſo much, that theſe two diſtillations being mixed, will render one another turbid. The Florentine academicians have taken this change of waters under their conſideration, among the many other minutiæ of natural and experimental philoſophy omitted by others. They found that common water *diſtilled* in leaden veſſels would render all other waters turbid, on mixing with it; whether it were ſpring, fountain, river, or well-water, except alone the water of the conduit at Piſa: an experiment that proved a quality in that water, different from all others, though never before ſuſpected in it. The experiment being repeated at various ſeaſons afterwards, the water of this conduit was ſometimes found to grow turbid alſo; but this was at ſuch times as other waters, from rain, &c. had blended themſelves with the genuine water of the ſpring. Waters *diſtilled* in glaſs veſſels, and mixed with waters *diſtilled* in lead veſſels, were ſuppoſed by the Florentines indeed not to render one another turbid; but, by the obſervations often made by the curious Redi, it proved that they did. See Redi's Obſervat.

Common water *diſtilled* in gold, ſilver, or glaſs, with a glaſs head, and kept in glaſs, remains always clear; but, in cryſtal of Piſa, it grows turbid in a few hours, then milky, and in a few days yellow, and after all this bitter; whereas in cryſtal of Rome or Venice, the ſame water does not grow turbid till after two or three days, and never becomes yellow or bitter in it; and in cryſtal of Paris it will ſcarce grow turbid, but after a very conſiderable time. The various materials uſed in the making theſe ſeveral kinds of cryſtal, at the glaſs-houſes of theſe different places, and the various manner of working them, are the occaſion of this great difference in them; and on theſe principles we may find a new and more than ordinary way of judging of the goodneſs of glaſſes, which ſeem equal to one another. See WATERS.

DISTILLED *Waters of laurel-leaves.* See LAUREL.

DISTILLER, a perſon who diſtils ſpirits for ſale. Such a perſon is liable to the ſurvey and duties; and is not allowed to have any ſtill or number of ſtills, which ſingly or together contain leſs than a hundred gallons, under the penalty of 100*l.* and the waſh-ſtill ſhall contain at leaſt four hundred gallons, excluſive of the head, under the ſame penalty. 2 Geo. III. c. 5. and 14 Geo. III. c. 73.

Diſtillers are to enter their warehouſes, ſtills, and veſſels, &c. at the next office of exciſe, on pain of 20*l.* and perſons occupying any ſuch ſhall forfeit 50*l.* and the veſſels are to be marked by the gager. 8 and 9 W. c. 19. 24 Geo. II. c. 40.

Diſtillers who uſe private pipes, &c. for conveyance of diſtilled liquor, forfeit 100*l.* 10 and 11 W. c. 4. They ſhall alſo make holes in the breaſt of the ſtill for taking gages and ſamples, and provide locks on the ſtill-heads, the holes, diſcharge-cocks, and furnace-door, under a penalty of 50*l.* and of 200*l.* for breaking or wilfully damaging ſuch lock or faſtening, after it has been ſecured by the officer. 12 Geo. III. c. 46. 14 Geo. III. c. 73.

Diſtillers are required to give notice to the officer of exciſe, before they receive any wine, cyder, &c. or any kind of fermented waſh, on pain of 50*l.* and alſo before they charge or open the ſtill, expreſſing and deſcribing the number and marks of the waſh-batches uſed; and they are prohibited from charging the ſtill with any other, under a penalty of 100*l.* 24 Geo. II. c. 40. 12 Geo. III. c. 46. 14 Geo. III. c. 73.

Diſtillers, in preparing griſt for waſh, that uſe more wheat than in the proportion of one quarter of wheat to two quarters of any other grain, forfeit 50*l.* 33 Geo. II. c. 9.

Exciſe officers may enter warehouſes, &c. uſed by *diſtillers* and dealers, to take account of liquor, by day or night; and perſons obſtructing them forfeit 50*l.* 6 Geo. I. c. 21. and 5*s.* a gallon is forfeited for all liquors concealed; 3 W. c. 15.

Retailers of diſtilled liquors, or ſuch as ſell the ſame in leſs quantity than two gallons, muſt take out a licence; which is to be granted only to thoſe who keep taverns, victualling-houſes, inns, coffee-houſes, or ale-houſes; who, within the limits of the head office of exciſe in London, pay 10*l.* a year rent and pariſh rates, and in places where the occupiers are not rated, 12*l.* a year; and who, in other parts of the kingdom, pay to church and poor. They muſt firſt be licenced to ſell ale in the places where they dwell. Retailers without licence forfeit 10*l.* which may be either levied, and is in no caſe to be mitigated below 5*l.* or the offender may be committed to hard labour for two months; and by another act, the forfeiture is 50*l.* 16 Geo. II. c. 8. 17 Geo. II. c. 17. 24 Geo. II. c. 40. 26 Geo. II. c. 13. 9 Geo. III. c. 6. 13 Geo. III. c. 56. Hawkers of ſpirituous liquors in the ſtreets, &c. are liable to a forfeiture of 10*l.* 9 Geo. II. c. 23. 11 Geo. II. c. 26. Perſons giving away ſpirituous liquors, or paying wages in them, ſhall be deemed retailers. 9 Geo. II. c. 23. Keepers of gaols, work-houſes, &c. ſelling ſpirituous liquors, or knowingly ſuffering them to be ſold, except ſuch as are preſcribed by a phyſician, ſurgeon, or apothecary, forfeit for the firſt offence 100*l.* and for the ſecond, their office. Debts for ſpirituous liquors cannot be recovered, unleſs they have been contracted, or the liquors delivered at one time to the value of 20*s.* or upwards: and *diſtillers* knowingly ſelling or delivering diſtilled liquors to unlicenced retailers, forfeit 10*l.* and treble their value; and the retailer, convicting the *diſtiller*, is entitled to a ſhare of the penalty, and is himſelf indemnified. Perſons riotouſly reſcuing offenders, or aſſaulting informers, and their aiders or abettors, are guilty of felony, and liable to ſeven years tranſportation. 24 Geo. II. c. 40. No liquor exceeding one gallon ſhall be removed without a permit. 6 Geo. I. c. 21. Britiſh ſpirits made from corn are allowed on exportation as merchandize, a bounty or drawback of 3*l.* 12*s.* *per* ton; provided that they are not exported in caſks containing leſs than a hundred gallons, and in veſſels of leſs burden than a hundred tons; except to Africa and Newfoundland, whither they may be exported in any veſſels of more than ſeventy tons. 2 Geo. III. c. 5. and 6 Geo. III. c. 46.

DISTILLERY, the art of diſtilling BRANDY and other ſpirits. This art was firſt brought into Europe by the Moors of Spain, about the year 1150: they learned it of the African Moors, who had it from the Egyptians: and the Egyptians are ſaid to have practiſed it in the reign of the emperor Diocleſian, though it was unknown to the ancient Greeks and Romans. Anderſon's Hiſt. of Commerce, vol. i. p. 83. See FERMENTATION, and MALT *diſtillery.*

DISTINCT *notion*, or *idea*, according to M. Leibnitz, is, when we can enumerate marks and characters enough whereby to recollect a thing.

Such, e. gr. is this; that a circle is a figure bounded with a curve line that returns into itſelf; all the points whereof are equally diſtant from one middle part. Or, it is that wherein the mind perceives a difference from all other ideas.

DISTINCT *baſe*, in *Optics*, is that diſtance, from the pole of a convex glaſs, in which objects, beheld through it, appear *diſtinct*, and well defined: ſo that the *diſtinct baſe* coincides with what we otherwiſe call the focus.

The *diſtinct baſe* is cauſed by the collection of the rays proceeding from a ſingle point in the object, into a ſingle point in the repreſentation: and therefore concave glaſſes, which do not unite, but ſcatter and diſſipate the rays, can have no real *diſtinct baſe.*

DISTINCTION, a diverſity in things, or conceptions.

Logicians define *diſtinction*, an aſſemblage of two, or more words, whereby diſparate things, or their conceptions, are denoted.

There are three kinds of *diſtinctions*, taken from the three different modes of exiſtence: the firſt, *real*; the ſecond, *modal*; and the laſt, *rational.*

DISTINCTION, *Real*, is that between things which may exiſt, or be conceived to exiſt, apart from each other: ſuch is that between two ſubſtances, or the modes of two ſubſtances.

DISTINCTION, *Modal*, is that between ſeveral things, one whereof may exiſt without the other; but not *vice verſa*, the other without that: ſuch is that between the mind,

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and an act of will; between wax, and its hardneſs; water, and its freezing, &c.

DISTINCTIO *Rationis*, or *Rational* DISTINCTION, is that between ſeveral things, which are really one and the ſame, and whereof one cannot exiſt without the other, nor, *vice verſa*, the other without this: ſuch is that between a thing, and its eſſence; between the eſſence, and properties, &c.

Of this *diſtinction* ſome authors admit two kinds; the one barbarouſly called *rationis ratiocinatæ*, having ſome foundation in things; as when we diſtinguiſh the juſtice of God from his mercy: the other called *rationis ratiocinantis*, which has no foundation at all; and therefore is, by many, quite rejected.

Though others contend, that there is no *diſtinctio rationis*, but is, at the ſame time, a *real diſtinction*: thus, ſay they, God, and juſt God, are, to each other, as milk, and white milk; and a juſt God, and merciful God, as white milk, and ſweet milk. But when I ſay, milk is *diſtinguiſhed* from white milk, or white milk from ſweet milk, the *diſtinction* falls between whiteneſs and ſweetneſs, which is a *real diſtinction*. See REALISTS.

DISTINCTION, *Metaphyſical*, called alſo by the ſchoolmen *alietas*, *alteritas*, and *diverſitas*, is a non-agreement of being, whereby this entity is not that, or one thing is not another.

DISTINCTIO, or DISTINGUO, in the *Schools*, an expedient to evade an argument, or to clear up, and unfold an ambiguous propoſition, which may be true in one ſenſe, and falſe in another. The reſpondent was hard preſſed, but he diſengaged himſelf by a *diſtinguo*. Moliere makes T. D. ſay to his miſtreſs, who had told him, he muſt ſubmit to the will of a perſon he loved: *Diſtinguo, Mademoiſelle, pour l'intereſt de ſon amour, Concedo; contre ſa paſſion, Nego.*

DISTORTION, in *Medicine*. DISTORTIO *oris*, or DISTORTION *of the mouth*, is a contraction, or ſhortening of one ſide of the mouth, occaſioned by a convulſion, or a palſy of the muſcles of one ſide of the face.

When a *diſtortion* ariſes from a convulſion, it is on the ſame ſide with the convulſion, the force of the convulſed part being ſuperior to that of the ſound part: on the contrary, when it ariſes from a palſy, it is on the oppoſite ſide, the paralytic part being here ſurmounted by that which is ſound.

In a *diſtortion of the mouth*, the patient can only ſpit on one ſide; and if he laughs, or pronounces the letter O, he only moves one ſide of his mouth.

The Greeks call this diſorder σπασμος κυνικος, *ſpaſmus cynicus*. This malady is often the effect of careleſſneſs and ill habits. A remarkable inſtance of this kind is mentioned by Winſlow; in which, by careleſſneſs, dreſſing, and leaning, the back-bone of a young lady became crooked, and bent ſideway in contrary directions, like the letter S.

DISTORTION *of the eye*, called alſo SQUINTING, or STRABISMUS.

DISTORTOR *oris*, in *Anatomy*, a muſcle of the mouth, called alſo ZYGOMATICUS.

DISTRACTION, in *Medicine*, ſometimes denotes the act of pulling a fibre, membrane, or the like, beyond its natural extent: and what is capable of this enlargement, is ſaid to be *diſtractile*.

DISTRAIN, in *Law*. *To* DISTRAIN, is to attach, or ſeize on one's goods, for the ſatisfaction of a debt.

DISTRESS, in *Law*, a compulſion recurred to in certain real actions, for bringing a man to appear in court, or to pay rent, or other duty denied: and by the common law, *diſtreſſes* for rent were not to be ſold, but only detained for enforcing payment of the rent; but this is altered by ſtatute.

The method of *diſtreſs* for rent has been much altered in this caſe. If any tenant of lands or tenements ſhall fraudulently carry away his goods, to prevent *diſtreſs*, the landlord may within thirty days after *diſtrain* them wherever they ſhall be found, as if they had been on the premiſes; but no ſuch goods ſhall be *diſtrained*, if ſold, *bona fide*, for valuable conſideration before ſeizure, to any perſon not privy to the fraud. Tenants committing ſuch fraud, or others aſſiſting, ſhall forfeit double the value of the goods carried off, to be recovered by action of debt, &c. and where they ſhall not exceed fifty pounds value, the landlord may exhibit a complaint before two juſtices of peace, who are to examine the fact, and enquire into the value of the goods, and thereupon order the offender to pay double value, leviable by *diſtreſs* and ſale; or for want thereof, commit the offender to the houſe of correction for ſix months. Landlords or their agents may, with the aſſiſtance of a conſtable, ſeize any goods fraudulently concealed in any houſe, out-houſe, &c. And in caſe of a dwelling-houſe, on oath firſt made to ſome juſtice, of reaſon to ſuſpect that ſuch goods are therein, may break open the ſame, and *diſtrain* them. They may alſo *diſtrain* for rent, any cattle, or ſtock of their tenants, feeding on any common; or corn growing on the land, which they ſhall cure, and lay up when ripe, in any proper place, giving notice to the tenant within a week where lodged; and diſpoſe thereof toward ſatisfaction of the rent and charges; the appraiſement to be taken when cut and cured. But if after *diſtreſs* ſo taken, before the product be ripe and gathered, the tenant ſhall pay the rent, and charges of the *diſtreſs*, the ſaid *diſtreſs* ſhall ceaſe. Perſons may ſecure *diſtreſſes* lawfully taken, and ſell them upon the premiſes, in like manner as may be done off the ſame, by 2 W. and M. and any perſons may go to and from the premiſes, to view, appraiſe, buy, or take away the goods of the purchaſer; and if a reſcous be made for the *diſtreſs*, the perſons aggrieved ſhall have the remedy given by the ſaid ſtatute. Stat. 11 Geo. II. cap. 19.

The uſual effect of *diſtreſs* is to drive the party *diſtrained* to replevy the *diſtreſs*, and ſo take his action of treſpaſs againſt the *diſtrainer*; or elſe to compound with him for the debt, or duty, for which *diſtreſs* was made.

There are ſeveral things not *diſtrainable*; for a *diſtreſs* muſt be of a thing, whereof a valuable property is in ſome body; and, therefore, dogs, bucks, coneys, &c. that are *feræ naturæ*, cannot be *diſtrained*.

Again, although it be of a valuable property, as a horſe, (yet when a man or woman is riding on him) or an ax (in a man's hand cutting wood) and the like, are for that time privileged, and cannot be *diſtrained*.

Again, valuable things ſhall not be *diſtrained* for rent, which are for the benefit and maintenance of trades, and which, by conſequence, are for the commonwealth, and are by authority of the law there; as an horſe in a ſmith's ſhop; materials in the weaver's ſhop for making cloth; cloth, or garments, in the taylor's ſhop; ſacks of corn, or meal in a mill, or a market; nor any thing *diſtrained* for damage-feſant, for it is in *cuſtodia legis*.

Again, nothing ſhall be *diſtrained* for rent, which cannot be rendered again in as good a plight as it was at the time of the *diſtreſs* taken; as ſheaves or ſhocks of corn cannot be *diſtrained* for rent, but for damage-feſant they may. Again, beaſts belonging to the plough ſhall not be *diſtrained*.

Laſtly, furnaces, cauldrons, or the like, fixed to the freeholds, or doors, or windows of an houſe, or the like, cannot be *diſtrained*; when a *diſtreſs* is taken that has life in it, it muſt be brought into the common pound, or kept in an open place, where the owner may give it food.

Diſtreſs is divided, by Briton, into *real*, and *perſonal*.

DISTRESS, *perſonal*, is made by *diſtraining* a man's moveable goods, and ſeizing all the profits of his lands and tenements, from the teſte, or date of the writ, for the defendant's contempt in not appearing to an action brought againſt him when he was ſummoned, or attached; and the iſſues ſo returned by the ſheriffs, are forfeited to the king, and eſtreated into the exchequer.

DISTRESS, *real*, is made on immoveable goods. It differs from an attachment in this, that it cannot be taken by any common perſon, without the compaſs of his own fee; except it be preſently after the cattle, or other things, are driven, or borne off the ground, on purpoſe to avoid *diſtreſs*.

Diſtreſs is alſo divided into *finite*, and *infinite*.

DISTRESS, *finite*, is that limited by law, how often it ſhall be made to bring the party to trial of the action; viz. once, twice, &c.

DISTRESS, *infinite*, is without limitation, till the party come; as againſt a jury, which refuſes to appear upon certificate of aſſiſe, the proceſs is *venire facias*, *habeas corpus*, and *diſtreſs infinite*.

Laſtly, *diſtreſs* is again divided into *grand diſtreſs*, by Fitzherbert called *magna diſtrictio*; and *ordinary diſtreſs*.

DISTRESS, *grand*, is that made of all the goods and chattles the party hath within the county.

DISTRIBUTION, the act of dividing a thing into ſeveral parts, in order to the diſpoſing each in its proper place. See DIVISION.

DISTRIBUTION, in *Architecture*. DISTRIBUTION *of the plan*, denotes the dividing, and diſpenſing the ſeveral parts, and members, which compoſe the plan of a building.

DISTRIBUTION *of ornaments*, is an equal, orderly placing of the ornaments in any member, or compoſition of architecture. See ORNAMENT.

DISTRIBUTION, in *Law*; the ſurplus of an eſtate, or *pur autre vie*, is diſtributable by adminiſtrators. See ADMINISTRATORS.

For the *diſtribution* of the eſtates of inteſtates, ſee INTESTATE.

DISTRIBUTION, in *Logic*, is a kind of diviſion which diſtinguiſhes

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tinguiſhes an univerſal whole into its ſeveral kinds or ſpecies. The rules of a good *diſtribution* are much the ſame as thoſe of DIVISION.

DISTRIBUTIONS, *manual* and *quotidian*, in *Eccleſiaſtical Matters*, denote certain ſmall ſums of money, appointed by the donors, or founders thereof, to be *diſtributed* to ſuch of the canons of a chapter as are actually preſent, and aſſiſtant at certain offices.

DISTRIBUTION, in *Painting*, denotes the diſpoſition of the objects and lights in a picture. See CLAIR-OBSCURE.

DISTRIBUTION, in *Printing*, the taking a form aſunder, ſeparating the letters, and diſpoſing them in the caſes again, each in its proper cell.

DISTRIBUTION, in *Rhetoric*, is a kind of deſcription; or a figure whereby an orderly diviſion and enumeration is made of the principal qualities of a ſubject.

For example, He has underſtanding to ſee our faults, juſtice to reſtrain them, and authority to puniſh them. Their throat is an open ſepulchre; they flatter with their tongues; the poiſon of aſps is under their lips; their mouth is full of curſing, and lyes; and their feet are ſwift to ſhed blood.

DISTRIBUTIVE, that *diſtributes*, from *dis*, *aſunder*; and *tribuere*, *to give*.

DISTRIBUTIVE *juſtice*, is that whereby we give every perſon what belongs to him. See JUSTICE.

DISTRIBUTIVES, in *Grammar*. See NUMERALS.

DISTRICT, the territory, or extent of juriſdiction, of a judge.

A judge, or officer, cannot act out of his own *diſtrict*. See JUDGE.

DISTRICT, in *Law*, properly denotes the place wherein a man has the power of diſtraining; or, the circuit, or territory, wherein one may be compelled to appear.—Where we ſay, *hors de ſon fee*; others ſay, *extra aiſtrictum ſuum*.

DISTRINGAS, a writ directed to the ſheriff, or other officer, commanding him to diſtrain one for a debt to the king; or for his appearance at a certain day. See DISTRESS.

DISTRINGAS *juratores*, a writ directed to a ſheriff, whereby he is commanded to diſtrain upon a jury to appear, and to return iſſues on their lands, &c. for non-appearance. This writ iſſues for the ſheriff to have their bodies in court, &c. at the return of the writ.

DISVELOPED, in *Heraldry*, is uſed much in the ſame ſenſe with diſplayed. Thus colours, ſaid in an army to be flying, are, in heraldry, ſaid to be *diſveloped*.

DISUNITE, in the *Manege*, is uſed for a horſe that drags his haunches, that gallops falſe, or upon an ill foot. See GALLOP.

DITCH, in *Agriculture*. In marſhes, and other wet land, where there are no hedges, the common fence or incloſure for land is a *ditch*. They allow theſe *ditches* ſix foot wide againſt high-ways that are broad, and againſt commons five foot. But the common *ditches* about incloſures, dug at the bottom of the bank, on which the quick is raiſed, are three foot wide at the top, one at the bottom, and two foot deep; by this means each ſide has a ſlope, which is of great advantage; for where they neglect this, and dig them perpendicular, they are always waſhing down; beſide, in a narrow bottomed *ditch*, if cattle get down into it, they cannot ſtand to turn themſelves to crop the quick; but where the *ditch* is four foot wide, it ſhould be two and a half deep; and where it is five wide, it ſhould be three deep, and ſo in proportion.

DITCH, in *Fortification*, called alſo *foſs* and *moat*, a trench dug round the rampart, or wall of a fortified place, between the ſcarp, and counterſcarp. See *Tab. Fortif. fig.* 21. *lit. h h h*, &c.

Some *ditches* are dry; others full of water; each whereof have their advantage. The earth dug out of the *ditch* ſerves to form the rampart.

The *ditch* in front ſhould be of ſuch breadth as that the talleſt tree may not reach over it, i. e. from eighteen to twenty feet, and about ſeven or eight feet deep; and the *ditches* on the ſides are about ten feet wide, and ſix feet deep; though the rule others give for the dimenſions of the *ditch*, is, that it afford earth enough to build the rampart of due magnitude. The ſpace between the rampart and *ditch*, being about ſix feet, is called the *berm*, or *liſt*.

DITCH-*water*. See WATER.

DITHYRAMBIC, ſomething that relates to the *dithyrambus*. We ſay, a *dithyrambic* verſe, *dithyrambic* poet, *dithyrambic* heat, &c. A compound *dithyrambic* word, Mr. Dacier obſerves, has ſometimes its beauty and force. Some moderns call compoſitions which are in the taſte of an ode, only not diſtinguiſhed into ſtrophes, and conſiſting of all kinds of verſe indifferently, *dithyrambic* odes.

Dithyrambic poetry owes its birth to Greece, and the tranſports of wine. It favours ſtrongly of its original; as admitting of no rules, but the ſallies of a fiery imagination. And yet art is not quite excluded; but delicately applied, to guide and reſtrain the *dithyrambic* impetuoſity, and only indulge it in flights that are pleaſing. In effect, what our poets ſay of the ode, is more true of the *dithyrambic* than of the ode, that its diſorder is an effect of art.

DITHYRAMBUS, Διθυραμβος, in the *Ancient Poetry*, a hymn in honour of Bacchus, full of tranſport, and poetical rage.

The meaſure, which is what diſtinguiſhes this kind of poetry, is ſaid to have been invented by *Dithyrambus*, a Theban; but Pindar attributes it to the Corinthians; and the modern etymologiſts furniſh us with another origin of the word.

In effect, the verſe might be called thus from the god it was conſecrated to, who himſelf was named *Dithyrambus*; either on account of his having been brought twice into the world, according to the fable of Semele and Jupiter, or by reaſon of his having triumphed twice; from δις, *twice*; and θριαμβος, *triumph*. Be this as it will, the ancients, we are told by Ariſtotle and Horace, gave the appellation *dithyrambus* to thoſe verſes wherein none of the common rules or meaſures were obſerved; much like thoſe called by the French *vers libres*, by the Italians *verſi ſciolti*, and by the modern Greeks *politici*, a name they give to proſe, which theſe verſes reſemble more than poetry.

We have now no remains of the *dithyrambi* of the ancient poets, ſo that we cannot ſay preciſely what their meaſure was; all we know is, that it was very bold and irregular. The poets not only took the liberty to forge new words for the purpoſe, but they made double, and compound words, which contributed very much to the magnificence of the *dithyrambus*.

Horace has ſometimes imitated them. Dacier, F. Commire, and ſome other modern writers, have compoſed Latin pieces of all kinds of verſe indifferently, according as the ſubject and words preſented themſelves, without any order, or diſtribution into ſtrophes, and call them *dithyrambi*. See PINDARIC.

DITONE, DITONUM, in *Muſic*, an interval comprehending two tones, a greater and a leſs. See INTERVAL, and TONE.

The word is formed of δις, *twice*, and τονος, *tone*.

The ratio of the ſounds that form the *ditone* is of 4 to 5; and that of the *ſemi-ditone*, of 5 to 6. F. Parran makes the *ditone* the fourth kind of ſimple concords; others make it the firſt diſcord, dividing the *ditone* into eighteen equal parts, or commas, the nine on the acute ſide go to the greater tone. Salomon de Caux.

DITONICO, DIATONIC, in *Muſic*, according to Zarlino, is the pure and natural diatonic genus, or the diatonic of Didymus; in which not one of the ſounds is in the leaſt altered: ſuch is the plain chant of the church. But the *genus diatonum ditonicum* of Ptolemy, which coincides with the *diatonic* of Pythagoras, and reſults from that diviſion of a monochord bearing the name of Euclid's ſection of the canon, is expreſſed by $\frac{256}{243} \times \frac{9}{8} \times \frac{9}{8} = \frac{4}{3}$. But theſe ancient ſyſtems have juſtly been laid aſide, ſince the invention of a temperament, as being unfit for the execution of muſical compoſitions in ſeveral parts. Smith's Harmon. p. 33.

DITONICUM *Diatonum*. See GENUS.

DITRIGLYPH, in *Architecture*, the ſpace between two triglyphs. See TRIGLYPH.

DITRIHEDRIA, in *Natural Hiſtory*, the name of a genus of ſpars. The word is derived from the Greek δις, *twice*, τρις, *three*, and ἑδρα, a *ſide* or *plane*. The bodies of this genus are ſpars compoſed of twice three planes, being formed of two trigonal pyramids joined baſe to baſe, without the intervention of any intermediate column. Of this genus there are five known ſpecies. 1. One with long and pointed pyramids, found in the mines of Cornwall, and ſome other parts of England. 2. One with long and broad pyramids, found looſe in the fiſſures of the alabaſter quarries of Blanckenberg, in Germany. 3. One with ſhort and broad pyramids, found in the mines of Rammelſberg. 4. One with extremely broad depreſſed pyramids, found in the alabaſter quarries at Blanckenberg, and ſometimes in the mines of Goſſelaer in Saxony. 5. One with ſhort, but ſharp-pointed pyramids, found very frequently in the mines of the Harte Foreſt, and ſometimes on Mendip Hills with us. Hill's Foſſils, p. 218.

DITTANDER, or PEPPER-*wort*, or *Poor Man's Pepper*, *Lepidium*, in *Botany*, a genus of the *tetradynamia ſiliculoſa* claſs. Its characters are theſe: the flower has four oval petals placed in form of a croſs, and ſix awl-ſhaped ſtamina; two of which are ſhorter than the other. In the center is ſituated a heart-ſhaped germen, which turns to a ſpear-

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a ſpear-ſhaped ſeed-veſſel with two cells, divided by an intermediate partition, containing oblong ſeeds. There are ſeveral ſpecies.

The leaves of the broad-leaved *dittander*, bruiſed and mixed with hog's lard, and applied as a cataplaſm to the hips, helps the ſciatica; when chewed, they cauſe a great flux of rheum; and by that means are ſaid to help ſcrophulous humours of the throat. The women in Suffolk give them boiled in ale, to haſten the birth.

The *dittander* with a graſs leaf, or iberis, is alſo commended for its virtues in ſciaticas, when applied as the former; and hence it has been ſometimes called the *ſciatica creſs*.

DITTANY, *white*, *Dictamnus*, in *Botany*, a genus of the *decandria monogynia* claſs. Its characters are theſe: the flower hath five petals, which are unequal, and ten ſtamina, which are as long as the petals. In the center is ſituated a five-cornered germen, which afterward becomes a capſule, with five cells joined together, incloſing ſeveral roundiſh, hard, ſhining ſeeds. We have but one ſpecies, which is the white *dittany*, commonly called *fraxinella*.

There are three varieties of this plant; one with a pale red flower, ſtriped with purple; another with a white flower, and one with ſhorter ſpikes of flowers; but as they have been obſerved to vary when propagated by ſeeds, they are to be eſteemed only ſeminal varieties.

This is a very ornamental plant for gardens; and as it requires very little culture, deſerves a place in all good gardens. It hath a perennial root, which ſtrikes very deep into the ground.

The *fraxinella*, or *white dittany* of authors, is cultivated in gardens with us, and grows wild in France, Italy, and Germany. It generally grows about two foot high. The leaves much reſemble thoſe of the common aſh-tree, whence it has its name; the flowers are produced in long ſpikes, and are of a whitiſh red, mixed with purple. The cortical part of the root is ſometimes brought to us, dried and rolled up in the form of quills.

This root ſhould be choſen plump and full, white within and without, little burdened with ſmall fibres, and clean. It is alexipharmic, anthelmintic, diuretic, and uterine, but now very rarely uſed.

DITTANY, *baſtard*. See HOREHOUND.

DITTANY *of Crete*. See *Wild* MARJORAM.

DITTO, in *Books of Accounts*, written contracted D°. ſignifies the *ſame*, viz. as the preceding article.

The word is corrupted from the Italian *detto*, the *ſaid*; as in our law-phraſe "the ſaid premiſes," meaning the ſame as were aforementioned.

DIVAL, in *Heraldry*, the herb NIGHT-SHADE, a plant with poiſonous berries, looking like black cherries, uſed by ſuch as blazon with flowers and herbs inſtead of colours and metals, for ſable, or black. See SABLE.

DIVALIA, in *Antiquity*, a feaſt held among the ancient Romans on the twenty-firſt day of December, in honour of the goddeſs Angerona; whence it is alſo called ANGERONALIA.

On the day of this feaſt, the pontifices performed ſacrifice in the temple of Voluptia, or the goddeſs of joy and pleaſure, who, ſome ſay, was the ſame with Angerona; and ſuppoſed to drive away all the ſorrows and chagrins of life.

DIVAN, a council-chamber, or court, wherein juſtice is adminiſtered, in the eaſtern nations, particularly among the Turks.

Divan is an Arabic word, ſignifying the ſame with *ſopha* in the Turkiſh dialect.

There are two ſorts of *divans*, that of the grand ſignior, called the council of ſtate, which conſiſts of ſeven of the principal officers of the empire; and that of the grand vizir, compoſed of ſix other vizirs, or counſellors of ſtate, the chancellor and ſecretaries of ſtate, for the diſtribution of juſtice.

The word is alſo uſed for a hall, in the private houſes of the orientals. The cuſtom of China does not allow the receiving of viſits in the inner parts of the houſe, but only at the entry, in a *divan* contrived on purpoſe for ceremonies. Le Compte.

Travellers relate wonders of the ſilence and expedition of the *divans* of the Eaſt.

DIVAN-BEGHI, the appellation of one of the miniſters of ſtate in Perſia.

The *divan-beghi* is the ſuperintendant of juſtice; his place is the laſt of the ſix miniſters of the ſecond rank, who are all under the athemadaulet, or firſt miniſter.

To the tribunal of the *divan-beghi* appeals lie from ſentences paſſed by the governors. He has a fixed ſtipend, or appointment, of 50,000 crowns, that he may render juſtice *gratis*. All the ſerjeants, uſhers, &c. of the court, are in the ſervice of the *divan-beghi*. He takes cognizance of the criminal cauſes of the chams, governors, and other great lords of Perſia, when accuſed of any fault, and receives appeals from the daruga.

There are *divan-beghis* not only at court, and in the capital, but alſo in the provinces, and other cities of the empire.

This officer is not confined by any other law, or rule, in the adminiſtration of juſtice, but the Alcoran; which alſo he interprets at pleaſure. He takes no cognizance of civil cauſes.

DIVER, in *Ornithology*, the Engliſh name of the COLYMBUS, a genus of water birds; the characters of which are theſe: they have narrow, ſtrait, and ſharp bills; the upper mandible is the longeſt, with the edges of each bending in, the noſtrils are linear, their heads are ſmall, the tongue pointed, long and ſerrated near the baſe, their wings ſhort, their feet placed far backward on the body, and near the tail, which is ſhort, conſiſting of twenty feathers, and their legs broad and flatted, their claws broad like the nails of ones fingers. They are called *colymbi*, and in Engliſh *divers*, from their great expertneſs in diving, and long continuance under water.

There are properly two ſubordinate genera of theſe birds; the one having the feet not webbed, but the toes looſe, yet all widened by a membrane, and having no tail. Thoſe of the other genus have webbed feet like the duck, and have tails.

Of each of theſe genera there are ſeveral ſpecies. See *Tab. Birds*, N° 47. and articles DOB-*chick*, *Sea-turtle* DOVE, LUMME, and FLUDDER.

DIVER, *black*. See SCOTER.

DIVER, *dun*. See DUN-*diver*.

DIVERGENCY. For the point of *divergency* or *divergence* in *Optics*, ſee *Virtual* FOCUS.

DIVERGENT, or DIVERGING *lines*, in *Geometry*, are ſuch whoſe diſtance is continually increaſing.

Lines which converge one way, *diverge* the oppoſite way.

DIVERGENT, or DIVERGING, in *Optics*, is particularly applied to rays, which, iſſuing from a radiant point, or having in their paſſage undergone a refraction, or reflexion, do continually recede farther from each other.

In which ſenſe the word is oppoſed to *convergent*, which implies the rays to approach each other; or to tend to a center, where, being arrived, they interſect; and, if continued farther, become *diverging*.

Concave glaſſes render the rays *diverging*; and convex ones, converging.

Concave mirrors make the rays converge; and convex ones, *diverge*. See FOCUS.

It is demonſtrated, in *Optics*, that as the diameter of a pretty large pupil does not exceed $\frac{1}{5}$ of a digit; *diverging* rays, flowing from a radiant point, will enter the pupil, parallel, to all intents and purpoſes, if the diſtance of the radiant from the eye be 40,000 feet. See LIGHT, and VISION.

DIVERGING *hyperbola*, is one whoſe legs turn their convexities towards one another, and run towards quite contrary ways.

DIVERSIFYING, in *Rhetoric*, is of infinite ſervice to the orator; it is an accompliſhment eſſential to his character, and may fitly be called the ſubject of all his tropes and figures. Voſſius lays down ſix ways of *diverſifying* a ſubject. 1. By enlarging on what was briefly mentioned before. 2. By a conciſe enumeration of what had been inſiſted on at length. 3. By adding ſomething new to what is repeated. 4. By repeating only the principal heads of what had been ſaid. 5. By tranſpoſing the words and periods. 6. By imitating them. Voſſ. Rhet. lib. v. p. 281, ſeq.

DIVERSION, in *Medicine*, the turning of the courſe or flux of humours from one part to another, by proper applications.

DIVERSION, in *War*, the act of attacking an enemy in one place, where he is weak, and unprovided, with deſign to make him call his forces from another place, where he was going to make an irruption, or is to be attacked with greater force.

The Romans had no way to drive Hannibal out of Italy, but to make a *diverſion*, by attacking Carthage.

DIVERSITY. This differs from diſtinction in this, that the latter is the work of the mind; but the former is in things themſelves, antecedent to the operation of the mind. For things that are ſeveral, are different; even though I do not conceive them. See DISTINCTION.

The *diverſity*, or difference of things, therefore, ariſes from their eſſential attributes. See IDENTITY.

DIVERSITY, in *Painting*, conſiſts in giving every part or figure in a picture its proper air and attitude. The ſkilful painter has the penetration to diſcern the characters of nature, which vary in all men; whence the countenances and geſtures of the perſons he paints continually vary.

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DIVESTING, properly ſignifies undreſſing, or ſtripping off one's garment, in contradiſtinction from *inveſting*.

In law, it is uſed for the act of ſurrendering, or relinquiſhing one's effects. By a contract of donation, or ſale, the donor, or ſeller, is ſaid to be diſſeiſed, and *diveſted* of their property in ſuch a commodity, and the donee, or purchaſer, becomes *inveſted* therewith. See INVESTITURE.

A demiſe is a general *diveſtiture*, which the fathers and mothers make of all their effects, in favour of their children.

DIVIDEND, in *Arithmetic*, the number given to be divided; or that whereof the diviſion is made.

The *dividend* muſt always be greater than the diviſor. The *dividend* contains the diviſor as many times as the quotient contains unit.

DIVIDEND *of a bankrupt's eſtate*, is that part which is diſtributed to every creditor in proportion to his debt.

DIVIDEND, in the *Exchequer*, is one part of an indenture. 10 Ed. I. c. 11.

DIVIDEND, in *Law*, is uſed for a dividing of fees and perquiſites between officers of court, ariſing from writs, &c.

DIVIDEND *of ſtocks*, is a ſhare, or proportion of the intereſt of ſtocks erected on public funds, as the South Sea, India, Bank, &c. divided among, and payable half-yearly to the ſtock-holders: and the orders they have for receiving theſe *dividends*, are called *dividend-warrants*. Stealing any *dividend-warrants* of the Bank, South Sea Company, Eaſt India Company, or of any other corporation, is made felony, with or without benefit of clergy, in the ſame manner as if the offender had ſtolen, or taken by robbery, goods to the value of the money due on ſuch *dividend-warrants*. Stat. 2 Geo. II. c. 25.

DIVIDEND, in the *Univerſity*, is that part or ſhare, which every one of the fellows equally divide among themſelves, of their annual ſtipend.

DIVIDIVI, the name of a drug brought from the Caraccas into Spain in 1769; and which, by experiments that have been made upon it at Madrid, is found to be preferable to galls in dying black.

DIVIDUAL, in *Arithmetic*, is uſed for that part of the dividend, diſtinguiſhed by a point, in working by the rule of diviſion.

DIVINATION, the pretended act, or art, of foretelling future events. This art or ſcience, in which the pagans thought themſelves ſure of ſucceſs, if they proceeded according to certain eſtabliſhed rules, was founded in their ſyſtem of theology. They had deified all the parts and powers of nature, and more eſpecially the heavenly bodies; aſcribing to the latter not only life and intelligence, but a fore-perceiving motion, and a ſovereign influence on every thing here below. They had alſo other gods beſides the objects of nature, viz. DÆMONS, from whoſe ſubordinate miniſtry and mediation, *divination*, prophecy, and magic were ſuppoſed to proceed. Ammian. Marcell. lib. i. c. 1. Herod. lib. ii. c. 83. Plato in Symp. in Epinomide, in Phædra. Porphyr. ap. Euſeb. Præp. Evan. lib. iv. v. vi. & de Abſtinentia, lib. ii. Jamblich. de Myſter. Apul. Apol. Id. de Deo Socrat. Diogen. Laert. in Vita Pythag. lib. xxxii. p. 514. Farmer on Miracles, chap. iii. ſect. 3. See PROPHECY, ENTHUSIASM, &c.

Divination proceeded originally from the Egyptians to the Jews, Greeks, and Romans; and was divided by the ancients into *artificial*, and *natural*.

DIVINATION, *Artificial*, is that which proceeds by reaſoning upon certain external ſigns, conſidered as indications of futurity.

DIVINATION, *Natural*, is that which preſages things from a mere internal ſenſe, and perſuaſion of the mind, under a particular emotion or agitation, without any aſſiſtance of ſigns.

Plutarch, in his book De Defectu Oraculorum, allows that DÆMONS might be appointed by the gods to preſide over *divination* and oracles, and to be the guardians of the temperature of thoſe exhalations, to which they are aſcribed; but at the ſame time it is aſſerted, that the ſoul is naturally endued with the faculty of divining, and that certain exhalations of the earth were the means of exciting the prophetic power or virtue. P. 418, D. and p. 436, F.

Natural divination, again, is of two kinds; the one *native*, the other by *influx*.

The firſt is founded on this ſuppoſition, that the ſoul, which was thought to be a particle of the divine air or ſpirit, taken out from God, and to have exiſted from eternity, collected within itſelf, and not diffuſed, or divided among the organs of the body, has, from its own nature and eſſence, ſome fore-knowlege of future things: witneſs what is ſeen in dreams, extaſies, the confines of death, &c.

The ſecond is founded on this, that the ſoul receives, after the manner of a mirror, ſome ſecondary illumination from the preſence of God, and other ſpirits: and hence proceeded ORACLES.

DIVINATION, *Artificial*, is alſo of two kinds: the one arguing from natural cauſes: ſuch are the predictions of phyſicians about the events of diſeaſes, from the pulſe, urine, &c. ſuch alſo are thoſe of the politician, *O venalem urbem, & mox perituram, ſi emptorem inveneris!*

The ſecond proceeds from experiments and obſervations arbitrarily inſtituted, and is moſtly ſuperſtitious.

Infinite are the ſyſtems of *divination* reducible to this head; by birds, the entrails of beaſts, dreams, lines of the hand, points marked at random, numbers, names, the motion of a ſieve, the air, fire, the SORTES *Præneſtinæ*, *Virgilianæ*, and *Homericæ*; with numerous others, the principal ſpecies whereof, and their names, are:

Pſychomancy, or ſciomancy, which conſiſts in calling up the ſouls, or ſhades of the deceaſed, to learn of them ſomething required. Dactyliomancy, performed by means of one, or more rings. Hydromancy, performed with ſea-water. Pegomancy, with ſpring-water. Ornithomancy, or divining by the flight of birds, which was the buſineſs of the augurs. Clidomancy, performed with keys. Coſcinomancy, with a riddle, or ſieve. Cledoniſm, by words, or voice. Extiſpicina, by the entrails of victims. Alphitomancy, or aleuromancy, by flour. Keraunoſcopia, by the conſideration of thunder. Capnomancy, by ſmoke. Alectryomancy, by cocks. Pyromancy, by fire. Lithomancy, by ſtones. Eychnomancy, by lamps. Necromancy, by the dead, or their bones, &c. Oneirocritica, by dreams. Ooſcopy, by eggs. Lecanomancy, by a baſon of water. Gaſtromancy, by the belly, or by phials. Palpitation, ſaliſſatio, παλμος, by the pulſation, or motion of ſome member. Axinomancy, by a hatchet, or cleaver. Catoptromancy, or cryſtallomancy, by a mirror. Chiromancy, by the lines of the hand. Geomancy, by the earth. Ceromancy, by figures of wax. Arithmomancy, by numbers. Belomancy, by arrows. Sycomancy, &c. all deſcribed by Cardan, in his fourth book, De Sapientia; and under their proper articles in this Dictionary.

All theſe kinds of *divination* have been condemned by the fathers, and councils, as ſuppoſing ſome compact with the devil: though ſome of them, as well as the heathen philoſophers, contended for the ſupernatural power and efficacy of pagan *divination* and ſorcery. Euſeb. Præp. Ev. lib. v. c. 4. Aug. de Civ. Dei. lib. viii. c. 16. Farmer on Miracles, ubi ſupra.

Fludd has ſeveral treatiſes on the different ſpecies of *divination:* and Cicero has two books of the *divination* of the ancients, in which the ſeveral kinds of it are explained; and which he reſolves into many cauſes very different from that of an immediate revelation from ſome ſpiritual being.

In Holy Scripture, we find mention made of nine different kinds of *divination:* the firſt performed by the inſpection of planets, ſtars, and clouds: it is ſuppoſed to be the practiſers of this, whom Moſes calls מעונן *meonen*, of אנן *anan*, *cloud*, Deuter. chap. xviii. ver. 10. 2. Thoſe, whom the prophet calls in the ſame place מנחש *menacheſeh*; which the Vulgate, and generality of interpreters, render *augur*. 3. Thoſe, who in the ſame place are called מכשף *mecaſheph*; which the Septuagint and Vulgate tranſlate, *a man given to ill practices*. 4. Such authors, whom Moſes in the ſame chapter, ver. 11. calls חובר *hhober*. 5. Thoſe, who conſult the ſpirits called *Python*; or, as Moſes expreſſes it in the ſame book, אוב אשל, *thoſe who aſk queſtions of Python*. 6. Witches, or magicians, whom Moſes calls ידעני *judeoni*. 7. Thoſe, who conſult the dead, *necromancers*. 8. The prophet Hoſea, chap. iv. ver. 12. mentions ſuch as conſult ſtaves, שאל מקלי; which kind of *divination* may be called *rhabdomancy*. 9. The laſt kind of *divination* mentioned in Scripture is *hepatoſcopy*, or the conſideration of the liver. See RHABDOMANCY, MAGICIANS, &c.

DIVINE, ſomething that comes from, or relates to GOD.

The word is alſo uſed figuratively, for any thing that is excellent, extraordinary, and that ſeems to go beyond the power of nature, and the capacity of mankind.

In which ſenſe, the compaſs, teleſcope, clocks, &c. are ſaid to be *divine* inventions: Plato is called the *divine author*, the *divine Plato*; and the ſame appellation is given to Seneca: Hippocrates is called the *divine old man*, *divinus ſenex*, &c. The Arabs give the appellation *divine*, אלהון *elahioun*, to their ſecond ſect of philoſophers, conſiſting of ſuch as admit a firſt mover of all things, a ſpiritual ſubſtance free from all kind of matter; in a word, a God. By this name they diſtinguiſh them from their firſt ſect, whom they call *deberioun*, or *thabaioun*, i. e. *worldlings*, and *naturaliſts*, as admitting of no principles beyond the material world, and nature.

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The word אלהיון *elahioun* is derived from אלא *Alla, God:* ſo that the *elahioun* are the *divines*, or *theologues*, as Caſtellus renders it; or, ſuch as own a God.

DIVING, the art, or act of deſcending under water, to conſiderable depths, and abiding there a competent time.

The uſes of *diving* are very conſiderable, particularly in the fiſhing for pearls, corals, ſponges, &c. See PEARL-*fiſhing*.

There have been divers methods propoſed, and engines contrived, to render the buſineſs of *diving* more ſafe and eaſy. The great point in all theſe is to furniſh the *diver* with freſh air, without which, he muſt either make but a ſhort ſtay, or periſh.

Thoſe who *dive* for ſponges in the Mediterranean, help themſelves by carrying down ſponges dipt in oil in their mouths. But conſidering the ſmall quantity of air that can be contained in the pores of a ſponge, and how much that little will be contracted by the preſſure of the incumbent air, ſuch a ſupply cannot long ſubſiſt the *diver*. For it is found by experiment, that a gallon of air included in a bladder, and by a pipe reciprocally inſpired and expired by the lungs, becomes unfit for reſpiration in little more than one minute of time. For though its elaſticity be but little altered in paſſing the lungs, yet it loſes its vivifying ſpirit, and is rendered effete.

In effect, a naked *diver*, Dr. Halley aſſures us, without a ſponge, cannot remain above two minutes incloſed in water; nor much longer with one, without ſuffocating; nor without long practice, near ſo long; ordinary perſons beginning to be ſuffocated in about half a minute. Beſides, if the depth be conſiderable, the preſſure of the water in the veſſels makes the eyes blood-ſhotten, and frequently occaſions a ſpitting of blood.

Hence, where there has been occaſion to continue long at the bottom, ſome have contrived double flexible pipes, to circulate air down into a cavity incloſing the *diver*, as with armour, both to furniſh air, and to bear off the preſſure of the water, and give leave to his breaſt to dilate upon inſpiration; the freſh air being forced down one of the pipes with bellows, and returning by the other of them, not unlike to an artery, and vein.

But this method is impracticable when the depth ſurpaſſes three fathoms; the water embracing the bare limbs ſo cloſely, as to obſtruct the circulation of the blood in them; and withal preſſing ſo ſtrongly on all the junctures where the armour is made tight with leather; that if there be the leaſt defect in any of them, the water ruſhes in, and inſtantly fills the whole engine, to the great danger of the *diver*'s life.

DIVING-*bell*, is a machine contrived to remedy all theſe inconveniences. In this the *diver* is ſafely conveyed to any reaſonable depth, and may ſtay more or leſs time under the water, as the bell is greater or leſs.

It is moſt conveniently made in form of a truncated cone, the ſmalleſt baſe being cloſed, and the larger open. It is to be poiſed with lead, and ſo ſuſpended, that it may ſink full of air, with its open baſis downward, and as near as may be in a ſituation parallel to the horizon, ſo as to cloſe with the ſurface of the water all at once.

Under this covercle the *diver* ſitting, ſinks down with the included air to the depth deſired; and if the cavity of the veſſel can contain a ton of water, a ſingle man may remain a full hour, without much inconvenience, at five or ſix fathoms deep.

But the lower you go, ſtill the more the included air contracts itſelf, according to the weight of the water that compreſſes it; ſo that at thirty-three feet deep, the bell becomes half full of water; the preſſure of the incumbent water being then equal to that of the atmoſphere; and at all other depths, the ſpace occupied by the compreſſed air in the upper part of the bell, will be to the under part of its capacity filled with water, as thirty-three feet to the depth of the ſurface of the water in the bell below the common ſurface thereof. And this condenſed air, being taken in with the breath, ſoon inſinuates itſelf into all the cavities of the body, and has no ill effect, provided the bell be permitted to deſcend ſo ſlowly as to allow time for that purpoſe.

One inconvenience that attends it, is found in the ears, within which there are cavities which open only outwards, and that by pores ſo ſmall, as not to give admiſſion even to the air itſelf, unleſs they be dilated and diſtended by a conſiderable force. Hence, on the firſt deſcent of the bell, a preſſure begins to be felt on each ear, which, by degrees, grows painful, till the force overcoming the obſtacle, what conſtringes theſe pores, yields to the preſſure, and letting ſome condenſed air ſlip in, preſently eaſe enſues. The bell deſcending lower, the pain is renewed, and afterwards it is again eaſed in the ſame manner.

But the greateſt inconvenience of this engine is, that the water entering it, contracts the bulk of air into ſo ſmall a compaſs, that it ſoon heats, and becomes unfit for reſpiration: ſo that there is a neceſſity for its being drawn up to recruit it; beſides the uncomfortable abiding of the *diver*, who is almoſt covered with water.

To obviate the difficulties of the *diving-bell*, Dr. Halley, to whom we owe the preceding account, contrived ſome farther apparatus, whereby not only to recruit and refreſh the air from time to time, but alſo to keep the water wholly out of it at any depth; which he effected after the following manner:

His *diving-bell* (ſee *Tab. Hydraulics, fig.* 1.) was of wood, three feet wide at top, five feet at bottom, and eight feet high, containing about ſixty-three cubic feet in its concavity, coated externally with lead ſo heavy, that it would ſink empty; a particular weight being diſtributed about its bottom R, to make it deſcend perpendicularly, and no otherwiſe. In the top was fixed a meniſcus glaſs D, concave downwards, like a window, to let in light from above; with a cock, as at B, to let out the hot air; and a circular ſeat, as at L M, for the *divers* to ſit on: and, below, about a yard under the *bell*, was a ſtage ſuſpended from it by three ropes, each charged with a hundred weight, to keep it ſteady, and for the *divers* to ſtand upon to do their buſineſs. The machine was ſuſpended from the maſt of a ſhip by a ſprit, which was ſecured by ſtays to the maſt-head, and was directed by braces to carry it overboard clear of the ſide of the ſhip, and to bring it in again.

To ſupply air to this *bell* when under water, he had a couple of barrels, as C, holding thirty-ſix gallons each, caſed with lead, ſo as to ſink empty, each having a bung-hole at bottom, to let in the water as they deſcended, and let it out again as they were drawn up again. In the top of the barrels was another hole, to which was fixed a leathern pipe, or hoſe, well prepared with bees wax and oil, long enough to hang below the bung-hole; being kept down by a weight appended. So that the air driven to the upper part of the barrel by the encroachment of the water, in the deſcent, could not eſcape up this pipe, unleſs the lower end were lifted up.

Theſe air-barrels were fitted with tackle, to make them riſe and fall alternately, like two buckets; being directed in their deſcent by lines faſtened to the under edge of the *bell*; ſo that they came readily to the hand of a man placed on the ſtage, to receive them; and who taking up the ends of the pipes, as ſoon as they came above the ſurface of the water in the barrels, all the air included in the upper part thereof was blown forcibly into the *bell*; the water taking its place.

One barrel thus received, and emptied; upon a ſignal given, it was drawn up, and at the ſame time the other let down; by which alternate ſucceſſion freſh air was furniſhed ſo plentifully, that the learned doctor himſelf was one of five, who were all together in nine or ten fathoms deep of water for above an hour and a half, without the leaſt inconvenience; the whole cavity of the *bell* being perfectly dry.

All the precaution he obſerved, was, to be let down gradually about twelve feet at a time, and then to ſtop, and drive out the water that had entered, by taking in three or four barrels of freſh air, before he deſcended farther. And, being arrived at the depth intended, he let out as much of the hot air that had been breathed, as each barrel would replace with cold, by means of the cock B, at the top of the *bell*, through whoſe aperture, though very ſmall, the air would ruſh with ſo much violence, as to make the ſurface of the ſea boil.

Thus, he found, any thing could be done that was required to be done underneath. And by taking off the ſtage, he could, for a ſpace as wide as the circuit of the *bell*, lay the bottom of the ſea ſo far dry as not to be overſhoes therein. Beſides, that by the glaſs-window ſo much light was tranſmitted, that, when the ſea was clear, and eſpecially when the ſun ſhone, he could ſee perfectly well to write or read, much more to faſten, or lay hold of any thing under him that was to be taken up. And by the return of the air-barrel he often ſent up orders written with an iron pen or a plate of lead, directing how he would be moved from place to place.

At other times, when the water was troubled and thick, it would be as dark as night below; but in ſuch caſes he was able to keep a candle burning in the *bell*.

Dr. Halley obſerves, that they were ſubject to one inconvenience in this *bell*; they felt at firſt a ſmall pain in their ears, as if the end of a tobacco-pipe were thruſt into them; but after a little while there was a ſmall puff of air, with a little noiſe, and they were eaſy. This he ſuppoſes to be occaſioned by the condenſed air ſhutting up a valve leading from ſome cavity in the ear, full of common air; but when the condenſed air preſſed harder, it forced the valve to yield, and filled every cavity. One

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of the *divers*, in order to prevent this preſſure, ſtopped his ear with a pledget of paper; which was puſhed in ſo far, that a ſurgeon could not extract it without great difficulty.

The ſame author intimates, that by an additional contrivance he has found it practicable for a *diver* to go out of the *bell* to a good diſtance from it; the air being conveyed to him in a continued ſtream by ſmall flexible pipes, which ſerve him as a clue to direct him back again to the *bell*. For this purpoſe, one end of one of theſe pipes, kept open againſt the preſſure of the ſea, by a ſmall ſpiral wire, and made tight without by painted leather, and ſheep's guts drawn over it, being open, was faſtened in the *bell*, as at P, to receive air, and the other end was fixed to a leaden cap on the man's head, reaching down below his ſhoulders, open at bottom, to ſerve him as a little *bell*, full of air, for him to breathe at his work, which would keep out the water from him, when at the level of the great *bell*, becauſe of the ſame denſity as the air in the great *bell*. But when he ſtooped down lower than the level of the great *bell*, he ſhut the cock F, to cut off the communication between the two *bells*. Phil. Tranſ. abr. vol. iv. part ii. p. 188, &c. vol. vi. p. 550, &c.

The air in this *bell* would ſerve him for a minute or two; and he might inſtantly change it, by raiſing himſelf above the great *bell*, and opening the cock F. The *diver* was furniſhed with a girdle of large leaden weights, and clogs of lead for the feet, which, with the weight of the leaden cap, kept him firm on the ground; he was alſo well cloathed with thick flannels, which being firſt made wet, and then warmed in the *bell* by the heat of his body, kept off the chill of the cold water for a conſiderable time, when he was out of the *bell*.

Mr. Martin Triewald, F. R. S. and military architect to his Swediſh majeſty, contrived to conſtruct a *diving-bell* on a ſmaller ſcale, and leſs expence, than that of Dr. Halley, and yet capable of anſwering the ſame intents and purpoſes. This *bell*, AB (*fig.* 2.) ſinks with leaden weights DD, ſuſpended from the bottom of it. It is made of copper, and tinned all over on the inſide; three ſtrong convex lenſes GGG, defended by the copper-lids HHH, illuminate this *bell*. The iron plate E ſerves the *diver* to ſtand upon, when he is at work; this is ſuſpended by chains FFF, at ſuch a diſtance from the bottom of the *bell*, that when he ſtands upright, his head is juſt above the water in the *bell*, where he has the advantage of air fitter for reſpiration, than when he is much higher up; but as there is occaſion for the *diver* to be wholly in the *bell*, and conſequently his head in the upper part of it, Mr. Triewald has contrived, that, even there, after he has breathed the hot air as long as he well can, by means of a ſpiral copper tube *b c*, placed cloſe to the inſide of the *bell*, he may draw the cooler and freſher air from the lowermoſt parts; for which purpoſe a flexible leather-pipe, about two feet long, is fixed to the upper end of the tube at *b*; and to the other end of the pipe is faſtened an ivory mouth-piece, for the *diver* to hold in his mouth, by which to reſpire the air from below. We ſhall only remark, that as air rendered effete by reſpiration is ſomewhat heavier than common air, it muſt naturally ſubſide in the *bell*; but it may probably be reſtored by the agitation of the ſea-water, and thus become fitter for reſpiration. See *Fixed* AIR. Phil. Tranſ. abr. vol. viii. p. 634. or Deſaguliers's Exper. Phil. vol. ii. p. 220, &c.

The famous Corn. Drebell had an expedient in ſome reſpects ſuperior even to the *diving-bell*, if what is related of it be true. He contrived not only a veſſel to be rowed under-water, but alſo a liquor to be carried in the veſſel, which ſupplied the place of freſh air.

The veſſel was made for king James I. carrying twelve rowers, beſides the paſſengers. It was tried in the river Thames; and one of the perſons in that ſubmarine navigation, then living, told it one, from whom Mr. Boyle had the relation.

As to the liquor, Mr. Boyle aſſures us, he diſcovered by a phyſician, who married Drebell's daughter, that it was uſed from time to time, when the air in that ſubmarine boat was clogged by the breath of the company, and rendered unfit for reſpiration: at which time, by unſtopping the veſſel full of this liquor, he could ſpeedily reſtore to the troubled air ſuch a proportion of vital parts, as would make it ſerve again a good while. The ſecret of this liquor Drebell would never diſcloſe to above one perſon, who himſelf aſſured Mr. Boyle what it was. Boyle's Exp. Phyſ. Mech. of the Spring of the Air.

We have had many projects of *diving* machines, and *diving* ſhips of various kinds, which have proved abortive.

DIVING-*bladder*, a term uſed by Borelli for a machine, which he contrived for *diving* under the water to great depths, with great facility, and prefers to the common *diving-bell*. The veſica, or *bladder*, as it is uſually called, is to be of braſs or copper, and about two foot in diameter. This is to contain the *diver's* head, and is to be fixed to a goat's ſkin habit, exactly fitted to the ſhape of the body of the perſon. Within this veſica there are pipes, by means of which a circulation of air is contrived; and the perſon carries an air-pump by his ſide, by means of which he may make himſelf heavier or lighter, as the fiſhes do, by contracting or dilating their air-bladder: by this means, the objections all other *diving* machines are liable to are obviated, and particularly that of the air; the moiſture by which it is clogged in reſpiration, and by which it is rendered unfit for the ſame uſe again, being here taken from it by its circulation through the pipes, to the ſides of which it adheres, and leaves the air as free as before. Borelli Opera Poſthuma.

DIVINITY, the quality, nature, and eſſence, of God.

It is falſly, that the atheiſts hold the notion of a *divinity* to be a political invention of the ancient legiſlators, to ſecure and enforce the obſervation of their laws: on the contrary, it is certain, the legiſlators made uſe of that opinion, which they found already impreſſed on the minds of the people.

The *heathen divinities* may be reduced to three claſſes: the firſt *theological*, repreſenting the *divine* nature under divers attributes: thus Jupiter denotes the abſolute power of God, Juno his juſtice, &c.

The ſecond claſs of *divinities* are *phyſical:* thus Æolus is that power in nature, whereby vapours and exhalations are collected to form winds, &c.

The laſt are *moral divinities*. Thus the Furies are only the ſecret reproaches and ſtings of conſcience.

DIVINITY is alſo uſed in the ſame ſenſe with THEOLOGY.

DIUIOHU, in *Botany*, a name given by the people of Guinea to a ſpecies of plant, with which they uſe to ripen or break boils, beating the leaves, and laying them on.

DIVISIBILITY, a paſſive power, or property in quantity, whereby it becomes ſeparable into parts; either actually, or at leaſt mentally.

The ſchoolmen define *diviſibility*, *capacitas coextenſionis cum pluribus*; a capacity of being co-extended with ſeveral things: thus, a ſtaff four feet long is *diviſible*, becauſe it may be co-extended with four feet, or forty-eight inches, &c.

This the Peripatetics and Carteſians univerſally hold an affection, or property of all matter, or body: the Carteſians, as holding the eſſence of matter to conſiſt in extenſion; for every part, or corpuſcle of the body, being extended, has parts including other parts, and conſequently is *diviſible*.

The Epicureans, again, hold *diviſibility* to agree to every phyſical continuum, as, without parts adjacent to parts, there can be no continuity; and wherever there are parts ſo adjacent, there muſt be *diviſibility*. But they deny, that this affection agrees to all bodies; for the primary corpuſcles, or atoms, they hold perfectly inſecable, and indiviſible.

The principal argument they allege is, that, from the *diviſibility* of all body, and of every aſſignable particle of body, even after any repeated number of diviſions, it follows, that the ſmalleſt corpuſcle is infinitely *diviſible*, which with them is an abſurdity. For a body can only be divided into ſuch parts as it actually contains. But to ſuppoſe infinite parts in the ſmalleſt corpuſcle, ſay they, is to ſuppoſe it infinitely extended: for infinite parts placed externally to each other, as the parts of bodies doubtleſs are, muſt make an infinite extenſion.

They add, that there is a great difference between the *diviſibility* of phyſical, and mathematical quantities. For every mathematical quantity, or dimenſion, they grant, may be increaſed and diminiſhed infinitely; but phyſical quantity, neither the one nor the other.

An artiſt, dividing a continued body, arrives at certain minute parts, beyond which he cannot go; theſe we may call *minima artis*. In like manner, nature, which may begin where art ends, will find bounds; which we may call *minima naturæ*; and God, whoſe power is infinite, beginning where nature ends, may ſubdivide the *minima naturæ*; but he will at length come at certain parts, to which there being no other parts continuous, they cannot be taken away. Theſe minute parts are ATOMS.

All we can ſay on this ſubject is, that on the one hand it is certain, every extended corpuſcle muſt have two ſides, and conſequently is *diviſible*; for, if it had not two ſides, it were not extended; and if it had no extenſion, an aſſemblage of divers ſuch corpuſcles would not compoſe a body. And on the other hand, the infinite *diviſibility* ſuppoſes an infinity of parts in the minuteſt corpuſcle; whence it follows, that there is no body, how ſmall ſoever,

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ever, but may furniſh as many ſurfaces, or parts, as the whole globe of the earth can; nay, and infinitely more; which, to ſay no worſe, is a ſtrange paradox.

The infinite *diviſibility* of mathematical quantity is thus proved, and illuſtrated by the mathematicians: ſuppoſe a line AD (*Tab.* II. *Geometry*, *fig.* 27.) perpendicular to BF; another as GH, at a ſmall diſtance from A, alſo perpendicular to the ſame line; with the centers C, C, C, &c. and diſtances CA, CA, &c. deſcribe circles cutting the line GH in the points *e*, *e*, &c. Now, the greater the radius AC is, the leſs is the part *e*G; but the radius may be augmented *in infinitum*, and therefore the part *e*G may be diminiſhed in the ſame manner; and yet it can never be reduced to nothing; becauſe the circle can never coincide with the right line BF. Conſequently, the parts of any magnitude may be diminiſhed *in infinitum*.

The chief objections againſt this doctrine are, that an infinite cannot be contained by a finite; and that it follows from a *diviſibility in infinitum*, either that all bodies are equal, or that one infinite is greater than another. To which it is anſwered, that to an infinite may be attributed the properties of a finite and determined quantity; and who has ever proved, that there could not be an infinite number of parts infinitely ſmall in a finite quantity; or that all infinites are equal? The contrary is demonſtrated by mathematicians in innumerable inſtances. We are not here contending for the poſſibility of an actual diviſion *in infinitum*: we only aſſert, that however ſmall a body is, it may be ſtill farther divided; which we imagine may be called a diviſion *in infinitum*, becauſe what has no limits, is called *infinite*.

All that is ſuppoſed, in ſtrict geometry, concerning the *diviſibility* of magnitude, amounts to no more, than that a given magnitude may be conceived to be divided into a number of parts, equal to any given or propoſed number. It is true, that the number of parts, into which a given magnitude may be conceived to be divided, is not to be fixed or limited, becauſe no given number is ſo great but a greater may be conceived and aſſigned; but there is not, therefore, any neceſſity of ſuppoſing the number of parts actually infinite; and if ſome have drawn very abſtruſe conſequences from ſuch a ſuppoſition, yet geometry ought not to be loaded with them. Mac-Laurin's Fluxions, art. 290. See EXTENSION.

It is true, that there are no ſuch things as parts infinitely ſmall; yet the ſubtilty of the particles of ſeveral bodies is ſuch, that they very much ſurpaſs our conception; and there are innumerable inſtances in nature of ſuch parts actually ſeparated from one another.

Mr. Boyle gives us ſeveral inſtances of this. He ſpeaks of a ſilken thread 300 yards long, that weighed but two grains and an half. He meaſured leaf-gold, and found by weighing it, that fifty ſquare inches weighed but one grain: if the length of an inch be divided into 200 parts, the eye may diſtinguiſh them all; therefore there are in one ſquare inch 40000 viſible parts; and in one grain of it there are 2000000 of ſuch parts; which viſible parts no one will deny to be farther *diviſible*.

Again, a whole ounce of ſilver may be gilt with eight grains of gold, which may be afterwards drawn into a wire thirteen thouſand feet long.

In odoriferous bodies we can ſtill perceive a greater ſubtilty of parts, and even ſuch as are actually ſeparated from one another; ſeveral bodies ſcarce loſe any ſenſible part of their weight in a long time, and yet continually fill a very large ſpace with odoriferous particles.

The particles of LIGHT, if light conſiſts of real particles, furniſh another ſurpriſing inſtance of the minuteneſs of ſome parts of matter. A lighted candle placed on a plane will be viſible two miles, and conſequently fill a ſphere, whoſe diameter is four miles, with luminous particles, before it has loſt any ſenſible part of its weight. And as the force of any body is directly in proportion to its quantity of matter multiplied by its velocity; and ſince the velocity of the particles of light is demonſtrated to be at leaſt a million of times greater than the velocity of a cannon ball, it is plain, that if a million of theſe particles were round, and as big as a ſmall grain of ſand, we durſt no more open our eyes to the light, than expoſe them to ſand-ſhot point-blank from a cannon.

By help of microſcopes, ſuch objects as would otherwiſe eſcape our ſight, appear very large: there are ſome ſmall animals ſcarce viſible with the beſt microſcopes; and yet theſe have all the parts neceſſary for life, as blood, and other liquors. How wonderful muſt the ſubtilty of the parts be, which make up ſuch fluids! See ANIMALCULES.

Whence is deducible the following theorem:

Any particle of matter, how ſmall ſoever, and any finite ſpace, how large ſoever, being given; it is poſſible for that ſmall ſand, or particle of matter, to be diffuſed through all that great ſpace, and to fill it in ſuch manner, as that there ſhall be no pore in it, whoſe diameter ſhall exceed any given line; as is demonſtrated by Dr. Keil. Introduct. ad Ver. Phyſ.

DIVISION, the act of ſeparating a whole into the parts it contains.

If the whole be compoſed of parts really diſtinct, called *integral parts*, the *diviſion* made thereof is properly called *partition*; as when a houſe is divided into its apartments.

If the whole be compoſed of parts, called *ſubjective*; that is, if the whole be only one common term, the ſubjects compriſed in the extent whereof are the parts, the *diviſion* thereof is what we properly call *diviſion*: ſuch is the *diviſion* of a genus into its ſpecies, &c.

DIVISION, in *Algebra*, or *Species*, is performed by reducing the dividend and diviſor into the form of a fraction: this fraction being the quotient.

Thus, if ab were to be divided by cd, it muſt be placed thus, $\frac{ab}{cd}$, and that fraction is the quotient; though others chooſe to write it thus, $cd)\ ab$, or $cd : ab$, or $ab \div cd$, which laſt mark $\div$ is the moſt common character for *diviſion*.

To perform the work of *diviſion* algebraically, theſe rules are to be obſerved: 1. When the dividend is equal to the diviſor, the quotient is unity, and muſt be placed in the quotient, becauſe every thing contains itſelf once.

2. When the quotient is expreſſed fraction-wiſe (as in ſimple *diviſion*) if the ſame letters are found equally repeated in each member of the numerator, and denominator; caſt away thoſe letters, and the remainder is the quotient: thus, $\frac{ab}{a})\ a$, and $\frac{abc}{ab}(c$, &c.

3. When there are any co-efficients, divide them as in common arithmetic, or divide them by any common meaſure, and to the quotients annex the quantities expreſſed by letters: thus, $\frac{360\,ab}{24\,b}(=15\,a$.

4. The general way of *diviſion* of compound quantities, after ranging them according to the dimenſions of one of their letters, is like the ordinary way in common arithmetic, reſpect being had to the rules of algebraic addition, ſubtraction, and multiplication; as alſo that the like ſigns give +, and unlike — in the quotient; taking care to divide every part of the dividend by its correſponding diviſor (that is, that whoſe letters ſhew it of the ſame kind with the other), to prevent a fraction, which would otherwiſe ariſe: thus,

$$\begin{array}{l} a+b)\ aa+ab-ca-cb\ (a-c \\ \underline{aa+ab} \\ 0 \\ \qquad\quad 0-ca-cb \\ \qquad\quad \underline{-ca-cb} \\ \qquad\quad 0 \end{array}$$

That the ſame reaſon for like ſigns giving a poſitive, and unlike a negative quotient, does hold in *diviſion*, as in multiplication, is clear from conſidering the nature of *diviſion* (which is only reſolving the thing into its parts); conſequently, ſince every dividend is nothing elſe but the product of the diviſor and quotient multiplied by each other, the quotient muſt conſiſt of ſuch ſigns, which could produce the dividend; therefore, if the dividend be divided by a quantity, that has a ſimilar ſign with it, the quotient muſt be poſitive; if by a quantity having a diſſimilar ſign, the quotient muſt be negative.

It may be a general rule in compound *diviſion* in algebra, always to place ſuch a letter in the quotient, as will, when multiplied into the diviſor, produce the dividend; for that is always a rectangle under the diviſor, and the quotient: as for example,

$$\begin{array}{l} zz-16)\ z^6-8z^4-124\,zz-64\ (z^4+8zz+4. \\ \qquad z^6-16z^4 \\ \qquad \underline{\qquad\qquad} \\ \qquad\quad 8z^4-124\,zz \\ \qquad\quad 8z^4-128\,zz \\ \qquad\quad \underline{\qquad\qquad} \\ \qquad\qquad\quad 4zz-64 \\ \qquad\qquad\quad 4zz-64 \\ \qquad\qquad\quad \underline{\qquad\qquad} \\ \qquad\qquad\quad 0 \end{array}$$

In ſome caſes the quotient will form an *infinite* SERIES, and then it is uſual to ſet down the laſt remainder with the diviſor under it.

DIVISION, in *Arithmetic*, is the laſt of the four fundamental rules, being that whereby we find how often a leſs quantity is contained in a greater; and the overplus.

Diviſion, in reality, is only a compendious method of ſubtraction; its effect being to take a leſs number from another greater, as often as poſſible; that is, as oft as it is contained therein. There are, therefore, three numbers

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bers concerned in *diviſion*: 1. That given to be divided, called the *dividend*. 2. That whereby the dividend is to be divided, called the *diviſor*. 3. That which expreſſes how often the diviſor is contained in the dividend; or the number reſulting from the *diviſion* of the dividend by the diviſor, called the *quotient*.

There are diverſe ways of performing *diviſion*, one called the *Engliſh*, another the *Flemiſh*, another the *Italian*, another the *Spaniſh*, another the *German*, and another the *Indian* way, all equally juſt, as finding the quotient with the ſame certainty, and only differing in the manner of arranging, and diſpoſing the numbers.

We have likewiſe *diviſion* in integers; *diviſion* in fractions; and *diviſion* in ſpecies, or algebra.

Diviſion is performed by ſeeking how often the diviſor is contained in the dividend; and when the latter conſiſts of a greater number of figures than the former, the dividend muſt be taken into parts, beginning from the left, and proceeding to the right, and ſeeking how often the diviſor is found in each of thoſe parts.

For example, it is required to *divide* 6759 by 3. I firſt ſeek how oft 3 is contained in 6, viz. twice; then, how oft in 7, which is likewiſe twice, with one remaining. This 1, therefore, is joined to the next figure 5, which makes 15, and I ſeek how oft 3 in 15; and laſtly, how oft 3 in 9. All the numbers expreſſing how oft 3 is contained in each of thoſe parts, I write down according to the order of the parts of the dividend, that is, from left to right, and ſeparate them from the dividend itſelf, by a line, thus.

Diviſor.	Dividend.	Quotient.
3)	6759	(2253

It appears therefore, that 3 is contained 2253 times in 6759; or that 6759 being divided into 3 parts, each part will be 2253. If there be any remainder, that is, if the diviſor repeated a certain number of times is not equal to the dividend, what remains is wrote over the diviſor fraction-wiſe. Thus, if inſtead of 6759 the dividend were only 6758, the quotient will be the ſame as in the former caſe, except for the laſt figure 8; for 3 being only contained twice in 8, the laſt number in the quotient will be 2; and as twice three is only 6, there remains 2 of the dividend; which I write after the quotient, with the diviſor underneath it, and a line to ſeparate the two, thus:

3) 6758 ($2252\frac{2}{3}$

If the diviſor is a digit, the *diviſion* may be eaſily performed, without ſetting down any thing but the remainders. Again, if the diviſor has cyphers in the firſt places towards the right-hand, theſe may be cut off, provided that an equal number of figures be cut off from the right of the dividend; and when the *diviſion* is finiſhed, we obtain the integral quotient; then to the remainder annex all the excluded figures of the dividend, and ſubjoin the whole diviſor. Thus,

8|00) 3678|54 (459 integral quotient.

Rem. 654, and the fractional part of the quotient is $\frac{654}{800}$

Moreover, if the diviſor is the product of two or more digits, which may be eaſily diſcovered, divide firſt by any one of theſe, and then divide the quotient by the other, and ſo on; the laſt quotient is that required; and for the fractional part, multiply the laſt remainder by the preceding diviſor, and to the product add the preceding remainder; multiply this ſum by the next preceding diviſor, and to the product add the next preceding remainder, and ſo on, till you have got through all the diviſors and remainders to the firſt. Thus, to divide 3428689 by 126, divide by 3, 6, and 7, becauſe $3\times6\times7=126$; the firſt quotient is 1142896, and the remainder 1; the ſecond quotient is 190482, and the remainder 4; the laſt quotient is 27211, and the remainder 5, which multiplied by the preceding diviſor 6, produces 30, to which the preceding remainder 4 being added, we have 34; this multiplied by the preceding or firſt diviſor, produces 102, and the remainder 1 added, makes 103, the true remainder; and the fractional part of the quotient is $\frac{103}{126}$. For the *diviſion* of concrete, or applicate numbers, ſee REDUCTION.

Proof of DIVISION.

Diviſion is proved by multiplying the quotient by the diviſor, or the diviſor by the quotient; and adding what remains of the *diviſion*, if there be any thing. If the ſum be found equal to the dividend, the operation is juſt, otherwiſe there is a miſtake.

DIVISION, in *Decimal Fractions*. See DECIMAL.

DIVISION, in *Geometry*, or *geometrical* DIVISION, is alſo called *application*; the deſign of which, when it is employed about the conſtruction of plain problems, is this; viz. a rectangle being given, as alſo a right line; to find another right line, the rectangle contained under which, with the right line given, ſhall be equal to the rectangle firſt given. Such effection, or conſtruction, is called the *application* of a given rectangle to a right line given; and the right line ariſing by ſuch application, is called the *geometrical quotient*.

This is found by the rule of three, by ſaying, as the line given is to one ſide of the rectangle, ſo is the other ſide to the line ſought.

Not unlike to which is Des Cartes's way of working *diviſion* in lines, by ſcale, and compaſs: thus, ſuppoſe *a c* (=6), were to be divided by *a d* (=3) (*Tab.* II. *Geometry*, *fig.* 28.) make any angle at pleaſure, and therein ſet off firſt *a d* (=3) the diviſor, and then on the ſame leg, *a u* = to unity; then on the other leg of the angle ſet *a c* (=6) the dividend, and join *d c*, and to it through *u*, draw *u b* parallel to *d c*, which ſhall cut off *a b* the quotient ſought; for as *a d* : *a u* : : *a c* : *a b*; that is, as the diviſor : is to unity : : ſo is the dividend : to the quotient; on which proportion depends all *diviſion*.

DIVISION *of a word*, in *Grammar*, is a diſcourſe explaining the latitude, or comprehenſion of a word; the latitude, when the word is univerſal; as when the genus is *divided* into ſpecies, and differences; the comprehenſion, when the word is ambiguous, as *taurus*, *bull*; which ſometimes denotes a conſtellation, ſometimes a beaſt, and ſometimes a mountain.

DIVISION *by Logarithms*. See LOGARITHM.

DIVISION, in *Logic*, is the ſeparating any thing into diverſe parts, or ideas. See DISTRIBUTION.

The ſchoolmen define it a diſcourſe, explaining a thing by its parts; in which it approaches near to the nature of a definition, whoſe character is to define a thing by its parts.

Diviſion, we have ſaid, is a diſtribution of a whole, &c. But there are two ſorts of wholes, as above expreſſed.

The firſt is what conſiſts of integral parts; as the human body, which contains diverſe members.

The ſecond is properly no other than an abſtract idea common to more things than one, as the univerſals; or a compound idea comprehending the ſubſtance, and its accidents, or at leaſt moſt of its accidents.

The whole admits of a triple *diviſion*. 1. When the genus, or kind, is divided by its ſpecies, or differences; as when ſubſtance is *divided* into body and ſpirit; or into extended, and thinking.

2. When any thing is *divided* into ſeveral claſſes, by oppoſite accidents; as when the ſtars are *divided* into thoſe which ſhine by their own light, and thoſe that only reflect a borrowed light.

3. When the accidents themſelves are *divided* according to the ſubjects in which they inhere; as when goods are *divided* into thoſe of the body, the mind, and fortune.

The laws of *diviſion* are, 1. That it be full and adequate, that is, that the members of the *diviſion* entirely exhauſt the whole thing *divided*; as when all numbers are *divided* into equal, and unequal.

2. That the members of the *diviſion* be oppoſite; as equal, and unequal; corporeal, and not corporeal; extended, and thinking.

3. That one member of the *diviſion* be not contained in another, ſo as the other may be affirmed of it. Though, in other reſpects, it might be included without any fault in the *diviſion*: thus extenſion, geometrically conſidered, may be *divided* into a line, ſurface, and ſolid; though the line be included in the ſurface, and the ſurface in the ſolid.

4. The *diviſion* muſt not be made into too many, or too general parts. Laſtly, the members, unleſs the ſubject require it, not to be too unequal; as if the univerſe were *divided* into heaven and earth.

DIVISION *of mathematical inſtruments*. See GRADUATION, and MURAL *Arc*.

DIVISION *of a mode*, divides a quality into its degrees. Philoſophers, after the phyſicians, ſuppoſe eight degrees of every quality: hence when a quality is ſaid to be in the eighth degree, it marks, that it can be no further intended, or heightened.

DIVISION, in *Muſic*, imports the dividing the interval of an octave into a number of leſſer intervals.

The 4th and 5th, each of them, divide or meaſure the octave perfectly, though differently. When the 5th is below, and ſerves as a baſs to the 4th, the *diviſion* is called *harmonical*; when the 4th is below, the *diviſion* is called *authentic*.

DIVISION *by Neper's Bones*. See NEPER's *Bones*.

DIVISION, in *Phyſics*, or DIVISIO *continui*, is the ſeparation of the parts of a quantity; whereby, what before was one, is now reduced into ſeveral. See CONTINUITY and DISSOLUTION.

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This *diviſion* is effected by means of motion, without which there can be no ſeparation of any continuum, or even contiguum.

This motion is performed diverſe ways, by fraction, ſciſſion, ſection, fiſſion, reſolution, dilution, maceration, diſperſion, effuſion, diſtraction, &c.

DIVISION *of Powers*. See POWERS.

DIVISION *of Proportion*. See PROPORTION.

DIVISION, in *Rhetoric*, the arrangement of a diſcourſe under ſeveral heads, to be ſpoken to ſeparately. See DISPOSITION.

DIVISION, in *Vulgar Fractions*. See FRACTION.

DIVISIONS *of an army*, in the *Military Art*, the ſeveral brigades and ſquadrons into which it is cantoned. See BRIGADE.

DIVISIONS *of a battalion*, the ſeveral platoons into which it is divided in marching or firing, each of which is commanded by an officer. See BATTALION.

DIVISION, in the *Sea-Language*, the third part of a naval army, or fleet; or one of the ſquadrons thereof, diſtinguiſhed by a particular flag or pendant, under the command of ſome flag-officer. See SQUADRON.

The white flag denotes the firſt ſquadron of France, the white and blue the ſecond, and the third is characterized by the blue. In England, the firſt admiral, or the admiral of the fleet, diſplays the union flag at the main-top-maſt-head; next follows the white flag with St. George's croſs; and afterwards the blue. The private ſhips carry pendants of the ſame colour with their reſpective ſquadrons at the maſts of their particular *diviſions*; ſo that the laſt ſhip in the *diviſion* of the blue ſquadron carries a blue pendant at her mizen-top-maſt head. Naval battles are uſually ranged in three lines, according to their three *diviſions*.

DIVISIONES, in *Antiquity*, certain preſents of money, oil, bread, wine, or the like, appointed by will to be diſtributed annually among certain perſons or companies, and ſometimes to the people in general.

DIVISOR, the dividing number; or that which ſhews how many parts the dividend is to be divided into.

DIVISOR, *common*. See COMMON *meaſure*.

DIVORCE, from *diverto*, *I turn away*, a breach, or diſſolution, of the bond of MARRIAGE.

In our law, *divorce* is of two kinds; the one total, *a vinculo matrimonii*; which alone is properly *divorce*; the other partial, *a menſa & thoro*; a ſeparation from bed and board.

The woman divorced *a vinculo matrimonii*, receives all again that ſhe brought with her; the other has a ſuitable, ſeparate maintenance allowed her out of her huſband's effects. See ALIMONY.

The firſt only happens through ſome eſſential impediment, as conſanguinity or affinity within the degrees forbidden, precontract, impotency, &c. of which impediments the canon-law allows fourteen, comprehended in theſe verſes:

Error, conditio, votum, cognatio, crimen,
Cultus, diſparitas, vis, ordo, ligamen, honeſtas,
Si ſis affinis, ſi forte coire nequibis,
Si parochi & duplicis deſit præſentia teſtis,
Raptave ſit mulier, nec parti reddita tutæ.

In this kind of *divorce*, the marriage is declared null, as having been abſolutely unlawful *ab initio*, and the parties are ſeparated *pro ſalute animarum*, and allowed to marry again; the iſſue of ſuch marriage as is thus entirely diſſolved, are baſtards. *Divorce a menſa & thoro* diſſolveth not the marriage, becauſe it was juſt and lawful *ab initio*; but, for ſome ſupervenient cauſe, it becomes improper or impoſſible for the parties to live together; as in the caſe of intolerable ill temper, or adultery, in either of the parties. However, *divorces a vinculo matrimonii*, for adultery, have of late years been frequently granted in England by act of parliament.

Divorce is a ſpiritual judgment, and therefore is paſſed in the ſpiritual court. Under the old law, the woman *divorced* was to have of her huſband a writing, as St. Jerom and Joſephus teſtify, to this effect: *I promiſe, that hereafter I will lay no claim to thee*; which was called a *bill of divorce*.

Divorce was allowed of in great latitude both among the pagans and Jews. At Rome, barrenneſs, age, diſeaſe, madneſs, and baniſhment, were the ordinary cauſes of *divorce*. Spurius Carvilius, between 500 and 600 years after the building of Rome, under the conſulſhip of M. Attilius, and P. Valerius, was the firſt who put away his wife, becauſe ſhe was barren; though Plutarch, in his Roman Queſtions, maintains, that Domitian was the firſt who permitted *divorce*.

Juſtinian afterwards added impotence, a vow of chaſtity, and the profeſſion of a monaſtic life, as valid reaſons of *divorce*.

The Roman lawyers diſtinguiſh between *repudium* and *divortium*; making the former to be the breaking of a contract or eſpouſal, and the latter ſeparation after matrimony. Romulus enacted a ſevere law, which ſuffered not a wife to leave her huſband, but gave the man the liberty of turning off his wife, either upon poiſoning her children, counterfeiting his private keys, or for the crime of adultery; but if the huſband on any other occaſion put her away, he ordered one moiety of his eſtate for the wife, and the other to the goddeſs Ceres; beſides an atonement to the gods of the earth. Plut. in Rom. However, in later times, the women, as well as the men, might ſue a *divorce*. Juvenal, Sat. ix. Martial, lib. x. Ep. 41.

The common way of *divorcing* was by ſending a bill to the woman, containing the reaſons of ſeparation, and the tender of all her goods which ſhe brought with her; and this was called *repudium mittere*; or elſe it was performed in her preſence, and before ſeven witneſſes, and accompanied with the formalities of tearing the writings, refunding the portion, taking away the keys, and turning the woman out of doors.

The Grecian laws concerning *divorces* were different: the Cretans allowed *divorce* to any man that was afraid of having too many children. The Spartans ſeldom *divorced* their wives; and it was extremely ſcandalous for a woman to depart from her huſband. The Athenians allowed *divorce* on very ſmall grounds, by a bill, containing the reaſon of the *divorce*, and approved, if the party appealed by the chief magiſtrate; and women alſo were allowed to leave their huſbands on juſt occaſions. Perſons *divorcing* their wives were obliged to return their portions; otherwiſe, the Athenian laws obliged them to pay nine oboli a month for alimony. The terms expreſſing the ſeparation of men and women from each other were different; the men were ſaid *αποπεμπειν*, or *απολευειν*, *to diſmiſs their wives*, but wives, *απολειπειν*, *to leave their huſbands*. Pott. Arch. Græc. vol. ii. book iv. cap. 12.

Among the Jews, beſides incontinence and adultery, uglineſs, old age, or ill humour in a wife, were ſufficient reaſons for giving her a bill of *divorce*. Nay, even the man's own pleaſure, or his repenting of his match, were admitted as good reaſons. Selden de Uxore Heb. lib. iii. cap. 17.

It is generally held, that Jeſus Chriſt allowed of *divorce* in the caſe of adultery. But ſome take this for a miſtake; and maintain, that *divorce* is no where permitted in the New Teſtament for adultery; but only a ſeparation. See Matt. xix. 9. Mark x. 11. Paul 1 Cor. vii. 27. See alſo the council of Florence; at the end, after the queſtions propoſed to the Greeks. Tertull. de Monogam. cap. 9. & 10. Auguſtin. de Bono Conjugio, & de Adult. Conjug. See ADULTERY.

Pope Innocent I. in his decretal to Exuperius, declares ſuch as contract a new marriage after *divorce*, adulterers; as well as the perſons with whom they marry. The occaſion of this decree was, that ſuch marriages were then allowed of by the Roman laws. There is an exception, however, in the caſe of marriage between two heathens, which the decrees allow to be diſſolved after the converſion of one of the parties. And St. Paul ſays the ſame, 1 Cor. vii. 15. Yet even in this caſe, 1. The marriage is not immediately diſſolved by the converſion of one of the parties, but they may ſtill live together, and even on ſome occaſions they ought to do ſo. Nor is it even diſſolved by the ſeparation of the infidel party; for if ſhe be afterwards converted, he is obliged to take back his wife. But the marriage is totally diſſolved by a ſecond marriage of the converted party with another perſon.

2. Though the party converted to the faith may, the minute of his converſion, legally ſeparate himſelf, and contract with another; a liberty the Chriſtian law allows him; as in juſtice he is not deemed to owe any thing to an infidel; yet charity frequently forbids ſuch *divorce* and ſeparation: as, e. gr. if the infidel conſent to live with him, and do not moleſt him in his religion; if his faith be not at all in danger; if there be any hopes of converting her; or of gaining the children; if the ſeparation would prove a ſcandal to the heathens, and render Chriſtianity odious, &c. See St. Paul 1 Cor. vii. 13, 14.

The fourth council of Toledo decrees, that in a country where Chriſtianity is the prevailing religion, the infidel party muſt be adverтiſed to become Chriſtian; which if ſhe refuſe, the marriage is to be diſſolved.

The council of Trent prohibits *divorce* on any occaſion whatever. The papal diſpenſations, however, are a ſalvo for this inſtance of rigour.

In England, *divorce* can only be had by conſent of parliament. Milton has an expreſs treatiſe of the doctrine and diſcipline of *divorce*, where he maintains, that *divorce* ought to be permitted for a mere incompatibility of humours.

DIURESIS, *Διυρησις*, that ſeparation which is made of the urine by the kidneys.

The

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The word is formed from διὰ, *through*; and οὖρεω, *I make water*.

DIURETICS, in *Medicine*, are ſuch remedies as provoke or promote the diſcharge of urine.

Such is water drank plentifully; white wine drank in a morning; alcali ſalts of all kinds; ſea-ſalt, ſal gemmæ, nitre, borax, alum, tartar, ſal ammoniac, whey, ſour milk, lemon-juice, &c.

Aqueous liquors are generally *diuretic*, eſpecially if mixed with ſalt, and drank cold. Fermented liquors are the leaſt *diuretic* of all; and the leſs ſo, as they are the fatter. Sharp thin ſour wines, rheniſh, &c. as alſo acid ſpirits of vinegar, ſalt, ſulphur, alum, vitriol, &c. aſparagus, bitter almonds, ſmallage, eryngium, eupatorium, ſaſſafras, &c. are all *diuretics*.

DIURETICUS *ſal*. See SAL *Diureticus*.

DIURNAL, from *dies*, *day*, in *Aſtronomy*, ſomething relating to the day; in oppoſition to nocturnal, which regards the night.

DIURNAL *arch*. See ARCH.

DIURNAL *circle*. See CIRCLE *Diurnal*.

DIURNAL *motion of a planet*, is ſo many degrees and minutes, &c. as any planet moves in twenty-four hours.

The DIURNAL *motion of the earth*, is its rotation round its axis, the ſpace whereof conſtitutes the natural day.

The reality of the *diurnal rotation* of the earth is now paſt all diſpute.

DIURNAL is alſo uſed in ſpeaking of what belongs to the nycthemeron, or natural day of twenty-four hours. In which ſenſe it ſtands oppoſed to annual, menſtrual, &c.

The *diurnal* phænomena of the heavenly bodies are ſolved from the *diurnal* revolution of the earth; that is, from the revolution of the earth round its own axis in twenty-four hours. To illuſtrate this: ſuppoſe the circle PRTH (*Tab. Aſtronomy*, *fig.* 2.) to denote the earth; C the center of the earth, through which its axis is conceived to paſs, around which its *diurnal* revolution is performed; P denotes any place on the earth; the line EW the viſible horizon of the place; E the eaſt point of the ſaid horizon, W the weſt; the circle *a b c d e f*, the circumference of the heavens; the circle S, the ſun in the heavens; the ſemicircle PRT, the enlightened hemiſphere of the earth; or that half of it oppoſite to the ſun; and laſtly, the ſemicircle PHT, the darkened hemiſphere of the earth.

Now, the earth ſuppoſed in this ſituation, and moving round its axis towards the ſun; it is evident, the place P of the earth will then juſt begin to be enlightened by the ſun; and ſo the ſun will appear there to be juſt riſing, or aſcending the horizon at E the eaſt point of it. The earth being moved round its own axis, ſo that the place P of the earth, which before was under the point *a* in the heavens, is now under the point *b*; it is evident, the horizon of the ſaid place P will be now ſo ſituated, as that the ſun will appear to a ſpectator at P, conſiderably aſcended above E, the eaſt end of the horizon. And while, by the revolution of the earth round its axis, the place P paſſes from under the point *b* in the heavens, to the point *c*, the horizon of the place P will continually ſink lower and lower in reſpect of the ſun, and ſo the ſun will appear to aſcend higher and higher, till P is come under *c*, where the ſun will appear in its greateſt height above the horizon for that day; and ſo it will be noon, or mid-day, at the place P. The earth moving on, as the place P paſſes from under *c* to *d*, the weſt point of its horizon will aſcend higher and higher, and ſo the ſun will appear more and more to deſcend, as is repreſented by the horizon at the point of the earth under *d*. The place P being carried by the *diurnal* revolution of the earth from under *d* to under *e*, the ſun will then appear juſt in W, the weſt point of the horizon, and ſo will appear to be juſt ſetting. The place P being come under *f*, it will be then midnight there. Laſtly, the place P being come round again under *a*, it will be there ſun-riſing again. The ſame holds good as to any other of the celeſtial lights, and the earth, as is obvious from the figure: the circle repreſenting the ſun being taken to denote any other ſtar, planet, &c.

It remains to obſerve, that whereas, by the *diurnal* revolution of the earth, all the ſeveral celeſtial lights ſeem to move in the heavens from eaſt to weſt, hence this ſeeming *diurnal motion* of the celeſtial lights is called their *common motion*, as being common to all of them. Beſides which, all the celeſtial lights, except the ſun, have a proper motion; from which ariſe their proper phænomena; as for the proper phænomena of the ſun, they likewiſe ſeem to ariſe from the proper motion of the ſun; but they are really produced by another motion, which the earth has, and whereby it moves round the ſun once every year, whence it is called the *annual motion of the earth*.

DIURNARY, DIURNARIUS, an officer in the Greek empire, who wrote down, in a book for that purpoſe, whatever the prince did, ordered, regulated, &c. every day.

DIUTURNITY, the long continuance or duration of any being.

DIVUS, DIVA, in *Antiquity*, appellations given to men and women who had been deified, or placed in the number of the gods.

Hence it is, that on medals ſtruck for the conſecration of an emperor, or empreſs, they give them the title of *Divus*, or *Divo*. For example: DIVUS JULIUS. DIVO ANTONINO PIO. DIVO PIO. DIVO CLAUDIO. DIVA FAUSTINA AUG. &c.

DIZOSTOS, in *Botany*, a name given by ſome of the old Greek writers to the *apios*, or knobby-rooted ſpurge: it is ſo called, becauſe of its having uſually two or three ſlender, and ruſh-like ſtalks, growing up from the roots, which ſeem as if they were fit to be uſed as cords or bandages. See APIOS.

DIZZINESS, in *Medicine*. See VERTIGO.

DO, in the *Italian Muſic*, is a ſyllable uſed inſtead of *ut*, being ſuppoſed more reſonant and muſical than *ut*.

Do *law*.—To *do law*, *facere legem*, is the ſame as to *make law*, anno 23 Hen. VI. cap. 14. See MAKE.

DOB-CHICK, or DIDAPPER, in *Zoology*, the common Engliſh name of a ſmall water-fowl, the leaſt of all the *diver-kind*, and known among authors by the name of *colymbus minor*; and called by Linnæus *colymbus auritus*. It ſeldom exceeds ſix ounces in weight, and has a ſhort beak not more than a finger's breadth long, large at the baſe, but tapering to a point at the end; its eyes are large, and it is covered with a very thick downy plumage; it is of a very deep blackiſh brown on the back, and very white on the belly; its wings are very ſmall, and it has no tail.

This bird is of ſuch a ſtructure, that it moves much more eaſily under water, than on its ſurface, or aloft. He raiſes himſelf from the water with great difficulty; but when he is got up to the air, he can then continue his flight for a long time. He forms his neſts by the water, near the banks, with a large quantity of vegetables, the fermentation of which, occaſioned by the warmth of the bird, hatches the eggs, though the water riſes through the neſt, and keeps them wet. Phil. Tranſ. N° 206. p. 990.

DOBULA, in *Ichthyology*, a name given by Geſner, and other writers, to the chub. It has been called *capito* and *cephalus* by the moderns, and *ſqualus* by the ancients; but it requires no generical name, being properly only a ſpecies of the cyprinus. See CEPHALUS and CYPRINUS.

DOBULA is alſo uſed for a freſh-water fiſh, of the leuciſcus, or dace kind, but is of a larger and thinner ſhape, and a much better taſted fiſh. It is caught in the freſh waters of Germany about Hamburgh, and in many other places. Schonefeldt, Hiſt. Piſc.

DOCETÆ, from δοκεῖν, *to appear*, in *Eccleſiaſtical Hiſtory*, the followers of Julius Caſſianus, one of the VALENTINIAN ſect, towards the cloſe of the ſecond century, who revived a notion that had been adopted by a branch of the GNOSTICS, againſt whom St. John, Ignatius, and Polycarp, had aſſerted the truth of the incarnation. They believed and taught, as their name imports, that the actions and ſufferings of Jeſus Chriſt were not in reality, but only in appearance.

DOCIMASIA, Δοκιμασια, from δοκιμαζω, *I try*, in *Antiquity*, a cuſtom among the Athenians, by which every man, before he was admitted to a public employment, was obliged to give an account of himſelf, and his paſt life, before certain judges in the forum; for if any man had lived a vicious and ſcandalous life, he was thought unworthy of the meaneſt office. Nor was this thought enough; for in the firſt ordinary aſſembly after their election, they were a ſecond time brought to the teſt; when, if any thing ſcandalous was found againſt them, they were deprived of their honours. Pott. Archæol. Græc. lib. ii. cap. 11. tom. i. p. 73.

DOCIMASTICAL *experiments*. See ASSAYING.

DOCIMENUM *marmor*, a name given by the ancients to a ſpecies of marble, of a bright and clear white, much uſed in the large ſumptuous buildings, as temples and the like. It had its name from Docimenos, a city of Phrygia, afterwards called Synaia, near which it was dug, and from whence it was ſent to Rome. It was accounted little inferior to the Parian in colour, but not capable of ſo elegant a poliſh; whence it was leſs uſed by the ſtatuaries, or in other ſmaller works. The emperor Adrian is ſaid to have uſed this marble in building the temple of Jupiter, and many other of the great works of the Romans are of it.

DOCK, *Rumex*, *Lapathum*, in *Botany*, a genus of the *hexandria trigynia* claſs. Its characters are theſe: the empalement of the flower is permanent; the flower has three

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three petals, which are larger than the empalement, to which they are very like. It hath ſix ſhort hair-like ſtamina, terminated by erect thin ſummits; and a three-cornered germen, ſupporting three hair-like reflexed ſtyles, thruſting out of the clefts of the petals, crowned by large jagged ſtigmas; the germen afterward becomes a three-cornered ſeed, included in the petals of the flower. There are ſixteen ſpecies.

The great *water-dock* has been long famous in medicine. The roots of the common wild *docks* are nearly of the ſame quality; and equally diſcover their aſtringent matter, both to the taſte, and by ſtriking an inky blackneſs with ſolution of chalybeate vitriol. Muntingius wrote a treatiſe De Britannica Antiquorum Herba. He endeavours to prove, that its name *Britannica* was not derived from that of our iſland, but from Teutonic words, expreſſing the power of faſtening looſe teeth, or of curing the diſeaſe which makes them looſe; and later experience has ſhewn, that it is a medicine of conſiderable efficacy againſt putrid ſpongy gums, and as an internal antiſcorbutic. The roots are principally uſed, and are ſaid to be of great ſervice in the jaundice, in the herpes, and eryſipelas, and in diſpoſing inveterate ulcers to heal. It is alſo ſaid to be a remedy in quinzies.

It has been chiefly uſed in medicated wines and ſmall ales, with the addition of ſome ſpicy materials, and ſometimes of other antiſcorbutic plants, as ſcurvy-graſs, buck-bean, horſe-raddiſh, &c.

The *lapathum acutum*, *Oxylapathum*, or ſharp-pointed leaved *dock*, is as eminent as an antiſcorbutic, and a cleanſer of the blood. It is ſuppoſed to have an aperient as well as an aſtringent virtue, and is recommended in habitual coſtiveneſs, and obſtructions of the viſcera. A decoction of half an ounce, or an ounce, of the freſh roots, or of a dram or two of the dry roots, is commonly directed for a doſe. It is alſo uſed externally in fomentations and ointments againſt the itch, and other cutaneous foulneſſes.

The ſorrel has been claſſed by Linnæus under this genus. See SORREL.

DOCK, in the *Manege*, is uſed for a large caſe of leather, as long as the *dock* of a horſe's tail, which ſerves it for a cover. The French call the *dock*, *trouſſequeue*. It is made faſt by ſtraps to the crupper; and has leathern thongs that paſs between his thighs, and along the flanks to the ſaddle-ſtraps, in order to keep the tail tight, and to prevent its whiſking about.

DOCK, among *Sportſmen*, is uſed for the fleſhy part of a boar's chine, between the middle and the buttock.

DOCK, DOCKING, in *Law*, a means or expedient for cutting off an eſtate tail in lands, or tenements, by means of a common recovery; that the owner may be enabled to ſell, give, or bequeath the ſame.

DOCK, probably from δοχιον, *receptaculum*, of δεχομαι, *I receive*, in the *Sea-Language*, a pit, pond, or creek, by the ſide of an harbour, made convenient to work in, in order to build or repair ſhips.

This is of two ſorts: a *dry dock*, where the water is kept out by great flood-gates, till the ſhip is built, or repaired; but afterwards can be eaſily let into it again to float, and launch her.

A *wet dock* is any place in the ouze, where a ſhip may be haled in, and ſo *dock* herſelf, or ſink herſelf a place to lie in; and where ſhe can be cleaned only during the receſs of the tide.

DOCK-*yards*, are magazines of all ſorts of naval ſtores, and timber for ſhip-building; the royal *dock-yards* in England, are thoſe at Chatham, Portſmouth, Plymouth, Woolwich, Deptford, and Sheerneſs. In time of peace, ſhips of war are laid up in theſe *docks*, thoſe of the firſt rates moſtly at Chatham, where, and at other yards, they receive, from time to time, ſuch repairs as are neceſſary.

Theſe yards are generally ſupplied from the northern crowns, with hemp, pitch, tar, roſin, canvaſs, oak-plank, and ſeveral other ſpecies. But as for maſts, particularly thoſe of the largeſt ſize, they have been uſually brought from New England.

The principal *dock-yards* are governed by a commiſſioner, reſident at the port, who ſuperintends all the muſters of the officers, artificers, and labourers, employed in the *dock-yard*, and ordinary. He alſo controuls their payments; examines the accounts; contracts and draws bills on the navy-office to ſupply the deficiency of ſtores, and regulates whatever belongs to the yard, maintaining due order in the reſpective offices.

DOCKET ſometimes denotes a little bill tied to wares or goods, and directed to the perſon and place they are to be ſent to.

DOCKET, or DOGGET, in *Law*, is a brief in writing, on a ſmall piece of paper, or parchment, containing the purport and effect of a larger writing. The rolls of judgment are *docketted*, when they are brought into the court of common-pleas, and entered on the *docket* of that term; ſo that by ſearching theſe *dockets*, any judgment may be found, if the attorney's name is known. Decrees in chancery are alſo *docketted*.

DOCTOR, a perſon who has paſſed all the degrees of a faculty, and is impowered to teach, or practiſe the ſame.

The title of *doctor* was firſt created towards the middle of the twelfth century; to ſucceed to that of maſter, which was become too common and familiar.

The eſtabliſhment of the *doctorate*, ſuch as now in uſe among us, is ordinarily attributed to Irnerius, who himſelf drew up the formulary. The firſt ceremony of this kind was performed at Bologna, in the perſon of Bulgarus, who began to profeſs the Roman law, and on that occaſion was ſolemnly promoted to the *doctorate*, i. e. inſtalled *juris utriuſque doctor*. But the cuſtom was ſoon transferred from the faculty of law to that of theology; the firſt inſtance whereof was given in the univerſity of Paris, where Peter Lombard, and Gilbert de la Potree, the two chief divines of thoſe days, were created *doctors* in theology, *ſacræ theologiæ doctores*.

Spelman takes the title of *doctor* not to have commenced till after the publication of Lombard's ſentences, about the year 1140; and affirms, that ſuch as explained that work to their ſcholars, were the firſt that had the appellation of *doctors*.

Others go much higher, and hold Bede to have been the firſt *doctor* at Cambridge, and John de Beverley at Oxford, which latter died in the year 721. But Spelman will not allow *doctor* to have been the name of any title or degree in England, till the reign of king John, about the year 1207.

To paſs *doctor in divinity* at Oxford, it is neceſſary the candidate have been four years bachelor of divinity. For *doctor of laws*, he muſt have been ſeven years in the univerſity to commence bachelor of law; five years after which he may be admitted *doctor of laws*. Otherwiſe, in three years after taking the degree of maſter of arts, he may take the degree of bachelor in law; and in four years more, that of LL. D. which ſame method and time are likewiſe required to paſs the degree of *doctor in phyſic*.

At Cambridge, to take the degree of *doctor in divinity*, it is required the candidate have been ſeven years bachelor of divinity. Though in ſeveral of the colleges, the taking of the bachelor of divinity's degree is diſpenſed with, and they may go out *per ſaltum*. To commence *doctor in laws*, the candidate muſt have been five years bachelor of law, or ſeven years maſter of arts. To paſs *doctor in phyſic*, he muſt have been bachelor in phyſic five years, or ſeven years maſter of arts.

A *doctor* of the civil law may exerciſe eccleſiaſtical juriſdiction, though a layman, ſtat. 37 Hen. VIII. cap. 17. ſect. 4.

DOCTOR *of the law* was a title of honour or dignity among the Jews.

The Jews, it is certain, had *doctors* long before Jeſus Chriſt. The inveſtiture, if we may ſo ſay, of this order, was performed by putting a key, and a table-book in their hands; which is what ſome authors imagine our Saviour had in view, Luke xi. 52. where ſpeaking of the *doctors of the law*, he ſays, *Woe unto you*, doctors of the law; *for you have taken away the key of knowlege; you entered not in yourſelves, and them that were entering, you hindered.*

The Greek text of St. Luke calls them νομικοι; and the Vulgate *legiſperiti*; agreeably to which, our Engliſh tranſlators call them *lawyers*. But the French verſion of *docteurs de la loi* ſeems the moſt adequate. In effect, the word *lawyer*, *legiſperitus*, is only found in St. Luke, and St. Paul, Titus iii. 13. And νομικῷ, in St. Matthew xxii. 35. is rendered by the Vulgate, *legis doctor*; though the Engliſh verſion ſtill retains the word *lawyer*.

Theſe Jewiſh *doctors* are the ſame whom they otherwiſe call RABBINS.

DOCTOR *of the church*, a title given to certain of the fathers whoſe doctrines and opinions have been the moſt generally followed and authorized.

We uſually reckon four *doctors* of the Greek church, and three of the Latin. The firſt are St. Athanaſius, St. Baſil, St. Gregory Nazianzen, and St. Chryſoſtom. The latter are St. Jerom, St. Auguſtine, and Gregory the Great.

In the Roman Breviary there is a particular office for the *doctors*. It only differs from that of the confeſſors, by the anthem of the Magnificat, and the leſſons.

DOCTOR is alſo an appellation adjoined to ſeveral ſpecific epithets, expreſſing wherein the merit of ſuch as the ſchools owned for their maſters, conſiſted.

Thus Alexander Hales is called the *irrefragable doctor*, and the *fountain of life*, as mentioned in Poſſevinus. Thomas Aquinas is called the *angelical doctor*; St. Bona-

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venture, the *ſeraphic doctor*; John Duns Scotus, the *ſubtile doctor*; Raimond Lully, the *illuminous doctor*; Roger Bacon, the *admirable doctor*, &c.

DOCTOR, Διδασκαλος, in the Greek *Church*, is a particular officer, appointed to interpret part of the Scriptures. He who interprets the Goſpels, is called *doctor of the Goſpels*; he who interprets St. Paul's Epiſtles, *doctor of the Apoſtle*; he who interprets the Pſalms, *doctor of the Pſalter*.

DOCTOR'S *Commons*. See COLLEGE *of Civilians*.

DOCTRINE, from *doceo*, *I teach*, denotes in general any thing that is taught, as a matter either of faith or practice; and the term has accordingly been applied to a variety of opinions, that have been adopted and inculcated in philoſophy, religion, &c. There are certain *doctrines* reſpecting the political conſtitution of Great Britain, the aſſerting and publiſhing of which are made illegal by ſtatute. Thus, if any perſon maliciouſly or adviſedly affirm, that both or either of the houſes of parliament have any legiſlative authority without the king, ſuch perſon ſhall incur all the penalties of a præmunire. 13 Car. II. cap. 1. Alſo if a perſon affirm and maintain, by writing or printing, that the king and parliament have no right to direct the ſucceſſion of the crown, he is guilty of high treaſon; and if he maintains the ſame *doctrine* by teaching, or adviſed ſpeaking, he incurs a præmunire. 13 Eliz. cap. 1. 6 Anne, cap. 7. There are alſo other doctrines of a religious nature, which it is unlawful publicly to maintain and preach. See BLASPHEMY, COMMON *Prayer*, HERESY, TRINITY, &c.

DOCTRINE, *Chriſtian, fathers of*. See FATHERS.

DOCUMENT, in *Law*, ſome written monument produced in proof of any fact aſſerted, eſpecially an ancient one.

DODARTIA, in *Botany*, a genus of the *didynamia angioſpermia* claſs. Its characters are theſe: the empalement is cut into five parts at top; the flower hath one petal, and the upper-lip is twice as long as the lower. It has four ſtamina, two of which are ſhorter than the other; in the center is ſituated a round germen, which afterward becomes a globular capſule with two cells, filled with ſmall ſeeds. There are two ſpecies, natives of the Eaſt.

James ſays there are no medical virtues attributed to this plant.

DODDER, *Cuſcuta*. In the Linnæan ſyſtem of *Botany*, this makes a diſtinct genus of plants, of the *tetrandria digynia* claſs, the characters of which are theſe: the calyx is a one-leaved perianthium, in form of a cup, fleſhy at the baſe, and divided ſlightly into four obtuſe ſegments at the rim. The flower is compoſed of only one petal, of an oval figure, a little longer than the cup, and divided ſlightly into four obtuſe ſegments at the edge. The ſtamina are four pointed filaments of the length of the cup; the antheræ are roundiſh; the germen of the piſtil is roundiſh; the ſtyles are two in number, and are erect, and ſhort; the ſtigmata are ſimple; the fruit is fleſhy, and roundiſh, and contains two cells ſplitting open horizontally; the ſeeds are two from each flower.

This is a plant that differs from all others, in having no leaves, but conſiſting of a number of long, ſlender, red threads, or filaments, by which it takes hold, and twiſts about the plants that are near it, ſucking its nouriſhment from them. It has ſeveral monopetalous flowers, divided generally into four ſhort and narrow ſegments, to which ſucceed little round ſeed-veſſels, containing each four ſmall ſeeds. It grows frequently upon heaths and commons, on furze and nettles; as alſo in the fields upon flax and tares, doing great damage, and almoſt choaking them; whence it is called by the country people hellweed, and devil's guts.

The *cuſcuta* grows indifferently on all kinds of herbs; and, of conſequence, the kinds thereof are infinite; to which writers uſually attribute the particular virtues of the plants they grow on.

The moſt known of theſe plants, and thoſe moſt uſed in medicine, are ſuch as grow on thyme; which are the proper *epithymes*; and thoſe on flax. There are two kinds in the ſhops; the one from Venice, the other from Candia; they have both an aromatic taſte, but that of Venice has the ſtrongeſt.

Dodder of thyme has been accounted opening and cleanſing; good to purge melancholy and bilious humours, to open obſtructions in the liver and ſpleen, good for the jaundice, and ſerviceable againſt the itch. But in this country it is an entire ſtranger to practice; though the remarkable ſubtility of its taſte ſeems to promiſe ſome conſiderable medicinal power.

DODECACTIS, in *Natural Hiſtory*, a name by which Linkius, and ſome other authors, have called a kind of aſtrophyte, or branched ſtar-fiſh, which has twelve rays, firſt parting from the body, and each of theſe finally divided into many others.

DODECADACTYLON, in *Anatomy*, a name given by ſome of the old authors, to the gut called the DUODENUM, from its being anciently ſuppoſed to be about twelve fingers-breadth long.

DODECAGON, from δωδεκα, *twelve*, and γωνια, *angle*, a regular polygon, or figure, with twelve equal ſides and angles.

Dials are ſometimes drawn on all the ſides of a *dodecagon*. In *Fortification*, a place ſurrounded with twelve baſtions is called a *dodecagon*; ſuch is Palma Nova in Friuli, &c.

DODECAGYNIA, from δωδεκα, *twelve*, and γυνη, *female*, a *wife*, in *Botany*, an order of plants, comprehending ſuch as have ſtyles. See *Tab.* II. *of Botany*.

DODECAHEDRON, from δωδεκα, *twelve*, and ἑδρα, *ſeat*, in *Geometry*, one of the regular bodies, comprehended under twelve equal ſides, each whereof is a pentagon.

Or, a *dodecahedron* may be conceived to conſiſt of twelve quinquangular pyramids, whoſe vertices, or tops, meet in the center of a ſphere conceived to circumſcribe the ſolid; conſequently they have their baſes and altitudes equal.

To find the ſolidity of the DODECAHEDRON. Find that of one of the pyramids, and multiply it by the number of baſes, viz. 12; the product is the ſolidity of the whole body. Or its ſolidity is found by multiplying the baſe into $\frac{1}{3}$ of its diſtance from the center, twelve times; and to find this diſtance, take the diſtance of two parallel faces; the half is the height.

The diameter of the ſphere being given, the ſide of the *dodecahedron* is found by this theorem: the ſquare of the diameter of the ſphere is equal to the rectangle under the aggregate of the ſides of a *dodecahedron*, and hexaedron inſcribed in the ſame, and triple the ſide of the *dodecahedron*. Thus, if the diameter of the ſphere be 1, the ſide of the *dodecahedron* inſcribed will be $(\sqrt{\frac{5}{3}} - \sqrt{\frac{1}{3}}) \div 2$; conſequently, that is to this as 2 to $(\sqrt{\frac{5}{3}} - \sqrt{\frac{1}{3}})$, and the ſquare of that, to the ſquare of this, as $6 : 3 - \sqrt{5}$.

Therefore the diameter of the ſphere is incommenſurable to the ſide of an inſcribed *dodecahedron*, both in itſelf, and its power.

DODECANDRIA, in *Botany*, the eleventh claſs of plants, which have hermaphrodite flowers, with twelve, or from twelve to nineteen, incluſive, ſtamina, or male parts in each. See *Tab. of Botany*, *Claſs* 11.

The word is formed of δωδεκα, *twelve*, and ανηρ, *male*. This claſs comprehends five orders, viz. the *monogynia*, *digynia*, *trigynia*, *pentagynia*, and *dodecagynia*.

Of this claſs of plants are the aſarabacca, agrimony, &c.

DODECATEMORY, from δωδεκα, *twelve*, and μερος, *part*, the twelfth part of a circle.

The term is chiefly applied to the twelve houſes, or parts of the zodiac of the primum mobile; to diſtinguiſh them from the twelve ſigns.

DODECATEMORY is alſo a denomination ſome authors give to each of the twelve ſigns of the zodiac, becauſe they contain a twelfth part of the zodiac a-piece.

DODECATHEON, in *Botany*, a genus of plants of the *pentandria monogynia* claſs, with a wheel-ſhaped reflex flower, the ſtamina reſting on the tubular baſe, and the fruit an oblong capſule, containing a ſingle cell.

DODO, in *Zoology*, the name of a bird, called alſo by ſome *cygnus cucullatus*, by others *gallus gallinaceus peregrinus*, and by Bontius *dronte*. It is a very ſingular bird, ſomewhat larger than a ſwan, but wholly different from the ſwan in ſhape, though by ſome eſteemed a kind of that bird. Its head is large, and is covered with a membrane reſembling a hood; its beak is of an oblong figure, and is yellow at its origin, and black at the point, and is ſomewhat crooked; it is very naked, having only a few feathers ſcattered over its body, and the rudiments of wings made up of a few naked quills; the hinder parts of its body are very bulky and fat, and it has a tail made of four or five curled greyiſh feathers, reſembling thoſe of the oſtrich. Its legs are very thick and ſtrong. See *Tab. of Birds*, N° 6.

DODONÆA, in *Botany*, the name of a genus of plants, about which authors were very unſettled in their opinions, till Linnæus characterized it under this name, and ranged it in the *octandria monogynia* claſs. Burman has made it a ſpecies of the carpinus, and Plumier of the *ſtaphylodendron*. The characters are theſe: the perianthium is divided into three oval, erect, and equal ſegments. There are no petals. The ſtamina are eight in number, and are extremely ſhort; the antheræ are of an oblong figure; they ſtand very low, and ſcarce exceed the length of the cup. The germen of the piſtil is of a three-cornered ſhape; the ſtyle is ſubulated and very long, and the ſtigma is ſimple. The fruit is a roundiſh capſule, having three inflated cells, with prominent angles. The ſeeds are contained each in one cell. The cup has ſometimes four ſegments, and the fruit four cells.

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DODONÆUS, DODONIAN, in *Antiquity*, an epithet given to Jupiter, as adored, or worſhipped, in the temple of *Dodona*, in a foreſt of the ſame name.

Dodona, whence the appellation ariſes, is an ancient city of Epirus, celebrated on divers accounts, as the foreſt of *Dodona*, the oracle of *Dodona*, and the fountain of *Dodona*.

Dodona's foreſt was a wood, or grove of oaks, all conſecrated to Jupiter. In this was a temple of that god, wherein was the moſt famous, and, as it ſaid, the moſt ancient oracle of all Greece.

Indeed, it was not in the temple only that oracles were delivered; the very pigeons that inhabited the wood are ſaid to have done the ſame.

The origin, and occaſion of this fable, we have from Herodotus, who obſerves, it was founded on this, that πελειας, which in the Theſſalian language ſignifies a pigeon, does likewiſe ſignify a witch, or propheteſs. But what is more extraordinary is, another tradition among the poets, as if the very oaks of the foreſt of *Dodona* ſpoke, and delivered oracles. This fable is eaſily deduced from the former; the pigeons in the oaks being ſuppoſed to ſpeak, it was no great flight of poetical fancy, to introduce the trees themſelves ſpeaking, &c. See Voſſius de Idololat. lib. i. cap. 7. p. 27.

The fountain of *Dodona* was in the temple of Jupiter. The ancient naturaliſts aſſure us, it had a property of rekindling torches, &c. when newly extinguiſhed. This, no doubt, it did, by means of ſome ſulphureous fumes exhaling from it; as we ſtill find a fountain in Dauphiné, called the *burning fountain*, do. It is alſo ſaid to have extinguiſhed lighted torches; which is no great miracle, ſince plunging them into a place where the ſulphur was too denſe, or into the water, muſt have that effect.

DODRA, in *Roman Antiquity*, a drink prepared from nine different ingredients; which are enumerated by the epigrammatiſt in the following line,

Jus, aqua, mel, vinum, panis, piper, herba, oleum, ſal.

Vid. Auſon, Epigram 86.

DODRANS, in *Antiquity*, a diviſion of the AS; being $\frac{3}{4}$ thereof, or nine unciæ.

DOE, the female of the buck.

DOG, *Canis*, in *Zoology*, a large genus of quadrupeds. See CANIS.

The *dog* in its wild ſtate lives in the woods in many parts of the Eaſt; it does not attack a man, neither does it diſcover any of that familiarity which we find in tame ones. Indeed many other animals may be made as tame as the *dog* by the ſame treatment; as has been tried on the other, with ſucceſs.

Authors mention many ſpecies of this animal, as the maſtiff, wolf-*dog*, hound, grey-hound, ſpaniel, water-ſpaniel, bull-*dog*, lap-*dog*, &c. but theſe are only varieties of the original wild kind, which is of a middle ſize between the maſtiff and grey-hound, and diſtinguiſhed by a tail bending upwards.

Dr. Caius, an Engliſh phyſician in the reign of queen Elizabeth, has given the following ſyſtematical arrangement of Britiſh *dogs*.

- I. The moſt generous kinds
  - *Dogs* of chace
    - Hounds
      - Terrier
      - Harrier
      - Blood-hound
    - Gaze-hound
    - Grey-hound
    - Leviner, or Lyemmer
    - Tumbler
  - Fowlers
    - Spaniel
    - Setter
    - Water-ſpaniel, or Finder
  - Lap-*dogs*
    - Spaniel gentle, or Comforter
- II. Farm-dogs
  - Shepherd's *dog*
  - Maſtiff, or Ban-*dog*
- III. Mongrels
  - Wappe
  - Turnſpit
  - Dancer.

See HOUND, MASTIFF, SPANIEL, TERRIER, &c. Pennant's Zoology, vol. i. p. 59, &c.

By a late act, commencing May 1, 1770, ſtealing of *dogs* incurs a forfeiture of 20*l.* and charges of conviction, for the firſt offence, or an impriſonment for any time between ſix and twelve months; and for a ſubſequent offence of not leſs than 30*l.* and charges, or, on non-payment, impriſonment for twelve months, and public whipping. Perſons alſo in whoſe cuſtody *dogs*, or their ſkins, are found, are liable to like penalties.

DOG, *ſetting*. See SETTING.

DOG, *water*. See SPANIEL.

The ſportſmen generally eſteem the black *water-ſpaniels* above thoſe of any other colour, they being generally the moſt hardy. If there be any farther judgment to be made from the colour, it is, that the ſpotted or pied are generally the quickeſt at ſcent, and the ſimple liver-coloured the quickeſt at ſwimming. Theſe, however, are but very uncertain rules to judge by, and the things principally to be regarded are the *dogs* being of a good breed, and well taught. As to the ſhape, the head of a good *water-dog* is generally round, and the hair curling, the ears large and broad, and hanging down; the eyes full and lively, the noſe ſhort, and the lips like a hound's. The neck ſhould be thick and ſhort, the ſhoulders broad, the legs ſtrait, and the chine ſquare. The buttocks ſhould be round, and the thighs brawney; the paſterns ſtrong, and the fore-feet round; the hair in general ſhould be long and curled, not looſe and ſhaggy.

As to the training up a dog for ſporting, the maſter of him cannot begin when he is too young, the principal thing to be taught being obedience, and that being beſt taught while the creature is young. As ſoon as he can lap, he ſhould be taught to couch and lie cloſe at command, and not to dare to ſtir from that poſture till he is ordered; he will ſoon be brought to this, by beating when he diſobeys, and encouraging him when he does right. He ſhould always be taught before the times of his eating, and never have his food given him, but when he has done ſomething to deſerve it. This will teach him always to do well, for the ſake of the expected victuals. No perſon ſhould ever interfere in the teaching; for two maſters breed a confuſion, and the creature never will learn well from them.

The teacher muſt be careful always to uſe the ſame words in his leſſons; thoſe words are to be choſen which are the moſt plain in their ſounds, and the moſt diſtinct from one another; and when theſe are once fixed upon, they muſt never be altered; for the *dog*, being guided wholly by the ſound, not at all by the ſenſe, any alteration of them, though the change be into words of the ſame ſenſe, quite confounds the creature. The word *down* is ſhort and expreſſive, and no other need be uſed when he is ordered to couch; but this being once given him, is never to be varied afterwards. The next ſound he ſhould be taught after this, is the word of correction; for no leſſon can be given but faults will be committed, and no fault ſhould paſs without correction or blame; in this caſe the word *ſirrah*, ſpoke angrily, will always be underſtood. This, at firſt, ſhould be uſed with a laſh or a blow, and after a time he will know it as a word of diſpleaſure, and it will do for ſmall faults without the blow. Certain words of cheriſhing and encouragement muſt alſo be taught him at the ſame time, as *good boy*, or the like, uſing always with them actions and looks of chearfulneſs and pleaſure, as clapping him on the back, and the like. After theſe, he muſt be taught the meaning of ſome words of advice, to put him in mind of his buſineſs, when he is out upon the ſport, ſuch as *take heed*, or the like. Theſe will not only ſet him upon the watch, and make him diligent; but he will alſo be careful and cunning, and at the ſame time chearful and pleaſed in himſelf, as knowing that he is doing his maſter a pleaſure.

When the young *dog* is thus far inſtructed, and knows the meaning of the words of inſtruction, correction, encouragement, and advice, and will couch and lie down at his maſter's feet, how and when he pleaſes, and that with the ſignal of a word, or a look only; he is then to be taught to follow cloſe at his maſter's heels, by leading him by a line tied to his collar; he is to be carefully taught this, ſo that when taken out to the ſport, he muſt neither run under the legs, nor hang too far back; this alſo will tend to the making him the more obedient. When he has been thus taught to follow with a line, he muſt be taught to follow in the ſame manner, looſe, and without a line, and always to be at his maſter's heels.

The next leſſon he is to be taught, is to fetch and carry any thing he is commanded; this muſt be taught him by way of ſport, as a diverſion, by ſhaking a glove at his head, and teaching him to ſnatch it, and afterwards to catch it when thrown from the hand, and bring it back again; this he is to be encouraged in with cheriſhing words, and all other means.

The beſt method of perfecting the creature in this, is by letting

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letting him have no food, but what he earns by doing well, always feeding him when he does as he ſhould do. If he carry the glove away, or play wantonly with it, and refuſe to bring it back, his maſter is to uſe the word of inſtruction, as *take heed.* If this does not bring him to, he is to uſe the word of correction; and if he does not bring it back at this, he muſt proceed to blows; and on many other trials he muſt have nothing given him to eat, till he has done as he ought, and has it by way of reward. When by this means he is taught ſo well, that he will bring back the glove, wherever it is thrown, and carry it only to his maſter, though he is in company with other perſons, who all call him; he is then to be cheriſhed and encouraged, and taught to bring back any thing elſe that is thrown, whether ſticks, ſtones, or any thing whatever. After this, he is to be taught to carry dead fowl, and finally live ones, and this with ſo tender a mouth, as not to hurt them: thus he will be taught at length to bring the fowl that his maſter ſhoots, without tearing them or hurting a feather. The next leſſon is to be taught by taking him out in the field, and dropping ſomething unknown to him; after he is come to ſome diſtance from the place, he is to be ſent back to ſeek for it, and if he bring it back, he is to be encouraged. If he bring back a wrong thing, he is to be encouraged for the attempt, and ſent back again. By repeating this at different diſtances, he will be taught to go back ever ſo far in ſearch of any thing; and if he fails in the leſſons, he is to be chid, beaten, or kept faſting, for it, according to the offence.

When he has been perfected in all theſe leſſons, he muſt be taught his buſineſs of hunting; he is to be firſt taught with tame fowl, which his maſter is to aſſiſt him in taking, and reward and encourage him when he has done. After this he is to be ſent in without aſſiſtance to take the fowl alone; and if he ſucceeds, he is to be encouraged and rewarded, and corrected if he fails. By this practice he will ſoon become maſter of his game; but great care is to be taken in teaching him, when he has caught it, to bring it back to the ſhore, without biting or hurting it.

The next thing to this, is the training him to the gun; to this purpoſe he muſt be taught to follow ſtep by ſtep behind his maſter, and under covert of his ſhadow, till he has ſhot, or, when there is occaſion, to couch and lie cloſe, never daring to ſtir till the gun has gone off; and then, upon the leaſt notice or beckoning, to come and do what he is commanded.

Many of theſe *dogs* are ſo expert, that they will have their eye upon the game as ſoon as their maſter; and the moment the gun is gone off, they will, without bidding, go and fetch it; but this is being too forward; and if he is uſed afterwards with nets or lime-twigs, he will do great miſchief, by ruſhing on the birds as ſoon as they are taken, and tearing the nets, or ſpoiling the twigs. Obedience is the beſt quality in this ſort of *dog*; and it is better he ſhould wait for command, than know his buſineſs without it.

The ſportſmen, who know the time of birds moulting, make a very great uſe of this ſort of *dog*, taking him with them without gun, net, or any other aſſiſtance. The common moulting-time of *water-fowl* is from June to Auguſt; in this time they are not able to fly well; and in ſome part of it, when their old wing-feathers are off, and the new ones are grown ſcarce at all, the *dog* is then to be taken to the ſides of rivers, and other waters, and ſet to hunt about the cloſe places, among which they hide themſelves at this time; the *dog*, being ſet to hunt, will eaſily find them in theſe retreats, and will take them either by leaping ſuddenly upon them, or fairly purſuing ſuch of them as have not the uſe of their wings.

There is alſo another great uſe of the *dog* in driving them without catching them. This is practiſed only in mooriſh and fenny countries, where they are very numerous. In theſe countries a proper place is to be ſought for, where the birds retire to, and theſe are planted with nets; then the *dog* is ſent into the waters and places of covert, where they are ſuppoſed to be, and this at the moulting-time, when they cannot fly away from him. The alarm he puts them into which he firſt attacks, ſoon calls many others together, and there is a large body of them formed, which the *dog* drives before him like a flock of ſheep; and being directed by the ſportſmen, frightens directly into the places of their retreat, where the nets are placed before hand to receive them.

DOG, in *Aſtronomy*, a name common to two conſtellations, called the *Great*, and *Little Dog*; but, among aſtronomers, more uſually, *Canis major, & minor.* See CANIS *major & minor.*

DOG-*draw*, in the *Foreſt Law*, a manifeſt deprehenſion of an offender againſt veniſon in a foreſt; when he is found *drawing* after a deer by the ſcent of a hound, led in his hand.

There are four offences in the foreſt, noted by Manwood; viz. *ſtable-ſtand, dog-draw, back-bear*, or *back-berond*, and *bloody-hand.* See STABLE-*ſtand*, &c.

DOG's *Bane*, in *Botany*, *Apocynum*, from απο and κυνος, a *dog*, becauſe the ancients believed this plant would kill dogs. This belongs to the claſs of *pentandria digynia*, in the Linnæan ſyſtem. Its characters are theſe: the flower is of one leaf, cut into five acute ſegments at the top, which turn backward; and in the bottom of the flower are ſituated five nectariums, which ſurround the germina; and there are five ſtamina, which are ſcarcely viſible. In the center are two oval germina, which afterward become two large pointed capſules, having one cell, which is filled with compreſſed ſeeds, lying over each other like tiles on a houſe, and furniſhed with long feathery down; by which when the pods are ripe and open, the ſeeds are wafted by the wind to a conſiderable diſtance; ſo that where theſe plants grow naturally, they are very troubleſome weeds. There are eleven ſpecies. The down of theſe plants is in great eſteem in France, for ſtuffing eaſy chairs, and making very light quilts, which are ſo warm and light, that they are a very proper covering for gouty perſons. This the French call *delawad*; and in the ſouthern parts of France, where ſome of the ſorts will thrive in the open air, and perfect their ſeeds, there are many plantations of theſe plants for the ſake of the down.

James attributes no virtues to this plant.

DOG's *Bane*, *Baſtard*, *Cynanchum*, in *Botany*, a genus of the *pentandria digynia* claſs. Its characters are theſe: the flower hath one petal, which is ſpread open, plain, and divided into five parts; the nectarium, which is ſituated in the center of the flower, is erect, cylindrical, and the length of the petal. It hath five ſtamina, which are parallel to the nectarium, and an oblong bifid germen; the empalement becomes a capſule, with two oblong pointed pods, which open longitudinally, and are filled with ſeeds, lying over each other imbricatim, crowned with long down. There are ſeven ſpecies, natives of warm climates.

DOG-*berry tree.* See *Cornelian* CHERRY.

DOG's *cabbage.* See *Dog's* CABBAGE.

DOG-*days.* See CANICULAR *days.*

DOG-*fiſh.* See CANIS *galeus.*

DOG-*fly*, *Cynomyia*, in *Natural Hiſtory*, the name of a ſpecies of fly common in woods and among buſhes, and particularly troubleſome to *dogs.* It uſually ſeizes upon the ears, and it is in vain to beat it off; for it returns in a moment, and cannot be prevented but by being killed. It ſtings very ſeverely, and always raiſes a bliſter in the part. It ſomewhat reſembles the flat black fly, ſo troubleſome to cattle. It has no trunk, but has two teeth much reſembling thoſe of the waſp. Its wings are always placed ſo cloſe upon its body, that they are not ſeen. There are two kinds of it, one larger, and found in woods, and the other common in hedges.

DOG's *graſs.* See GRASS.

DOG's *Mercury.* See MERCURY.

DOG-*roſe*, a name for the common briar, or hip-tree. It is obſervable of ſome kinds of this ſhrub, that the flowers ſmell extremely ſweet in the night, or very early in the morning, but not at all ſo in the day-time. The reaſon of which ſeems to be the ſame as in all the noctuolent plants, of which there are ſeveral kinds, as ſome of the geraniums, and of the jaſmines, &c. that is, that the ſun exhales and diſſipates their odorous effluvia in the day-time as ſoon as they are expanded from the flower, but that in theſe cold times the vapours are condenſed, and reach our noſtrils in an agreeable manner. Phil. Tranſ. N° 114.

DOG's *tail graſs*, *Cynoſurus*, in *Botany*, a kind of graſs called *criſtata* by Scheuchzer, and other authors; but in the Linnæan ſyſtem of botany, under this name, it makes a diſtinct genus of plants, of the *triandria digynia* claſs; the characters of which are, that the cup is only a partial covering, lying on one ſide, but large, and made of two leaves, which are pennated, and remain when the flower is fallen. The glume contains many flowers, and is bivalve, the valves being ſlender, pointed, and equal in ſize; the flower is made of two valves, the exterior one is long, hollow, and bearded; the interior plain, and naked. The ſtamina are three capillary filaments; the antheræ are oblong; the germen of the piſtillum is of a turbinated form; the ſtyles are two in number, hairy, and crooked; the ſtigmata are ſingle; the flower does not open, but nicely encloſes the ſeed, which is ſingle, of an oblong ſhape, and pointed at both ends.

DOG's *teeth*, in *Anatomy.* See TEETH.

DOG's *tongue*, in *Botany.* See HOUND's *tongue.*

DOG's

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Dog's *tooth, Violet*, in *Botany, Dens Canis*, or *Erythronium*, a genus of the *hexandria monogynia* claſs. Its characters are theſe: the flower is bell-ſhaped, compoſed of ſix oblong petals, which ſpread open to their baſe. It hath ſix ſtamina joined to the ſtyle; in the center is ſituated a three-cornered germen, which afterward becomes an oblong, obtuſe, capſule, with three cells, filled with flat ſeeds. There are two ſpecies. The flowers are propagated by off-ſets from their roots; and love a ſhady ſituation, and a loamy ſoil; but ſhould not be too often removed.

The powder of the dried root of this plant is ſaid to kill worms in children. Drank in wine, it is an approved remedy for the colic. It is ſaid to be reſtrictive and reſtorative, and taken in water, cures children of the epilepſy; it is alſo eſteemed a great provocative to venery.

Dog's *tooth ſhell*. See DENTALIS.

Dog-*wood*. This wood, when put into water, is ſaid to ſtupify fiſh there, ſo that they are eaſily taken with the hand. It is uſed in America for this purpoſe; and the method is to tie it to the ſtem of the fiſhing boat. It is the wood of a ſpecies of cornus. See *Cornelian* CHERRY.

Dog-*wood of Jamaica*. See ACACIA.

Dog-*wood of Virginia*. See BAY-*tree*, and CORALLODENDRON.

DOGA, in *Antiquity*, a large veſſel into which the wine was put when newly brought from the vintage.

DOGE, the chief magiſtrate in the republics of Venice and Genoa.

The word properly ſignifies *duke*, being formed from the Latin *dux*; as *dogate*, and *dogado*, from *ducatus, duchy*.

The *dogate*, or office and dignity of *doge*, is elective; at Venice, the *doge* is elected for life; at Genoa, only for two years; he is addreſſed under the title of *Serenity*, which among the Venetians is ſuperior to that of highneſs.

The *doge* is the chief of the council, and the mouth of the republic; yet the Venetians do not go into mourning at his death, as not being their ſovereign, but only their firſt miniſter. In effect, the *doge* of Venice is no more than the phantom, or ſhadow of the majeſty of a prince; all the authority being reſerved to the republic. He only lends his name to the ſenate; the power is diffuſed throughout the whole body, though the anſwers be all made in the name of the *doge*. If he gives any anſwers on his own account, they muſt be very cautiouſly expreſſed, and in general terms, otherwiſe he is ſure to meet with a reprimand. So that it is abſolutely neceſſary he be of an eaſy and pliable diſpoſition.

Anciently, the *doges* were ſovereigns; but things are much altered; and at preſent, all the prerogatives reſerved to the quality of *doge*, are theſe which follow: he gives audience to ambaſſadors; but does not give them any anſwer from himſelf, in matters of any importance; only he is allowed to anſwer according to his own pleaſure, to the compliments they make to the ſignory; ſuch anſwers being of no conſequence. The *doge*, as being firſt magiſtrate, is head of all the councils; and the credentials which the ſenate furniſhes its miniſters in foreign courts, are written in his name; and yet he does not ſign them; but a ſecretary of ſtate ſigns them, and ſeals them with the arms of the republic. The ambaſſadors direct their diſpatches to the *doge*; and yet he may not open them, but in preſence of the counſellors. The money is ſtruck in the *doge's* name, but not with his ſtamp, or arms. All the magiſtrates riſe, and ſalute the *doge*, when he comes into council; and the *doge* riſes to none but foreign ambaſſadors.

The *doge* nominates to all the benefices in the church of St. Mark; he is protector of the monaſtery delle Virgine; and beſtows certain petty offices of uſhers of the houſhold, called *Commanders of the Palace*. His family is not under the juriſdiction of the maſter of the ceremonies; and his children may have ſtaff-officers, and gondoliers in livery.

His grandeur, at the ſame time, is tempered with a variety of circumſtances, which render it burdenſome. He may not go out of Venice, without leave of the council; and if he does go out, he is liable to receive affronts, without being entitled to demand ſatisfaction; and, if any diſorder ſhould happen where he was, it belongs not to him, but to the podeſta, as being inveſted with the public authority, to compoſe it.

The children and brothers of the *doge* are excluded from all the chief offices of ſtate. They may not receive any benefice from the court of Rome; but are allowed to accept of the cardinalate, as being no benefice, nor including any juriſdiction. The *doge* may not diveſt himſelf of his dignity, for his eaſe; and after his death, his conduct is examined by three inquiſitors, and five correctors, who ſift it with great ſeverity.

DOGGS, machines of iron for burning wood on; alſo hooks fixed in large timbers, for drawing them with horſes.

DOGGER, a ſmall ſhip, built after the Dutch faſhion, with a narrow ſtern, and two maſts; viz. a main-maſt, and a mizen-maſt, principally uſed in fiſhing on the *doggers* bank.

DOGGERS, in the Engliſh *Alum-Works*, a name given by the workmen to a ſort of ſtone found in the ſame mines with the true alum-rock, and containing ſome alum, though not nearly ſo much as the right kind. The county of York, which abounds greatly with the true alum-rock, affords alſo a very conſiderable quantity of theſe *doggers*; and in ſome places they approach ſo nearly to the nature of the true rock, that they are wrought to advantage. See ALUM.

Dogger-*fiſh*, in our *Statutes*, ſeem to be fiſh brought in the fiſhing-veſſels, called *doggers*, to Blackneſs Haven, &c. anno 31 Edw. III. ſtat. 3. cap. 2.

Dogger-*men*, fiſhermen belonging to *dogger*-ſhips. 25 Hen. VIII. cap. 4.

DOGGET. See DOCKET.

DOGMA, Δογμα, a maxim, tenet, ſettled propoſition, or principle; particularly in matters of religion, or philoſophy.

DOGMATICAL, ſomething relating to a doctrine, or opinion.

In common uſe, a *dogmatical* philoſopher is ſuch an one as aſſerts every thing poſitively; in oppoſition to a ſceptic, who doubts of every thing.

A *dogmatical* phyſician is he, who, on the principles of the ſchool philoſophy, rejects all medicinal virtues not reducible to manifeſt qualities.

DOGMATICI, DOGMATISTS, a ſect of ancient phyſicians, called alſo *logici, logicians*, from their uſing the rules of logic and reaſon, in ſubjects of their profeſſion.

They laid down definitions, and diviſions, reducing diſeaſes to certain genera, thoſe genera to ſpecies, and furniſhing remedies for them all; ſuppoſing principles, drawing conſequences, and applying thoſe principles and conſequences to the particular diſeaſes under conſideration. In which ſenſe the *dogmatiſts* ſtand contradiſtinguiſhed to empirics, and methodiſts.

The *dogmatiſts* were thoſe who brought phyſic into a form, and arrangement, like thoſe of other ſpeculative ſciences; defining, dividing, laying down principles, and drawing concluſions; and hence they had alſo the appellation of *logici*; q. d. *reaſoners*. They alſo applied themſelves to ſeek the cauſes of diſeaſes, the nature of remedies, &c.

Eraſiſtratus, a famous *dogmatiſt*, went ſo far, that, not content to diſſect dogs, and other brute animals, he begged condemned criminals of the magiſtrates, and opened them while alive, and ſearched in their entrails.

DOITKIN, a kind of baſe coin of ſmall value, prohibited by the ſtatute 3 Hen. V. cap. 1. Hence came the phraſe, *Not worth a doitkin*.

DOLABRUM, among the Romans, a kind of knife uſed in ſacrifices among that people. Vid. Hiſt. Acad. Inſcript. tom. ii. p. 345.

DOLE, in the Saxon and Britiſh tongue, ſignifies a part or portion, moſt commonly of a meadow.

Hence alſo *dole-meadow*; a meadow wherein ſeveral perſons have ſhares.

The word ſtill ſignifies a *ſhare*; a diſtributing, or dealing of alms; or a liberal gift made by a great man to the people.

DOLE, in the *Law of Scotland*, is uſed for a malevolent intention. The word is taken from the civil law term *dolus*.

Dole, in the law of Scotland, as well as in the civil law, is an eſſential ingredient to conſtitute an action criminal. In crimes wherein the will, not the event, muſt be regarded, no negligence can equal *dole*; unleſs the negligence be ſo extremely ſupine, as not to be conceivable without implying *dole*.

Under *dole* are comprehended the vices and errors of the will, which are immediately productive of the criminal fact, though not premeditated, but the effect of ſudden paſſion. In this reſpect *dole* differs from what the Engliſh law calls malice. However both laws agree in this, that the bare intention never brought forth into act, is no crime; yet giving counſel to perpetrate is criminal, if the fact is done purſuant thereto.

DOLE-*fiſh*, in our *Statutes*, ſeems to be that fiſh, which the fiſhermen, yearly employed in the North ſeas, do of cuſtom receive for their allowance or ſhares. Vid. ſtat. 35 Hen. VIII. cap. 7.

DOLET, in *Natural Hiſtory*, a word uſed by ſome writers, in *Medicine*, for red vitriol, or colcothar of vitriol.

DOLG-BOTE, in the Saxon *Laws*, a recompence, amends, or ſatisfaction, made for a ſcar or wound.

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DOLICHODROMUS, in the *Ancient Exerciſes*, one who ran the length of a *dolichos*. See DOLICHOS.

DOLICHOLITHOS, in *Natural Hiſtory*, a name given by ſome authors to a ſpecies of ſtone, of a blackiſh colour, and of the ſhape of a kidney-bean, found in great abundance about Tyrol, and yielding a ſmell on rubbing.

DOLICHOS, in *Antiquity*, a word uſed by different writers in different ſenſes. The ancient phyſicians underſtood by it long or prolix, and uſed it in this ſenſe in their deſcriptions of diſeaſes. Others uſed it for the fruit or pod of the kidney-bean. Suidas makes it ſignify a race, or courſe, of twelve ſtadia, or of twenty-four.

DOLICHOS, in *Botany*, the name of a genus of plants, of the *diadelphia decandria* claſs, the characters of which are theſe: the perianthium is compoſed of one leaf; it is very ſhort, and is divided into four ſegments at the end; the upper ſegment is emarginated: the flower is of the papilionaceous kind; the vexillum is roundiſh, large, and emarginated, and is wholly bent backward; and there are two callous oblong bodies running parallel to one another, and growing in the tender part of the vexillum towards its baſe. Theſe compreſs the alæ together; the alæ are of an obtuſe oval figure, and are of the length of the carina; the carina is compreſſed, the filaments are diadelphous, and the antheræ are ſimple. The germen of the piſtil is ſlender and compreſſed, the ſtyle points upward, the ſtigma is bearded, and runs from the middle of the inner part of the ſtyle to its apex, which is callous and obtuſe. The fruit is a large pod, of a pointed oblong figure; it is bivalve, and is divided into two cells; the ſeeds are of an elliptic figure, and uſually are compreſſed. This plant approaches greatly to the phaſeoli, but is diſtinguiſhed at firſt ſight by the carina of the flower, which is not ſpiral, as in that genus.

DOLIMAN, a kind of long caſſock, worn by the Turks, hanging down to the feet, with narrow ſleeves, buttoned at the wriſt.

The Turks, both men and women, wear drawers next the ſkin; over that a ſhift, or ſhirt; and over the ſhirt a *doliman*. In ſummer it is linen, or muſlin; in winter, ſattin, or ſtuff.

DOLIUM, in *Natural Hiſtory*, the name of a genus of ſhells, called by ſome *conchæ globoſæ*, and by the French, *tonnes*. The characters are theſe: it is an univalve ſhell, with a globoſe, or round belly, with a lax aperture, ſometimes ſmooth, and ſometimes dentated. The clavicle is either moderately umbonated or depreſſed; and the columella is in ſome ſpecies ſmooth, in others wrinkled. Some authors have called theſe *conchæ ampullaceæ*; and they have had, at times, many other names, but all tending to the ſame ſenſe, and expreſſing the globular figure of the body, which is the great character by which theſe are diſtinguiſhed from all other ſhells. See *Tab. of Shells*, N° 15.

The Perſian ſhell, ſo much eſteemed in cabinets, is a very ſingular one; but the globoſe figure of its body evidently refers it to this genus, though it differ in many other particulars from all the ſpecies of it. Aldrovandus could not tell what to make of the ſhells of this genus, but has thrown them together at the end of his book; obſerving, that they ſeemed to be of the turbinated kind, but that they want the turbo.

Of the round umbilicated *dolia*, there are ſix ſpecies; of the oblong and ſmooth, five ſpecies; of the oblong coſtated, and umbonated, ſeven ſpecies; of thoſe with long and arched tails, five ſpecies; of that ſeries, which from their ſhape are called *bullæ*, ſeven ſpecies: to which is to be added a very rare ſpecies of *dolium*, which is faſciated, of a blue colour on the outſide, and white within; this is called by ſome the *vitta cærulea*; and there is an olive-coloured ſhell of the ſame kind.

DOLLAR, or DALLER, a ſilver COIN, nearly of the value of the Spaniſh piece of eight, or French crown.

Dollars are coined in diverſe parts of Germany and Holland; and have their diminutions, as *ſemi-dollars*, *quarter-dollars*, &c.

They are not all of the ſame fineneſs, nor weight. The Dutch *dollars* are the moſt frequent. In the Levant they are called *aſtaini*, from the impreſſion of a lion thereon.

DOLOR, *Pain*, in *Medicine*. Galen, in his firſt book of Elements, has defined pain, in oppoſition to pleaſure, to be a diſagreeable and troubleſome ſenſation. Of pain there are various kinds; one is attended with pulſation; another with a ſenſe of incumbent weight; another with a tenſion. There is a *pain* which attends eroſion, inciſion, punction, and perforation, comprehended with theſe and the like differences, under the name of acute; and laſtly there is a *pain* attended with a torpor or numbneſs.

Pains conſidered as prognoſtics of a recovery. *Pains* affect the patient in the beginning of a diſeaſe, or afterward: in the beginning they are for the moſt part to be accounted as pathognomonic ſigns, ſignifying that ſome part among the viſcera labours under an inflammation. Thus it is when the *pain* begins with a fever, and a tumor or tenſion of ſome part; and theſe ſorts of *pain* are called inflammatory. It is beſt for the patient when theſe *pains* are neither violent nor continual; but after a ſhort duration, are either quite removed, or elſe mitigated, and are, beſides, attended with no other pernicious ſigns. But it is beſt of all, and ſafeſt in ſuch a caſe, when theſe *pains* ceaſe or remit with reaſon, or for ſome manifeſt cauſe; as it happens when ſuch ceſſation or remiſſion is owing to ſome beneficent evacuation, excited by nature, or procured by art; ſuch as veneſection, ſpontaneous bleeding at the noſe, ſweats, ſtools, ſpitting, or when a ſubſequent fever removes the *pain* by virtue of its heat; as we learn from Hippocrates.

As for thoſe *pains* which ariſe in the progreſs of the diſtemper, thoſe which phyſicians call critical, are thought to be the more kindly and favourable; becauſe partly as as a ſign, and partly as a cauſe, they prognoſticate a happy criſis. As a ſign they indicate an hæmorrhage, vomiting, or ſome other evacuation, agreeable to the obſervation of Hippocrates. 1 Epid. ſect. 3.

Theſe are the *pains*, which by indicating a happy criſis, prognoſticate a recovery; ſuch, in particular, are the *pains* which affect, ſometimes for a long while together, the ignoble parts which lie remote from the viſcera, and are principally to be regarded, as well as other ſigns, when they happen on a critical day, with manifeſt tokens of concoction; in which circumſtance we may with confidence predict a recovery, if none of the mortal ſigns appear.

Pains prognoſticating death. All pains affecting a noble part of the body are bad; whether they are produced together with the diſeaſe, and ſo are eſteemed pathognomonic ſigns, or are excited afterward; for the former, in conjunction with other pathognomonic, or proper ſigns, form a prognoſtic. Thus a violent and continual pain of the head in a phrenſy, with other deſtructive ſigns of a phrenſy, is mortal. Some *pains* are generally mortal, from the excellence and uſefulneſs of the part which they affect: thoſe, for inſtance, which ſeize the heart, or cauſe ſtrangulations in the mouth of the ſtomach, the fauces, head, ears, breaſt, or bladder. For *pains* in theſe members are always pernicious, and eſpecially when attendant on a continual fever, with other bad ſymptoms, indicating an inflammation, which are generally mortal.

Pains in the viſcera and noble parts, which affect not the patient in the beginning of acute diſtempers, but are felt afterward in the progreſs of the diſeaſe; if ſevere and conſtant, are to be eſteemed very pernicious; as ſhewing ſome noble part of the viſcera to be afflicted with a high inflammation, acceſſary to the fever, and not to be ſubdued but by extraordinary ſtrength of nature. Wherefore theſe pains are uſually ſucceeded by very formidable ſymptoms; ſuch as a coldneſs in the extreme parts, which is the ordinary conſequence of violent pains, according to Hippocrates. 7 Aph. 26.

Thus may be ſeen what judgment is to be made, and what prognoſtics to be drawn, from pains moleſting the viſcera, or noble parts; but if theſe *pains* are accompanied or ſucceeded by ſome mortal ſign, no leſs than the deſtruction of the patient is indicated. The ſame conſequence may be prognoſticated from a variety of *pains* affecting the noble parts, or other ſevere ſymptoms of a different kind, appearing at the ſame time; for theſe, as they are indications of ſeveral dangerous diſorders in conjunction, ſo when attendant on *pain*, or a multiplicity of *pains*, they portend nothing but the worſt of events. For if nature finds it difficult to ſubdue one conſiderable diſtemper, it muſt certainly ſink and give way to the joint attacks of many diſeaſes, unleſs upheld by an extraordinary meaſure of ſtrength.

Pain in the ignoble parts we have before declared to be good; and if attended with a concoction of the humours, of conſiderable duration, are effectual in removing, or at leaſt in mitigating the fever, with its threatening ſympromes, and putting the patient in a better ſtate. Such *pains* begin on critical days, and are not concerned in exaſperating any of the ſymptoms. But *pains* in the ignoble parts, in the beginning of a diſeaſe, when all things are crude, by which no ſymptoms of the noble parts are removed or diminiſhed, but rather exaſperated and multiplied, and the ſick rendered worſe, are of a bad kind. But *pains* ariſing in the ignoble or remote parts, are moſt to be dreaded, when ſucceeded by a fever, and other no leſs ſevere and dangerous ſymptoms, under which the patient grows worſe.

Pains of the ignoble parts are no leſs formidable, and to be ſuſpected, when they vaniſh, and become inſenſible

on

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on a ſudden; or when they begin in a remote part, and thence remove toward the viſcera; which indicate a conflux of humours to the noble parts.

Aſclepiades conſidered *pain* as a principal indication for bleeding; for he thought *pain* was cauſed by a retention of the larger molecules, in the pores or paſſages, which nothing but bleeding could diſlodge. The rule is excellent, whatever the reaſon he gives for it may be; for it would be difficult to lay down a maxim in phyſic either more univerſal, or of greater importance. James.

Pain, conſidered as a ſymptom of a diſeaſe, makes a conſiderable article in a palliative cure.

Pain is mitigated, or aſſuaged, divers ways; as, 1. By diluting and ſoftening acrimonies, with warm water mixed with flour, applied by way of drink, fomentation, clyſter, or bath. 2. By reſolving and waſhing away obſtructions, by the ſame means, and reſolvents. 3. By relaxing the nervous veſſels, with drinks, fomentations, baths, relaxants, anodynes, and aperients. 4. By correcting the acrimony itſelf with proper remedies. 5. By freeing the obſtruent, obſtructed, and acrimonious parts from the too great preſſure of the vital humour; and by ſoftening, and ſuppurating, and depurating them. 6. By rebating or deadening the ſenſe by narcotics, either internally or externally.

DOLPHIN, *Delphinus*, in the Linnæan ſyſtem of *Zoology*, makes a diſtinct genus of fiſhes of the order of *cete*, and claſs of MAMMALIA; the characters of which are, that there are teeth in both jaws, and a pipe in the head.

In the Artedian ſyſtem of ichthyology, *delphinus* is alſo the name of a genus of the plagiuri, or cetaceous fiſhes; the characters of which are theſe: the teeth are placed in both the jaws, the pipe or opening is in the middle of the head, and the back is always pinnated.

The ſpecies of this genus are theſe, 1. The *dolphin*, with a coniform body, with a broad back, and a ſub-obtuſe ſnout. This is the *phocæna*, or porpeſſe. 2. The *dolphin*, with an oblong ſubcylindric body, with a long acute ſnout: this is the *delphinus* of the generality of authors, and is called the *porpeſſe* alſo by the Engliſh. 3. The *dolphin* with the back ridged upwards, and with broad ſerrated teeth; this is the *orca* of authors, called by us the *grampus* and *north caper*; the body of this fiſh is ſo thick, that its breadth is equal to half its length. See PORPESSE.

The name *delphinus* is of Greek origin, and is ſuppoſed by ſome to be derived from the word δελφαξ, a *pig* or *hog*; and, according to others, from the word δελφυς, *vulva*, this fiſh being of the viviparous kind, and one of thoſe few which have the vulva and penis in the different ſexes, like thoſe of land animals.

All the nations who have given this fiſh their ſeveral names, have derived them from its reſemblance to the ſame creature, a hog; and this not without reaſon, as there is much analogy between the two animals; the *dolphin* being as fat as the hog, and having his intrails extremely like thoſe of that quadruped; but in this there has yet been ſome confuſion, as the common porpeſſe, which much reſembles the *dolphin* in many reſpects, has alſo been indiſcriminately called by the ſame name with that fiſh. The difference between the two is, that the *dolphin* has a much longer ſnout or noſe, ſticking out ſomewhat in form of a gooſe's bill, and is in the whole a longer, ſlenderer, more fleſhy, and leſs fat fiſh, and is the larger of the two. The *phocæna* or *porpeſſe* is fatter, ſmaller, broader backed, and has a more obtuſe and ſhorter ſnout.

The *dolphin* is a cetaceous fiſh, covered with a ſmooth, but very tough and firm ſkin; its body is long and rounded, and its back prominent. Above the ſnout it has a pipe, by which it throws out the water neceſſarily taken in with food. Theſe fiſh are ſuppoſed to live a great number of years. The figures of them on ſome antique marbles and coins, which repreſent them crooked and unnatural, have been conceived originally by perſons who had ſeen them playing about on the ſurface of the water, in which caſe they ſometimes deceive the eye, and appear crooked: from theſe probably our ſign-painters took their idea of the *dolphin*. They are an extremely ſwift fiſh in ſwimming, and are able to live a long time out of the water, though they can continue but a little while under it without air; hence they are ſometimes taken up dead by fiſhermen in their nets, having been ſuffocated by being forcibly kept under water: they have been known to live three days on dry ground. Willughby, Hiſt. Piſc. p. 30.

This fiſh was conſecrated by the ancients to the gods, and called the ſacred fiſh. Scarce an accident could happen at ſea, but the *dolphin* offered himſelf to convey to ſhore the unfortunate. The ſtory of Arion, the muſician, is related by Ovid, Faſti, lib. ii. ver. 113.

It was formerly reckoned a great delicacy in this country.

DOLPHIN is alſo a name given by the Engliſh to the fiſh called *hippuris*, by the generality of authors; but by ſome *hippoſele* and *equiſele*, and by others *dorado*. According to the new ſyſtem of Artedi, this fiſh is a ſpecies of the *coryphæna*, and is diſtinguiſhed from all the other kinds, by its having a forked tail. See HIPPURIS and CORYPHÆNA.

DOLPHIN, *Delphinus*, in *Aſtronomy*. See DELPHINUS.

DOLPHINS *of a cannon*, in *Gunnery*, are the two handles placed on the ſecond reinforce ring of braſs guns, reſembling the fiſh of that name. They ſerve for mounting and diſmounting the guns.

DOLPHIN *of the maſt*, in *Sea-Language*, is a peculiar kind of wreath, formed of platted cordage, to be faſtened occaſionally round the maſts, as a ſupport to the PUDDENING, whoſe uſe is to ſuſtain the weight of the fore and main-yards, in caſe the rigging or chains, by which thoſe yards are ſuſpended, ſhould be ſhot away in the time of battle.

DOM, or DON, a title of honour, originally Spaniſh, though uſed occaſionally in other countries. See TITLE. It is equivalent to *maſter*, *ſir*; or *lord*, *monſieur*, *ſieur*, *mynheer*, &c.

Gollut, in his Mem. des Bourg. lib. v. cap. 11. aſſures us, that the firſt on whom the Spaniards conferred the title, was *dom* Pelayo; when, upon their being routed, and driven out, by the Saracens, at the beginning of the eighth century, they rallied again on the Pyreneans, and made him king.

In Portugal, nobody is allowed to aſſume the title of *dom*, which is a badge or token of nobility, without the king's leave.

DOM is likewiſe uſed in France among ſome orders of religious, as the Chartreux, Benedictines, &c.

We ſay, the reverend father *dom* Calmet, *dom* Alexis, *dom* Balthaſar, &c.

In the plural they write *doms*, with an *s*, in ſpeaking of ſeveral. RR. PP. *doms* Claude du Ruble, and Jaques Douceur.

The word is formed from the Latin *domnus*, or *dominus*; of which it is an abbreviature. *Domnus* is found in diverſe Latin authors of the barbarous age. Onuphrius aſſures us, it was a title firſt given to the pope alone; then to the biſhops, abbots, and others, who held any eccleſiaſtical dignity, or were eminent for virtue and religion. At length it was uſurped by the mere monks.

Some ſay, the religious declined the title *dominus* out of humility, as belonging to God alone; and aſſumed that of *domnus*, as expreſſing inferiority, *quaſi minor dominus*. Indeed, the appellation *domnus* for *dominus* appears very ancient, if we conſider the ſurname of Julia, wife of the emperor Septimius Severus, who is called on medals, IVLIA DOMNA, for JULIA DOMINA.

DOM and SOM, words uſed in ancient charters, ſignifying a power of judging, and ſecurity in poſſeſſing. Hence *dome's* men, who were perſons appointed to determine ſuits and controverſies between parties. See DAY's *man*.

DOM-*Book*. See DOMES-DAY.

DOMAIN, the inheritance, eſtate, or poſſeſſion, of any one. See DEMESNE.

Menage derives the word from *domanium*, written in the barbarous Latin for *dominium*. See DOMINIUM.

DOME, or DOOM, ſignifies judgment, ſentence, or decree. The homagers oath, in the Black Book of Hereford, ends thus: So help me God at his holy *dome*, and by my trowthe.

DOME, in *Architecture*, a ſpherical roof; or a work of a ſpherical form raiſed over the middle of a building, as a church, hall, pavilion, veſtibule, ſtair-caſe, &c. by way of crowning, or acroter. See *Tab. Architecture*, *fig.* 40. D.

The word is formed from the barbarous Latin, *doma*, which ſignified a *roof*, or *open porch*; as is obſerved by Papias. It is frequent in the corrupt Latin authors, who borrowed it from the Greeks, among whom *trullus*, or *trullum*, is a common name for any round building; ſuch as the palace of Conſtantinople, wherein was held the council thence called *in trullo*.

Domes are the ſame with what the Italians call *cuppolas*; and we frequently *cupolas*; the Latins, according to Vitruvius, *tholi*.

They are uſually made round; though we have inſtances of ſquare ones; as thoſe of the Louvre; and others that are polygons, as that of the Jeſuits church in the rue St. Antoine at Paris. They have uſually columns ranged around their outſides, both by way of ornament, and to ſupport the vault.

DOME, *a flat*, is that whoſe ſweep, or contour, is leſs than a hemiſphere.

DOME, *eye of a*. See EYE.

DOME, in *Chemiſtry*, the arched cover of a reverberatory furnace. See REVERBERATORY.

DOMENGER,

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DOMENGER, in *Middle Age Writers*, is ſometimes uſed for damſel. See DAMSEL.

DOMES-DAY, or DOOMS-DAY-*Book*, *Liber judiciarius vel cenſualis Angliæ*, the judicial book, or book of the ſurvey of England; a moſt ancient record made in the time of William the Conqueror; upon a ſurvey, or inquiſition, of the ſeveral counties, hundreds, tithings, &c.

Its name is formed from the Saxon *dom*, *doom*, *judgment*, *ſentence*; and *day*, which has the ſame force; ſo that *dome-day* is no more than a reduplicative, importing *judgment judgment*.

But ſome condemn this etymology as whimſical; and contend that if it was juſt, the Latin for *domeſday* would be *dies judicii*; whereas, as appears above, it is ſtiled *Liber judiciarius, vel cenſualis Angliæ*. Bullet, in his Celtic Dictionary, hath the word *dom*, which he reads *ſeur*, *ſeigneur*, (and hence the Spaniſh word *don*) as alſo the words *deya*, and *deia*, which he renders *proclamation*, *advertiſement*. *Doomſday* therefore ſignifies the lord's or king's proclamation, or advertiſement, to the tenants who hold under him; and agrees well with great part of the contents of this famous ſurvey. Obſervations on the Statutes, p. 190. note (*m*).

The drift, or deſign of the book, is to ſerve as a regiſter, by which ſentence may be given in the tenures of eſtates; and from which that noted queſtion, whether lands be ancient demeſne, or not, is ſtill decided. Its contents are ſummed up in the following verſes:

Quid deberetur fiſco, quæ, quanta tributa,
Nomine quid cenſus, quæ vectigalia, quantum
Quiſque teneretur feodali ſolvere jure,
Qui ſunt exempti, vel quos angaria damnat,
Qui ſunt vel glebæ ſervi, vel conditionis,
Quove manumiſſus patrono jure ligatur.

This book is ſtill remaining, fair and legible; conſiſting of two volumes, a greater, and a leſs; the greater comprehending all the counties of England, except Northumberland, Cumberland, Weſtmorland, Durham, and part of Lancaſhire, which were never ſurveyed; and except Eſſex, Suffolk, and Norfolk, which are comprehended in the leſſer volume, which concludes with theſe words: *Anno milleſimo octogeſimo ſexto ab incarnatione Domini, vigeſimo vero regis Wilhelmi, facta eſt iſta deſcriptio non ſolum per hos tres comitatus, ſed etiam alios.*

It is called *Liber judicialis*, becauſe a juſt and accurate deſcription of the whole kingdom is contained therein; with the value of the ſeveral inheritances, &c.

It was begun by five juſtices, aſſigned for that purpoſe in each county, in the year 1081, and finiſhed in 1086. Camden calls it *Gulielmi Librum cenſualem*, king William's Tax-book.

This book was formerly kept under three different locks and keys; one in the cuſtody of the treaſurer, and the others of the two chamberlains of the exchequer. It is now depoſited in the chapter-houſe at Weſtminſter, where it may be conſulted, on paying to the proper officers a fee of 6*s*. 8*d*. for a ſearch, and 4*d*. per line for a tranſcript.

Our anceſtors had many *dome-books*. We are told by Ingulphus, that king Alfred made a like regiſter with that of William the Conqueror. It was begun upon that prince's dividing his kingdom into counties, hundreds, tithings, &c. when an inquiſition being taken of the ſeveral diſtricts, it was digeſted into a regiſter, called *Dom-boc*, q. d. the *Judgment-book*, and was repoſited in the church of Wincheſter; whence it is alſo called the *Wincheſter-book*, and *Rotulus Winton*. This book is ſaid to have been extant ſo late as the reign of king Edward IV. but is now unfortunately loſt. It probably contained the principal maxims of common-law, the penalties for miſdemeanors, and the forms of judicial proceedings. And upon the model of this *Dom-boc* it is, that the *Domeſday* of the Conqueror was formed.

That of king Alfred referred to the time of king Ethelred; and that of the Conqueror, to the time of Edward the Confeſſor; the entries being thus made, *C. tenet rex Gulielmus in dominico, & valet ibi ducatæ*, &c. T. R. E. *valebat*; q. d. it is worth ſo much *tempore regis Eduardi*, in the time of king Edward.

There is a third *Dom-boc*, or *Domes-day-book*, in quarto, differing from the other in folio, rather in form than matter. It was made by order of the ſame Conqueror; and ſeems to be the more ancient of the two.

A fourth book there is in the exchequer, called *domesday*; which, though a very large volume, is only an abridgment of the other two. It has abundance of pictures, and gilt letters at the beginning, which refer to the time of Edward the Confeſſor. There is alſo a fifth book, called *Domes-day*, and the ſame with the fourth now mentioned.

DOMESTIC, from *domus*, *houſe*, a term of ſomewhat more extent than that of ſervant; the latter only ſignifying ſuch as ſerve for wages, as footmen, lacquies, porters, &c. whereas *domeſtic* comprehends all who act under a man, compoſe his family, and live with him, or are ſuppoſed to live with him. Such are ſecretaries, chaplains, &c.

Sometimes *domeſtic* goes farther, being applied to the wife and children.

DOMESTIC *gown*, *toga domeſtica*. See TOGA.

DOMESTICUS, Δομεστικος, in *Antiquity*, was a particular officer in the court of the emperors of Conſtantinople.

Fabrot, in his gloſſary on Theophylax Simocatta, defines *domeſticus* to be any perſon entruſted with the management of affairs of importance; a counſellor, *cujus fidei graviores alicujus curæ, & ſolicitudines committuntur*.

Others hold, that the Greeks called *domeſtici* thoſe who at Rome were called *comites*; particularly, that they began to uſe the name *domeſticus*, when that of count was become a name of dignity, and ceaſed to be the name of an officer in the prince's family.

Domeſtici, therefore, were ſuch as were in the ſervice of the prince, and aſſiſted him in the adminiſtration of affairs; both thoſe of his family, thoſe of juſtice, and thoſe of the church.

The grand DOMESTIC, *Megadomeſticus*, called alſo abſolutely the *domeſticus*, ſerved at the emperor's table, in quality of what we occidentals call *dapifer*. Others ſay, he was rather what we call a *majordomo*.

DOMESTICUS *menſæ* did the office of grand ſeneſchal, or ſteward.

DOMESTICUS *rei domeſticæ* acted as maſter of the houſhold.

DOMESTICUS *ſcholarum*, or *legionum*, had the command of the reſerved forces called *ſcholæ palatinæ*, whoſe office was to execute the immediate orders of the emperor.

DOMESTICUS *murorum*, had the ſuperintendance of all the fortifications.

DOMESTICUS *regionum*, that is, of the eaſt and weſt, had the care of public cauſes, much like our attorney or ſollicitor-general.

DOMESTICUS *icanatorum*, or of the military cohorts.

There were diverſe other officers of the army, who bore the appellation *domeſticus*, which ſignified no more than commander, or colonel. Thus, the *domeſtic of the legion* called *optimates*, was the commander thereof.

DOMESTICUS *chori*, or *chantor*, whereof there were two in the church of Conſtantinople; one on the right ſide of the church, and the other on the left. They were alſo called *protopſaltes*.

Dom. Magri diſtinguiſhes three kinds of *domeſtici* in the church: *domeſtic of the patriarchal clergy*; *domeſtic of the imperial clergy*, that is, maſter of the emperor's chapel; and *domeſticus deſpoinicus*, or of the empreſs. There was another order of *domeſtics*, inferior to any of thoſe abovementioned, called *patriarchal domeſtics*.

DOMESTICI was alſo the name of a body of forces in the Roman empire. Pancirollus takes them to have been the ſame with thoſe called *protectors*; who had the chief guard of the emperor's perſon, in a degree above the prætorians; and who under the Chriſtian emperors had the privilege to bear the grand ſtandard of the croſs.

They are ſuppoſed to have been 3500 before Juſtinian's time, who added 2000 more to the number. They were divided into ſeveral companies, or bands, which the Latins called *ſcholæ*, ſome whereof are ſaid to have been inſtituted by Gordian. Some of them were cavalry, and ſome infantry.

Their commander was called *comes domeſticorum*.

DOMICELLARY *canons*. See CANONS.

DOMICELLUS. See DAMSEL.

DOMIFYING, DOMIFICATION, in *Aſtrology*, the dividing or diſtributing the heavens into twelve houſes; in order to erect a theme, or horoſcope, by means of ſix great circles, called *circles of poſition*.

There are diverſe ways of *domifying*, according to diverſe authors. That of Regiomontanus, which is the moſt uſual, makes the circle of poſition paſs through the interſections of the meridian, and horizon. Others make them paſs through the poles of the world, or the equator; and others through the poles of the zodiac.

DOMINANT *of a mode*, in *Muſic*, that ſound which makes a perfect fifth to the final, in authentic modes; and a third to the final or ſixth, to the loweſt chord of a plagal mode.

DOMINARUM AQUA, a name given by Mynſicht to a diſtilled water, which he recommends to the ladies to facilitate delivery.

DOMINATION, in *Theology*, the fourth order of angels, or bleſſed ſpirits, in the hierarchy; reckoning from the ſeraphim. See HIERARCHY, and SERAPH.

St. DOMINGO *Company*. See COMPANY.

DOMINI—*Anno* DOMINI. See ANNO.

Bull in Cœna DOMINI. See BULL.

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DOMINIAL *offices*. See OFFICES.

DOMINICAL *Letter*, in *Chronology*, properly called *Sunday Letter*, one of the ſeven letters of the alphabet A B C D E F G, uſed in almanacs, ephemerides, &c. to denote the Sundays throughout the year.

The word is formed from *Dominica*, or *Dominicus dies*, *Lord's day*, *Sunday*.

The *Dominical letters* were introduced into the calendar by the primitive Chriſtians, in lieu of the nundinal letters in the Roman calendar.

Theſe letters, we have obſerved, are ſeven: and that, in a common year, the ſame letter ſhould mark all the Sundays, will eaſily appear; inaſmuch as all the Sundays are ſeven days apart, and the ſame letter only returns in every ſeventh place.

But in biſſextile, or leap-year, the caſe is otherwiſe: for by means of the intercalary day, either the letters muſt be thruſt out of their places for the whole year afterwards, ſo, e. gr. as that the letter which anſwers to the firſt of March, ſhall likewiſe anſwer to the ſecond, &c. or elſe the intercalary day muſt be denoted by the ſame letter as the preceding one. This latter expedient has been judged the better, and accordingly the Sundays after the intercalary day have another *Dominical letter*.

Hence, 1. As the common Julian and Gregorian year conſiſts of 365 days, i. e. of 52 weeks, and one day; the beginning of the year, every common year, goes backwards by one day: thus, e. gr. if this year the beginning, or firſt day fall on a Sunday, the next year it will fall on Saturday, the next on Friday, &c. Conſequently, if A be the *Dominical letter* of the preſent year, G will be that of the next year; and ſo on in a retrograde order.

2. As the Julian, and Gregorian biſſextile, or leap-year, conſiſts of 366 days, i. e. 52 weeks, and 2 days, the beginning of the next year after biſſextile goes back 2 days. Whence, if in the beginning of the biſſextile year, the *Dominical letter* were A, that of the following year will be F.

3. Since in leap-years the intercalary day falls on the 24th of February, in which caſe the 24th and 25th days are conſidered as one day, and denoted by the ſame letter; after the 24th day of February the *Dominical letter* goes back one place: thus, if in the beginning of the year the *Dominical letter* be A, it will afterwards be G. This day is now added to the end of February, and thence the change takes place.

4. As every fourth year is biſſextile, or leap-year, and as the number of letters is 7; the ſame order of *Dominical letters* only returns in 28 years; which, without the interruption of biſſextiles, would return in 4 years.

5. Hence the invention of the ſolar cycle of 28 years; upon the expiration whereof the *Dominical letters* are reſtored ſucceſſively to the ſame days of the month, or the ſame order of the letters returns.

To find the DOMINICAL *letter of any given year.* Seek the cycle of the ſun for that year, as directed under CYCLE; and the *Dominical letter* is found correſponding thereto. When there are two, the propoſed year is biſſextile; and the firſt obtains to the end of February; and the laſt for the reſt of the year.

The *Dominical letter* for any year of the preſent century may be found by the following canon:

Divide the odd years, their fourth and four by ſeven,
What is left ſubtract from ſeven, the letter is given.

Thus for the year 1778, the *letter* will be D.

The *Dominical letter* may be found univerſally, for any year of any century, thus:

Divide the centuries by four; and twice what does remain
Take from ſix; and then add to the number you gain
Their odd years and their fourth; which, dividing by ſeven,
What is left take from ſeven, and the letter *is given.*

Thus the letter for the year 1878 is F.

The reaſon of the foregoing rules may be eaſily explained. Every common year brings the *Dominical letter one* backward, and every leap year *two*; therefore to any number of years, under 100, add its fourth part for the leap years, omitting fractions; and the ſum will be the number of times the *letter* has ſhifted backward during that number of years, which, being divided by 7, leaves a remainder, that will be the number of the letter of the preſent year, reckoning from the *letter* belonging to the laſt centeſſimal year, in a retrograde order; or the complement of the remainder to 7 will be the preſent *Dominical letter* in a direct order. It is alſo evident, that four Gregorian centuries, containing three centeſſimal common years, which remove the letter two forward, and one centeſſimal leap year, which removes it one forward, will complete a revolution of the letter. Thus the *Dominical letter* of 1600 is A; of 1700 C; of 1800 E; of 1900 G; of 2000 A, &c. Therefore A, the ſixth letter backward from G, is the *Dominical letter* of a biſſextile centeſſimal year; and 6 muſt be added to the odd years and their fourth, and the ſum be divided by 7, in order to obtain the *letter* of any year in the next century, or the ſeventeenth; and, as the firſt common centeſſimal year brings the letter two forward from A, or two leſs than ſix backward from G, the remainder, after dividing the centuries by 4, muſt be doubled; and ſo we ſhall have $6-2=4$ to be added to the odd years, and their 4th, in the ſecond common century; and $6-4$, or 2, muſt be added in the third, and 0 in the 4th, becauſe the Gregorian biſſextile recurs, and the number of centuries may be divided by 4, without leaving any remainder.

By the reformation of the calendar under pope Gregory, the order of the *Dominical letters* was again diſturbed in the Gregorian year; for the year 1582, which at the beginning had G for its *Dominical letter*; by the retrenchment of ten days after the 4th of October, came to have C for its *Dominical letter*; by which means the *Dominical letter* of the ancient Julian calendar is four places before that of the Gregorian; the letter A in the former anſwering to D in the latter.

DOMINICAL, in *Church Hiſtory*. The council of Auxerre, held in 578, decrees, that women communicate with their *dominical*. Some authors contend, that this *dominical* was a linen cloth, wherein they received the ſpecies; as not being allowed to receive them in the bare hand. Others will have it a kind of veil, wherewith they covered the head. The moſt probable account is, that it was a ſort of linen cloth, or handkerchief, wherein they received, and preſerved, the Euchariſt, in times of perſecution, to be taken on occaſion at home. This appears to have been the caſe by the practice of the firſt Chriſtians, and by Tertullian's book Ad Uxorem.

DOMINICAL was alſo formerly uſed in the ſame ſenſe with HOMILY.

DOMINICANS, an order of religious, called in ſome places *Jacobins*, and in others, *Predicants*, or *Preaching Friers*. See JACOBINS, &c.

The *Dominicans* take their name from their founder Dominic de Guzman, a Spaniſh gentleman, born in 1170, at Calaroga, in Old Caſtile. He was firſt canon and archdeacon of Oſma; and afterwards preached with great zeal and vehemence againſt the Albigenſes in Languedoc, where he laid the firſt foundation of his order. It was approved of in 1215, by Innocent III. and confirmed in 1216, by a bull of Honorius III. under the title of St. Auguſtin; to which Dominic added ſeveral auſtere precepts and obſervances, obliging the brethren to take a vow of abſolute poverty, and to abandon entirely all their revenues and poſſeſſions; and alſo the title of *Preaching Friers*, becauſe public inſtruction was the main end of their inſtitution.

The firſt convent was founded at Tholouſe, by the biſhop thereof, and Simon de Montfort. Two years afterwards they had another at Paris, near the biſhop's houſe; and ſome time after, a third in the rue St. Jaques, St. James's ſtreet, whence the denomination of Jacobins.

Juſt before his death, Dominic ſent Gilbert de Freſney, with twelve of the brethren, into England, where they founded their firſt monaſtery at Oxford in the year 1221, and ſoon after another at London. In the year 1276, the mayor and aldermen of the city of London gave them two whole ſtreets by the river Thames, where they erected a very commodious convent, whence that place is ſtill called Black Friers, from the name by which the *Dominicans* were called in England.

St. Dominic, at firſt, only took the habit of the regular canons, that is, a black caſſock, and rochet; but this he quitted in 1219, for that which they now wear, which, it is pretended, was ſhewn by the bleſſed Virgin herſelf to the beatified Renaud d'Orleans.

This order is diffuſed throughout the whole known world. It has forty-five provinces under the general, who reſides at Rome; and twelve particular congregations, or reforms, governed by vicars general.

They reckon three popes of this order, above ſixty cardinals, ſeveral patriarchs, a hundred and fifty archbiſhops, and about eight hundred biſhops; beſide maſters of the ſacred palace, whoſe office has been conſtantly diſcharged by a religious of this order, ever ſince St. Dominic, who held it under Honorius III. in 1218.

The *Dominicans* are alſo inquiſitors in many places. See INQUISITION.

Of all the monaſtic orders, none enjoyed a higher degree of power and authority than the *Dominican* friers, whoſe credit was great, and their influence univerſal. But the meaſures they uſed in order to maintain and extend their authority, were ſo perfidious and cruel, that their influence began to decline towards the beginning of

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the ſixteenth century. The tragic ſtory of Jetzer, conducted at Bern in 1509, for determining an unintereſting diſpute between them and the Franciſcans, relating to the *immaculate* CONCEPTION, will reflect indelible infamy on this order. See an account of it in Burnet's Travels through France, Italy, Germany, and Switzerland, p. 31. or Moſheim's Eccl. Hiſt. vol. iii. p. 294, 8vo. They were indeed perpetually employed in ſtigmatizing with the opprobious name of hereſy numbers of learned and pious men; in encroaching upon the rights and properties of others, to augment their poſſeſſions; and in laying the moſt iniquitous ſnares and ſtratagems for the deſtruction of their adverſaries. They were the principal counſellors, by whoſe inſtigation and advice Leo X. was determined to the public condemnation of Luther. The papal ſee never had more active and uſeful abettors than this order, and that of the JESUITS.

The dogmata of the *Dominicans* are uſually oppoſite to thoſe of the Franciſcans.

There are alſo nuns, or ſiſters, of this order, called in ſome places, *Preaching Siſters*. Theſe are even more ancient than the friers; St. Dominic having founded a ſociety of religious maids, at Prouilles, ſome years before the inſtitution of his order of men; viz. in 1206.

There is alſo a *third order of Dominicans*, both for men and women.

DOMINIUM, DOMINION, in the *Civil Law*, denotes the abſolute power, or property, of a thing, to uſe or diſpoſe of it how we pleaſe.

Directum dominium is the right alone of *dominium*; and *dominium utile*, the profit redounding from it. The wife retains the *dominium directum* of her jointure, and the *dominium utile* paſſes to her huſband. With reſpect to ſignory, he who pays rent, has the *dominium utile* of the lands; and the lord he pays it to, the *dominium directum*.

DOMINIUM, DOMINION, or DOMAINE, in our *Ancient Cuſtoms*, denotes a rent due to the lord, where the property is not his.

DOMINORUM, *Affidatio*. See AFFIDATIO.

DOMINUS, in *Ancient Times*, a title prefixed to a name, uſually to denote the perſon either a knight, or a clergyman. See VICE-DOMINUS.

Though the title was ſometimes alſo given to a gentleman not dubbed; eſpecially if he were lord of a manor. See DOM, GENTLEMAN, and SIRE.

In Holland, the title *dominus* is ſtill retained, to diſtinguiſh a miniſter of the reformed church.

Recto quando DOMINUS *remiſit*. See RECTO.

DOMO *reparanda*, a writ that lies for one againſt his neighbour, by the fall of whoſe houſe he fears damage to his own. Reg. of Writs, fol. 153. In which caſe the civilians have the action *de damno infecto*.

DONARIA, among the *Ancients*, in its primary ſignification, was taken for the places where the oblations offered to the gods were kept; but afterwards was uſed to denote the offerings themſelves; and ſometimes, though improperly, the temples.

DONATION, DONATIO, an act, or contract, whereby a man transfers to another, either the property, or the uſe, of the whole, or a part of his effects, as a free gift.

A *donation*, to be valid and complete, ſuppoſes a capacity both in the donor, and the donee; and requires conſent, acceptance, and delivery; and by the French law regiſtry alſo.

DONATION *mortis cauſa*, in *Law*, a diſpoſition of property made by a perſon in his laſt ſickneſs, who, apprehending his diſſolution near, delivers, or cauſes to be delivered to another, the poſſeſſion of any perſonal goods, to keep in caſe of his deceaſe. If the donor dies, this gift needs not the conſent of his executor; but it ſhall not prevail againſt creditors; and it is accompanied with this implied truſt, that, if the donor lives, the property ſhall revert to himſelf, being only given in proſpect of death, or *mortis cauſa*. This method of *donation* ſeems to have been conveyed to us from the civil lawyers, who borrowed it from the Greeks. Odyſſey, lib. xvii. ver. 78. and Euripides Alceſtes, ver. 1020. See Blackſt. Com. vol. ii. p. 514.

DONATISTS, ancient ſchiſmatics in Africa, ſo denominated from their leader, Donatus.

They had their origin in the year 311, when, in the room of Menſurius, who died in that year, on his return to Rome, Cæcilian was elected biſhop of Carthage, and conſecrated without the concurrence of the Numidian biſhops, by thoſe of Africa alone; whom the people refuſed to acknowlege, and to whom they oppoſed Majorinus; who, accordingly, was ordained by Donatus, biſhop of Caſæ Nigræ. They were condemned, in a council held at Rome, two years after their ſeparation; and afterwards in another at Arles, the year following; and again at Milan, before Conſtantine the Great, in 316, who deprived them of their churches, and ſent their ſeditious biſhops into baniſhment, and puniſhed ſome of them with death. Their cauſe was eſpouſed by another Donatus, called the Great, the principal biſhop of that ſect, who, with numbers of his followers, was exiled by order of Conſtans. Many of them were puniſhed with great ſeverity. See CIRCUMCELLIONES. However, after the acceſſion of Julian to the throne in 362, they were permitted to return, and reſtored to their former liberty. Gratian publiſhed ſeveral edicts againſt them; and in 377 deprived them of their churches, and prohibited all their aſſemblies. But notwithſtanding the ſeverities they ſuffered, it appears that they had a very conſiderable number of churches towards the cloſe of this century; but at this time they began to decline, on account of a ſchiſm among themſelves, occaſioned by the election of two biſhops, in the room of Parmenian, the ſucceſſor of Donatus; one party elected Primian, and were called Primianiſts, and another Maximian, and were called Maximianiſts. Their decline was alſo precipitated by the zealous oppoſition of St. Auguſtin, and by the violent meaſures which were purſued againſt them, by order of the emperor Honorius, at the ſolicitation of two councils held at Carthage; the one in 404, and the other in 411. Many of them were fined, their biſhops were baniſhed, and ſome put to death. This ſect revived and multiplied under the protection of the Vandals, who invaded Africa in 427, and took poſſeſſion of this province; but it ſunk again under new ſeverities, when their empire was overturned in 534. Nevertheleſs they remained in a ſeparate body till the cloſe of this century, when Gregory, the Roman pontiff, uſed various methods for ſuppreſſing them; his zeal ſucceeded, and there are few traces to be found of the *Donatiſts* after this period. They were diſtinguiſhed by other appellations; as Circumcelliones, Montenſes, or Mountaineers, Campites, Rupites, &c. They held three councils, or conciliabules; that of Cirta in Numidia, and two at Carthage.

The errors of the *Donatiſts*, beſide their ſchiſm, were, 1. That baptiſm conferred out of the church, that is, out of their ſect, was null; and accordingly they rebaptized thoſe who joined their party from other churches, and re-ordained their miniſters. 2. That theirs was the only true, pure, and holy church; all the reſt of the churches they held as proſtitute, and fallen.

Donatus ſeems likewiſe to have given into the doctrine of the Arians, with whom he was cloſely allied; and, accordingly, St. Epiphanius, Theodoret, and ſome others, accuſed the *Donatiſts* of Arianiſm; and it is probable that the charge was well founded, becauſe they were patronized by the Vandals, who were of theſe ſentiments. But St. Auguſtine, ep. 185, to count Boniface, & Hær. 69, affirms, that the *Donatiſts*, in this point, kept clear of the errors of their leader.

DONATIVE, DONATIVUM, a preſent made any perſon; called alſo *gratuity*.

The Romans made large *donatives* to their ſoldiers. Julia Pia, wife of the emperor Severus, is called, on certain medals, MATER CASTRORVM, becauſe of the care ſhe took of the ſoldiery, by interpoſing for the augmentation of their *donatives*, &c.

Donative was properly a gift made to the ſoldiery; as *congiarium* was that made to the people. See CONGIARIUM.

Salmaſius, in his notes to Lampridius, in his Life of Heliogabalus, mentioning a *donative* that emperor gave of three pieces of gold per head, obſerves, that this was the common and legitimate rate of a *donative*. Caſaubon, in his notes on the Life of Pertinax by Capitolinus, obſerves, that Pertinax made a promiſe of three thouſand denarii to each ſoldier; which amounts to upwards of ninety-ſeven pounds ſterling. The ſame author writes, that the legal *donative* was twenty thouſand denarii; and that it was not cuſtomary to give leſs, eſpecially to the prætorian ſoldiers; that the centurions had double, and the tribunes, &c. more in proportion.

DONATIVE, in the *Canon Law*, a benefice given, and collated to a perſon, by the founder, or patron; without either preſentation, inſtitution, or induction by the ordinary.

If chapels founded by laymen be not approved by the dioceſan, and, as it is called, *ſpiritualized*, they are not accounted proper benefices, neither can they be conferred by the biſhop, but remain to the pious diſpoſition of the founders; ſo that the founders, and their heirs, may give ſuch chapels without the biſhop.

Gwin obſerves, that the king might of ancient time found a free chapel, and exempt it from the juriſdiction of the dioceſan; ſo may he, by letters patents, give liberty to a common perſon to found ſuch a chapel, and make it *donative*, not preſentable; and the chaplain, or beneficiary, ſhall be deprivable by the founder or his heir, and not

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not by the biſhop. And this ſeems to be the original of *donatives* in England.

Donatives are within the ſtatute againſt ſimony; and if they have cure of ſouls, within that againſt pluralities. If the patron of a *donative* doth not nominate a clerk, there can be no lapſe thereof, unleſs it be ſpecially provided for in the foundation; but the biſhop may compel him to do it by ſpiritual cenſures. But if it be augmented by queen Anne's bounty, it will lapſe like other preſentative livings. 1 Geo. I. ſtat. 2. cap. 10. The ordinary cannot viſit a *donative*, and therefore it is free from procuration, and the incumbent is exempted from attendance at viſitations.

All biſhopricks in ancient time were *donative* by the king. Again, where a biſhop has the gift of a benefice, it is properly called a *donative*, becauſe he cannot preſent to himſelf.

DONAX, in *Zoology*, a name by which ſeveral of the old authors have called the ſolen, or razor-fiſh. See SOLEN.

DONAX, in *Botany*, the name by which ſome authors call the great reed, the arundo maxima, or arundo Cypria of others. Tourn. Inſt. p. 256. See ARUNDO.

DONE *ſur, grant and render*, in *Law*, a double fine, comprehending the fine *ſur cognizance de droit com ces*, and the fine *ſur conceſſit*, which may be uſed to create particular limitations of eſtates. See FINE.

DONGON, in *Natural Hiſtory*, a name given by the people of the Philippine iſlands to a peculiar ſpecies of crane, which has a large body like a gooſe, and a ſhorter neck than the common kind: it has a long and very broad beak, and is of a grey colour; they have, beſides this, another ſpecies of crane, which they call tipul or tihol; as remarkable for the length of its neck and legs, as this for the breadth of its beak. This tipul can ſtand erect, and look over a tall man's head.

DONJON, in *Fortification*, generally denotes a large ſtrong tower, or redoubt, of a fortreſs, where the garriſon may retreat in caſe of neceſſity, and capitulate with greater advantage. See DUNGEON.

DONIS *conditionalibus, ſtatute de*, in *Law*, is the ſtatute of Weſtminſter 2. viz. 13 Edw. I. cap. 1. which revived in ſome ſort the ancient feodal reſtraints, that were originally laid on alienations, by enacting, that from thenceforth the will of the donor be obſerved; and that the tenements ſo given, to a man, and the heirs of his body, ſhould at all events go to the iſſue, if there were any; or, if none, ſhould revert to the donor. Blackſt. Com. vol. ii. p. 112.

DONNA, or *La* DONNA, in *Ichthyology*, a name given by Zuchelli, and ſome other authors, to the manati, or SEA-*cow*.

DONOR, in *Law*, he who gives lands, or tenements, to another, in tail. As donee, is he to whom the ſame are given.

DONZELLINA, in *Zoology*, a name by which ſome called the *julis*, a very beautifully painted fiſh of the Mediterranean, approaching to the nature of the turdus or wraſſe. See JULIS.

DOOLS, a term uſed in ſeveral parts of the kingdom for balks, or ſlips of paſture, left between the furrows of ploughed lands.

DOOR, in *Architecture*, an aperture in a wall, to give entrance, and exit, in and out of the building, or ſome apartment thereof. Moſt of the obſervations that are applicable to WINDOWS may be applied to *doors*.

The proportions of *doors* are adjuſted by thoſe of a man: in larger buildings they muſt always be larger than in ſmaller; but in none ſhould they be leſs than ſix feet high, to admit a man of juſt ſtature, erect; and as the breadth of a man, with his arms placed a-kimbo, is nearly ſubduple his height, the width ſhould never be leſs than three feet.

Some architects give us theſe dimenſions: in ſmall buildings the breadth of the *door* four feet, or four and a half; in middling buildings, five or ſix; in large ones, ſeven or eight; in chambers of the firſt, three and a half, three quarters, or four; of the ſecond, four, or four and a half; and of the third, five, or ſix; in churches, ſeven, or eight; in gates, nine, ten, or twelve: hence their height is eaſily determined; except for the gates of cities, which ſhould only be four fifths of their breadth.

It is an obſervation of Palladio, that the principal *door*, or entrance, of a houſe, muſt never be regulated by any certain dimenſions, but by the dignity of the perſon that is to live in it: yet, to exceed rather in the more, than the leſs, is a mark of generoſity; and may be excuſed with ſome noble emblem, or inſcription, as that of the conte de Bevilacqua over his large gate at Verona, where had been committed a like diſproportion, *Patet Janua, Cor magis.*

The principal *door*, as it is the entrance into all the apartments, ſhould be in the center of an edifice; though in ſmall houſes convenience may ſometimes require its being placed on one ſide.

DOOR, *ſcenography of a*. See SCENOGRAPHY.

DOORS, *architrave*. See ARCHITRAVE.

DOR, the Engliſh name for the common black beetle. Some alſo apply it to the duſty beetle, that flies about hedges in the evening. See SCARABÆUS.

DORADO, in *Aſtronomy*, a ſouthern conſtellation, not viſible in our latitude; it is alſo called XIPHIAS. The ſtars of this conſtellation, in Sharp's Catalogue, are ſix.

Names and ſituations of the ſtars.	Signs.	Longitud.			Latitude.			Magnitude.
		°	′	″	°	′	″	
In the head	♎	7	36	27	87	33	48	6
In the gills	♓	13	11	57	85	25	29	6
In the belly	♈	22	50	07	88	14	20	5
Above the back	♉	18	32	09	85	4	22	4
In the tail		4	5	31	74	38	11	3.4
5. In the end of the tail		2	44	28	70	12	28	4

DORADO, in *Ichthyology*, the name of a large ſea-fiſh, called by the Braſilians guaracapema; and ſo much reſembling the hippuris, as by many to be ſuppoſed to be the ſame fiſh; it grows to ſix or ſeven feet in length, and is of a ſomewhat broad and flatted form, being a foot and a half broad near the head; the head ends in a ſquare, and is thinned away to an edge, for the advantage of the creatures ſwimming the more ſwiftly. Its mouth is but ſmall for its ſize, and is furniſhed with very ſharp teeth; its eyes are large and round, and placed but a little above its mouth; its gills are large. It has one long fin running the whole length of the back, and another anſwering it on the belly, reaching from the anus to the tail; the tail is long, large, and forked; its ſcales are very ſmooth, and ſcarce ſenſible to the touch; its head, back, and ſides, are of a ſilver-green, its belly white; its back and ſides are ſpotted with blue; it is a very ſwift fiſh in ſwimming, and is very delicate and well taſted.

DOREAS *Lybica*, in *Natural Hiſtory*, the name by which Ælian and ſome other authors have called the common antelope. See GAZELLA.

DOREE, or *John* DOREE, in *Ichthyology*, a name given by us to a fiſh, called by authors the faber and gallus marinus. We have borrowed the name *doree* from the French; and, as to the word *John*, by ſome writers prefixed to it, it ſeems only a corruption of the French word *jaune, yellow*; they expreſſing the colour of the ſides of this fiſh, which is a gold-yellow, by the phraſe *jaune dorée*; this has given us the words *John Dorée*, or by thoſe who ſpell yet worſe, *John Dory*; as we ſee it in ſome authors.

According to the new Artedian ſyſtem, this is a ſpecies of the zeus, and is diſtinguiſhed by that author from the others of that genus, by the name of the zeus, with a prickly belly, and with a tail, not forked at the end, but rounded. Willughby, Hiſt. Piſc. p. 295. See ZEUS.

It is a ſhort and very broad and flat fiſh, being every where of the ſame thickneſs, and ſomething approaching to the plaiſe in figure, but ſwimming upright. Its head is large and very much flatted, its mouth extremely wide, and its eyes large. Its ſides are of an olive colour, beautifully variegated with a bluiſh white; and in the middle of each ſide, there is one large black ſpot of the ſize of a ſilver two-pence. It has two fins on the back, the anterior is the higher, and has ten rigid ſpines, accompanied with ſofter and very large rays, which bend into the form of a reaper's ſickle. The tail ends in a circular figure. Its uſual ſize is from ſix to ten inches in length, and it is commonly nearly half as broad as long. See *Tab. of Fiſhes*, N° 50.

The fleſh is well taſted, and by many preferred to that of the turbot. It is caught in the Mediterranean and other ſeas, and is not uncommon on the Cornwall coaſt, and other of the Engliſh ſhores.

The *Indian* DOREE is a fiſh caught in many parts of the Eaſt Indies, and called by the Dutch there, the meerkaen, the ſame with the abacatuai of Marcgrave, caught in the Braſilian ſeas. See ABACATUAIA.

DORIA, in *Botany*. See GOLDEN-*rod*.

DORIALTIDES, in *Natural Hiſtory*, the name of a ſtone, to which great virtues, medicinal and magical, were attributed by the writers of the middle ages.

DORIAN, in *Ancient Muſic*, the fourth ſpecies of the diapaſon. See DIAPASON.

DORIC, in *Architecture*, is the ſecond of the five orders; being that between the Tuſcan and Ionic. It is uſually placed

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placed upon the Attic base, though originally it had no base.

The *Doric* order seems the most natural, and best proportioned, of all the orders; all its parts being founded on the natural position of solid bodies. Accordingly, the *Doric* is the first, and most ancient, of the orders of architecture; and is what gave the first idea of regular building. See *Tab. Archit. fig.* 25. See also ARCHITECTURE.

At its first invention it was more simple than at present; and when in after-times they came to adorn and enrich it more, the appellation *Doric* was restrained to this richer manner, and the primitive simple manner they called by a new name, the Tuscan order, which was chiefly used in temples; as the former, being more light and delicate, was for porticos and theatres.

The tradition is, that Dorus, king of Achaia, having first built a temple of this order at Argos, which he dedicated to Juno, occasioned it to be called *Doric*; though others derive its name, from its being invented, or used, by the Dorians.

Some time after its invention they reduced it to the proportions, strength, and beauty, of the body of a man; hence, as the foot of a man was judged the sixth part of his height, they made the *Doric* column, including the capital, six diameters high, i. e. six times as high as thick. Afterwards they added another diameter to the height, and made it seven diameters; with which augmentation it might be said to be nearer the proportion of a man; the human foot, at least in our days, not being a sixth, but nearly a seventh part of the body.

The characters of the *Doric* order, as now managed, are, the height of its column, which is eight diameters; its frize, which is enriched with triglyphs, drops, and metopes; its capital, which is without volutes; and its admitting of cymatiums.

Vitruvius, indeed, complains of the *Doric* as very troublesome and perplexing, on account of the triglyphs and metopes, so as scarce to be capable of being used, except in the pycnostyle, by putting a triglyph between each two columns, or in the araeostyle, by putting three triglyphs between each two columns.

The moderns, on account of its solidity, use it in large strong buildings; as in the gates of cities, and citadels, the outsides of churches, and other massy works, where delicacy of ornaments would be unsuitable.

The gate of Burlington-house in Piccadilly is of the *Doric* order.

The most considerable ancient monuments of this order, are the theatre of Marcellus, at Rome; wherein the capital, the height of the frize, and its projecture, are much smaller than in the modern architecture; and the Parthenion, or temple of Minerva, at Athens, in which the short and massy columns bear upon the pavement without a base; and the capital is a simple torus, with its cincture, and a square, plain, and solid abacus.

Vignola adjusts the proportions of the *Doric* order thus: the whole height of the order, without pedestal, he divides into twenty parts, or modules; one of which he allows the base, fourteen to the shaft, or fust, one to the capital, and four to the entablature.

The particular proportions, &c. of the several parts and members, see under their respective articles, ARCHITRAVE, BASE, CAPITAL, COLUMN, CORNICH, ENTABLATURE, FRIZE, and PEDESTAL.

DORIC *Cymatium.* See CYMATIUM.

DORIC, in *Grammar.* The *Doric dialect* is one of the five *dialects*, or manners of speaking, which obtained among the Greeks. See DIALECT.

It was first used by the Lacedæmonians, and particularly those of Argos; thence it passed into Epirus, Libya, Sicily, the islands of Rhodes, and Crete.

In this *dialect*, Archimedes and Theocritus wrote, who were both of Syracuse; as likewise Pindar.

In strictness, however, we should rather define *Doric*, the manner of speaking peculiar to the Dorians, after their recess near Parnassus, and Asopus; and which afterwards came to obtain among the Lacedæmonians, &c. Some even distinguish between the Lacedæmonian, and *Doric*; but, in reality, they were the same; setting aside a few particularities in the language of the Lacedæmonians; as is shewn by Rulandus, in his excellent treatise, De Lingua Græca, ejusque Dialectis, lib. v.

Beside the authors already mentioned to have written in the *Doric* dialect, we might add Archytas of Tarentum, Bion, Callinus, Simonides, Bacchylides, Cypselas, Alcman, and Sophron.

Most of the medals of the cities of Græcia Magna, and Sicily, favour of the *Doric* dialect in their inscriptions: witness, ΑΜΒΡΑΚΙΩΤΑΝ, ΑΠΟΛΛΩΝΙΑΤΑΝ, ΑΧΕΡΟΝΤΑΝ, ΑΧΥΡΙΤΑΝ, ΗΡΑΧΛΕΩΤΑΝ, ΤΡΑΧΙΝΙΩΝ, ΘΕΡΜΙΤΑΝ, ΚΑΤΑΩΝΙΑΤΑΝ, ΚΟΠΙΑΤΑΝ, ΤΑΥΡΟΜΕΝΙΤΑΝ, &c. Which shews the countries wherein the *Doric* dialect was used.

The general rules of this dialect are thus given by the Port-royalists:

D'ε Η τα, d'ω grand, d'ε, do & d'ι l'α fait le Dore.
D'ει fait ητα; d'ε, ω; & d'ω αυ fait encore.
Oste ι de l'infini: & pour le singulier
Se sert au femenin du nombre plurier.

But they are much better explained in the fourth book of Rulandus; where he even notes the minuter differences of the dialects of Sicily, Crete, Tarentum, Rhodes, Lacedæmon, Laconia, Macedonia, and Thessaly.

The α abounds every-where in the *Doric*; but this dialect bears so near a conformity with the Æolic, that many reckon them but one.

DORIC, in *Music.* The *Doric mode* is the first of the authentic modes of the ancients.

Its character is, to be severe, tempered with gravity and mirth: it is proper for occasions of religion, and war. It begins with *D, Sol, Re.*

Plato admires the music of the *Doric* mode; and judges it proper, to preserve good manners, as being masculine. And on this account he allows of it in his Commonwealth.

The ancients had likewise their *Sub-Doric* mode, which was one of their plagal modes. Its character was, to be very grave, and solemn. It began with *G Ut*, a diatessaron lower than the *Doric mode.*

DORING, or DARING, among the *Sportsmen*, a term used to express a method of taking larks, by means of a CLAP-*net*, and a looking-glass. For this sport there must be provided four sticks, very straight and light, about the bigness of a pike; two of these are to be four feet nine inches long, and all notched at the edges, or at the end. At one end of each of these sticks there is to be fastened another of about a foot long on one side; and on the other side a small wooden peg, about three inches long. Then four more sticks are to be prepared, each of one foot length; and each of these must have a cord of nine foot long fastened to it at the end. Every one should have a buckle for the commodious fastening on to the respective sticks when the net is to be spread.

A cord must also be provided, which must have two branches. The one must be nine foot and a half, and the other ten foot long, with a buckle at the end of each; the rest or body of the cord must be twenty-four yards long. All these cords, as well the long ones as those about the sticks, must be well twisted, and of the bigness of one's little finger. The next thing to be provided is a staff of four foot long, pointed at one end, and with a ball of wood on the other, for carrying these conveniencies in a sack or wallet.

There should also be carried, on this occasion, a spade to level the ground where there may be any little irregularities; and two small rods, each eighteen inches long, and having a small rod, fixed with a packthread at the larger end of the other. To these are to be tied some packthread loops, which are to fasten the legs of some larks; and there are to be reels to these, that these birds may fly a little way up and down.

When all this is done, the looking-glass is to be prepared in the following manner. Take a piece of wood, about an inch and a half thick, and cut it in form of a bow, so that there may be about nine inches space between the two ends; and let it have its full thickness at the bottom, that it may receive into it a false piece; in the five corners of which, there are to be let in five pieces of looking-glass. These are to be so fixed, that they may part their light upwards, and the whole machine is to be supported on a moveable pin, with the end of a long line fixed to it; and made in the manner of the children's play-thing of an apple and a plum-stone; so that the other end of the cord being carried through a hedge, the barely pulling it may set the whole machine of the glasses a-turning. This and the other contrivances are to be placed in the middle between the two nets. The larks fixed to the place, and termed calls, and the glittering of the looking-glasses, as they twirl round in the sun, invite the other larks down; and the cord that communicates with the nets, and goes through the hedge, gives the person behind an opportunity of pulling up the nets, so as to meet over the whole, and take every thing that is between them. The places where this sort of sporting succeeds best are open fields, remote from any trees or hedges, except one by way of shelter for the sportsman, and the wind should always be either in the front or back; for if it blows sideways, it prevents the playing of the nets.

DORMANT, from *dormio, I sleep*, is the herald's term for the posture of a lion, or other beast, borne as sleeping in a coat of arms.

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DORMANT-*tree*, in *Building*, a name the workmen frequently give to a great beam lying acroſs the houſe; uſually called a *ſummer*.

DORMANT, or DORMAR-*tyles*. See TYLE.

DORMER, or DORMANT, in *Architecture*, denotes a window made in the roof of an houſe, or above the entablature; being raiſed upon the rafters.

The Latins call it *lucerna*, whence the French *lucerne*, and our *luthern*.

There are diverſe kinds; ſquare, round, &c. See LUTHERN.

DORMITORY, a gallery in convents, or religious houſes, divided into ſeveral cells, wherein the religious lodge, or lie, &c.

The word is formed from the Latin *dormitorium*; of *dormire*, *to ſleep*.

It is deemed a crime in a religious to lie out of the *dormitory*. By chap. xxii. of the rule of St. Benedict, it appears, that the ancient *dormitories* were not divided into cells, but were a kind of large open wards, filled with beds, as in our hoſpitals.

DORMITORY is alſo uſed for a burying-place. See COEMETERIUM.

DORMOUSE, in *Zoology*, the name of a ſpecies of wild field-mice, called alſo the ſleeper, claſſed under the genus of MOUSE, in the order of *glires*, in the Linnæan ſyſtem. It has two cutting-teeth in each jaw; four toes before, and five behind, and naked ears. There are two kinds of this creature, a larger and a ſmaller.

The larger *dormouſe* is the *mus quercinus* of Linnæus, with a long hairy tail, and a black ſpot under the eyes, and nearly of the ſize of the common rat. Its colour is a browniſh grey, like that of the common mouſe, but variegated with ſomewhat of a reddiſh caſt on the ſides, and on the head; the tail is all over hairy, and is terminated by a thick tuft of white fur. The eyes are large and prominent, and of a fine jetty ſhining black. The beard is partly white, and partly black. Round about the eyes, and round the ears, there is a fine blackneſs, the upper part of the tail is alſo black. The ſmell of this creature is the ſame with that of the mouſe, and its dung of the ſame kind. It lives in caverns under-ground, and ſleeps the chief part of the winter. It feeds on vegetables, and is particularly fond of hazel-nuts, which it uſually hoards up. It lodges in holes in the walls, and brings five or ſix young at a time; infeſts gardens; and is very deſtructive to fruits of all kinds.

The ſmaller kind is the *mus avellanarius* of Linnæus, with a long hairy tail, red body, and whitiſh throat, and is much more common than the larger one. This is of the ſize of the common mouſe, and in different countries varies much in colour. In Italy, Mr. Ray obſerved it all over of a reddiſh tawney on the upper part, except the end of the tail, and its upper part white, the tail only excepted; the tail covered with long and thick-ſet hairs, and looking ſomewhat like a ſquirrel's. The eyes are very black and prominent. Thoſe which the ſame author obſerved in England were leſs of the reddiſh hue on the back, and were not white under the belly, but only on the throat; neither had they the white tip at the end of the tail. Poſſibly the Italian and Engliſh may be really diſtinct ſpecies. This creature feeds on nuts, and other ſuch fruits. It retires into caves in winter, rolls itſelf up, and ſleeps much. It lives in thick hedges, forms its neſt of dead leaves, moſs, or graſs, and brings three or four young at a time.

DORONICI *radix*, in the *Materia Medica*, the name of a root kept in the ſhops in ſome places, but at preſent little uſed. There are two kinds of it, the Roman and the German. The Roman is a ſmall yellow root, appearing white when broken, of a ſweet aſtringent taſte, and viſcous in the mouth. The faireſt and plumpeſt roots ſhould be choſen, and ſuch as are freſh dried, or at leaſt not worm-eaten. The root is brought from the Alps, and ſome other places. The plant which produces it is the *doronicum officinarum* of Gerrard, and is kept with us in the gardens of the curious. The leaves are broad, and the flower is yellow, and of the ſize of a marygold.

It is ſaid to be an alexipharmic, but is not uſed in the preſent practice. Authors are indeed not at all agreed about its nature; ſome accounting it a very valuable medicine, and others a poiſon.

The German *doronicum* is a native of the mountainous parts of Germany, and flowers through the ſummer. The leaves and flowers bruiſed, emit a light pungent ſmell, which provokes ſneezing. They yield their virtues by infuſion, both to water, and rectified ſpirit; the roots are more aromatic than the other parts. This plant has been eſteemed in Germany as a ſpecific for diſſolving coagulated blood, occaſioned by falls and bruiſes, and thence has been intitled *lapſorum panacea*. It is likewiſe recommended in various obſtinate chronical diſorders; but its operation is too violent. Lewis's Mat. Med. p. 255. See DURUNEGI.

DORONICUM, in *Botany*. See LEOPARD'*s Bane*.

DORSAL, from *dorſum*, *back*, any thing that belongs to the back; as *dorſal* GLANDS, *dorſal* NERVES, *dorſal* MUSCLES, &c.

DORSCH, in *Ichthyography*, the common name of ſmall fiſh of the cod-kind, frequent in the Baltic, but more rare in other ſeas, and called by authors the aſellus varius, or ſtriatus. It is remarkable for having the ſmootheſt and ſofteſt ſkin of all the cod-kind; nevertheleſs it has ſmall ſcales. It is uſually caught of a foot, or a little more, in length. It approaches neareſt to the ſpecies called the whiting-pollack, but differs from it in having a beard. It is a fine fiſh for the table.

DORSI *primus*, in *Anatomy*, a name given by Fallopius, and many other authors, to a muſcle, now generally known by the name of *quadratus lumborum*, or the external lumbal muſcle. See QUADRATUS.

DORSI *latiſſimus*, in *Anatomy*. See LATISSIMUS *dorſi*.

DORSI *longiſſimus*, a muſcle common to the loins, and the back. It riſes from the upper part of the os ſacrum, ilium, and firſt vertebra of the loins; and in its beginning is confounded, if not the ſame, with the ſacrolumbalis. It runs upwards along the whole tract of the back, and is connected to every tranſverſe proceſs in its way; ending ſometimes in the firſt vertebra of the back, and ſometimes in the firſt of the neck. See *Tab. Anat. (Myol.) fig.* 7. *n.* 17. 17.

DORSI, *ſacer*. See SACER.

DORSIFEROUS, or DORSIPAROUS *plants*, from *dorſum*, and *fero*, *I bear*, are thoſe of the capillary kind; which are without ſtem, and bear their ſeeds on the backſide of their leaves.

DORSTENIA, in *Botany*. See CONTRAYERVA.

DORSUM, in *Anatomy*, is the hind-part of the thorax; commonly tranſlated the *back*.

The *dorſum* includes alſo the loins. See LOINS.

DORSUM *manus*, and *pedis*, is the outſide of the hand and foot; or that part oppoſite to the palm and ſole.

DORSUM *naſi* is the ridge of the noſe, which runs the whole length of that part.

In thoſe we call Roman noſes, the *dorſum* is higher, and more prominent, about the middle, than in the reſt; which part is called the *ſpina*, or *ſpine*.

DORT, *ſynod of*, in *Eccleſiaſtical Hiſtory*, a national ſynod, ſummoned by authority of the ſtates-general, the provinces of Holland, Utrecht, and Overyſſel, excepted, and held at Dort in 1618. The moſt eminent divines of the United Provinces, and deputies from the churches of England, Scotland, Switzerland, Bremen, Heſſia, and the Palatinate, aſſembled on this occaſion, in order to decide the controverſy between the GOMARISTS, or CALVINISTS, and ARMINIANS; the latter of whom were declared corrupters of the true religion. But the authority of this ſynod was far from being univerſally acknowleged either in Holland or in England. The provinces of Frieſland, Zealand, Utrecht, Guelderland, and Groningen, could not be perſuaded to adopt their deciſions; and they were oppoſed by the authority of archbiſhop Laud, and king James I. in England. The reformed churches in France, though at firſt diſpoſed to give a favourable reception to the deciſions of this famous ſynod, in proceſs of time eſpouſed doctrines very different from thoſe of the Gomariſts; and the churches of Brandenburgh and Bremen would not ſuffer their doctors to be tied down to the opinions and tenets of the Dutch divines. The liberty of private judgment, with reſpect to the doctrines of PREDESTINATION and GRACE, which the ſpirit that prevailed among the divines of Dort ſeemed ſo much adapted to diſcourage and ſuppreſs, acquired new vigour, in conſequence of the arbitrary proceedings of this aſſembly. Moſh. Eccl. Hiſt. vol. iv. p. 498, &c. 8vo. ed.

DORTMANNA, in *Botany*. See LOBELIA.

DORYCNIUM, in *Botany*, a name given by ſome to the upright umbellated ſilvery bindweed, called by others *cneorum*. See CONVOLVULUS.

DORYDREPANON. See DREPANON.

DORYPHORI, from δορυ, *ſpear*, and φερω, *I bear*, an appellation given to the life-guard-men of the Roman emperors. They were held in ſuch high eſtimation, as frequently to have the command of armies conferred on them.

It was uſual alſo for chief commanders to have their *doryphori*, or life-guard, to attend them.

DOSE, in *Pharmacy*, &c. the quantity of a medicine to be taken at one time.

The word is formed from the Greek δοσις, which ſignifies gift, or a thing given; from διδωμι, *do*, *I give*.

A ſecret in phyſic is nothing, unleſs the *doſe* be known.

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In authors, and diſpenſatories, that deſcribe the ſame remedy, frequently the *doſe* is different; which occaſions a great difference in its effect.

Dr. Cockburn has given us an eſſay towards determining the *doſes* of purgative medicines, on mechanical principles.

Several attempts have been made to aſcertain the proportional *doſes* for the different ages and conſtitutions of patients; but, after all that can be ſaid on this ſubject, much muſt be left to the judgment of the perſon who adminiſters the medicine. The following general proportions may be obſerved, though by no means intended for exact rules. A patient between 20 and 14 may take two-thirds of the *doſe* ordered for an adult; from 14 to 9, one half; from 9 to 6, one third; from 6 to 4, one fourth; from 4 to 2, one ſixth; from 2 to 1, a tenth; and under one, a twelfth. Buchan's Dom. Med. App. p. 695.

DOSENS, ſtreight cloths made in Devonſhire, and ſo called in Rot. Parl. 2 Hen. V. See DOWSEINES.

DOSITHEANS, DOSITHEI, an ancient ſect among the Samaritans, in the firſt century of the Chriſtian æra.

Mention is made in Origen, Epiphanius, Jerom, and divers other Greek and Latin fathers, of one Doſitheus, the chief of a faction among the Samaritans; but the learned are not at all agreed as to the time wherein he lived. St. Jerom, in his dialogue againſt the Luciferians, places him before our Saviour; wherein he is followed by Druſius, who, in his anſwer to Serrarius, places him about the time of Sennacherib, king of Aſſyria; but Scaliger will have him poſterior to our Saviour's time. And, in effect, Origen intimates him to have been contemporary with the apoſtles; where he obſerves, that he endeavoured to perſuade the Samaritans, that he was the Meſſiah foretold by Moſes.

He had many followers; and his ſect was ſtill ſubſiſting at Alexandria in the time of the patriarch Eulogius; as appears from a decree of that patriarch, publiſhed by Photius. In that decree, Eulogius accuſes Doſitheus of injuriouſly treating the ancient patriarchs and prophets; and attributing to himſelf the ſpirit of prophecy. He makes him contemporary with Simon Magus; and accuſes him of corrupting the Pentateuch in divers places, and of compoſing ſeveral books, directly contrary to the law of God.

Archbiſhop Uſher takes Doſitheus to be the author of all the changes made in the Samaritan Pentateuch; which he argues from the authority of Eulogius; but all we can juſtly gather from the teſtimony of Eulogius is, that Doſitheus corrupted the Samaritans copies ſince uſed by that ſect; but that corruption did not paſs into all the copies of the Samaritan Pentateuch, now in uſe among us, which vary but little from the Jewiſh Pentateuch.

And in this ſenſe we are to underſtand that paſſage in a Samaritan chronicle, where it is ſaid, that Douſis, i. e. Doſitheus, altered ſeveral things in the law of Moſes.

The author of that chronicle, who was a Samaritan by religion, adds, that their high-prieſt ſent ſeveral Samaritans to ſeize Douſis, and his corrupted copy of the Pentateuch. Epiphanius takes him to have been a Jew by birth, and to have abandoned the Jewiſh party for that of the Samaritans. He imagines him likewiſe to have been the author of the ſect of the Sadducees: this is inconſiſtent with his being later than our Saviour. And yet the Jeſuit Serrarius agrees to make Doſitheus the maſter of Sadoc, from whom the Sadducees are derived.

Tertullian, making mention of the ſame Doſitheus, obſerves, that he was the firſt who dared to reject the authority of the prophets, by denying their inſpiration. But he charges that as a crime peculiar to this ſectary, which, in reality, is common to the whole ſect, who have never allowed any but the five books of Moſes for divine.

DOSSER, a ſort of baſket to be carried on the ſhoulders of men. It is uſed in carrying the overplus earth from one part of a fortification to another, where it is wanted. There are likewiſe ſmall carts and wheel-barrows for the ſame uſe.

DOSSIL, in *Surgery*, is lint made into a cylindric form, or reſembling the ſhape of dates or olive-ſtones. *Doſſils* are ſometimes ſecured by a thread tied round their middle. Heiſt. Surgery, Introd. § 53.

DOTAL *goods*. See GOODS.

DOTE *aſſignanda*, in *Law*, a writ that lay for a widow, where it was found by office, that the king's tenant was ſeiſed of tenements in fee, or fee-tail, at the day of his death; and that he held of the king in chief, &c. in which caſe, the widow came into the chancery, and there made oath, that ſhe would not marry without the king's leave. Anno 15 Edw. III. c. 4. And hereupon ſhe had this writ to the eſcheator; for which ſee Reg. of Writs, fol. 297. and Fitz. Nat. Br. fol. 263.

These widows are called the king's widows.

DOTE *unde nihil habet*, in *Law*, a writ of dower that lies for the widow againſt the tenant, who bought land of her huſband in his life-time, whereof he was ſolely ſeiſed in fee-ſimple or fee-tail, in ſuch ſort, as the iſſue of them both might have inherited. Fitz. Nat. Br. fol. 147.

DOTE, *recto de*. See RECTO.

DOTIS *admenſuratione*. See ADMEASUREMENT, and Reg. of Writs, fol. 171.

DOTTEREL, in *Zoology*, the name by which the *morinellus* is commonly known in moſt parts of England.

The uſual weight of this bird is a quarter of a pound; but the male is ſmaller than the female, and weighs uſually half an ounce leſs. Its beak is a finger's breadth long. Its head is very beautifully variegated with ſmall black and white ſpots, and has a line of white over the eyes. Its throat is of a greyiſh white, variegated with ſtreaks of brown. Its breaſt, and the under part of its wings, are of a duſky yellow. It is common in Lincolnſhire, and ſome other counties of England; and is a very delicate bird. It is commonly caught in the night. Ray's Ornith. p. 230.

DOTTEREL, *Sea*, *Morinella* TRINGA, in the Linnæan ſyſtem, a name given by authors to the bird, commonly known in England by the name of the *turnſtone*; and called by Turner, *cinclus*. Ray's Ornith. p. 231. See TURNSTONE.

DOTTO, in *Natural Hiſtory*, a name given by ſome authors to a ſpecies of the emerald, which was a good green, but not clear or fine.

DOUBLE, in the *Manege*. A horſe is ſaid to *double* his reins, when he leaps ſeveral times together to throw the rider. Thus we ſay, this *ramingue doubles* his reins, and makes *pontlevis*. See RAMINGUE, and PONTLEVIS.

A hare is ſaid to *double* when ſhe keeps the plain fields, and winds about to deceive the hounds. Dict. Ruſt.

DOUBLE *Aſpect*. See ASPECT.

DOUBLE *Baſtion*. See BASTION.

DOUBLE *Caſt*, in *Huſbandry*, a term uſed by the farmers for that method of ſowing which does not diſpenſe the neceſſary quantity of ſeed for a piece of land at one bout, but requires the going over it twice. Plott, Oxf. p. 251.

DOUBLE *Children*, DOUBLE *Cats*, DOUBLE *Pears*, &c. inſtances of, are frequent in the Philoſophical Tranſactions, and elſewhere. See MONSTER.

Sir John Floyer, in the ſame Tranſactions, giving an account of a *double* turkey, furniſhes ſome reflections on the production of *double* animals in general. Two turkeys, he relates, were taken out of an egg of the common ſize, when the reſt were well hatched, which grew together by the fleſh of the breaſt-bone; but, in all other parts, were diſtinct. They ſeemed leſs than the ordinary ſize, as wanting bulk, nutriment, and room for their growth, which latter, too, was apparently the occaſion of their coheſion.

For, having two diſtinct cavities in their bodies, and two hearts, they muſt have ariſen from two cicatriculas; and conſequently, the egg had two yolks, which is no uncommon accident. He had a dried *double* chicken: he aſſures us, that though it had four legs, four wings, &c. it had but one cavity in the body, one heart, and one head; and that this, conſequently, was produced from one cicatricula.

So, Paræus mentions a *double* infant with only one heart: in which caſe, the original, or ſtamen of the infant, was one, and the veſſels regular; only the nerves and arteries towards the extremities, dividing into more branches than ordinary, produced thoſe *double* parts.

The ſame is the caſe in the *double* flowers of plants, occaſioned by the richneſs of the ſoil. So it is in the eggs of quadrupeds, &c.

There are, therefore, two reaſons of duplicity in embryos: 1. The conjoining, or connexion of two perfect animals; and, 2. An extraordinary diviſion, and ramification of the original veſſels, nerves, arteries, &c.

DOUBLE *Concave*, and DOUBLE *Convex Glaſs*. See CONCAVE, CONVEX, and GLASS.

DOUBLE *Cone*. See CONE.

DOUBLE *Dancette*, in *Heraldry*. See DANCETTE.

DOUBLE *Deſcant*, in *Muſic*. See DESCANT.

DOUBLE *Horizontal-Dial*, one with a double gnomon, whereof one points out the hour on the outward circle, and the other ſhews the hour on the ſtereographic projection drawn upon it. This dial finds the meridian, hour, the ſun's place, riſing, ſetting, &c. and many other propoſitions of the globe. See DIAL.

DOUBLE *Dieſis*. See DIESIS.

DOUBLE *Eccentricity*. See ECCENTRICITY.

DOUBLE *Feaſt*. See FEAST.

DOUBLE *Fever*. See FEVER.

DOUBLE *Fiché*, or DOUBLE *Fichy*, in *Heraldry*. A croſs is denominated *double fiché*, when the extremities are pointed at

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at each angle; that is, when each extremity has two points: in contradiſtinction to *fiché*, where the extremity is ſharpened away to one point.

Gibbon expreſſes it by an octagonal croſs, the two points whereof at each extremity are parted inwards by a ſmall ſpace of a line; by which it is diſtinguiſhed from the croſs of Malta, the two points whereof proceed from a third point, or acute angle between them.

DOUBLE *Fine.* See FINE.

DOUBLE *Fugue.* See FUGUE.

DOUBLE *Leaf*, in *Botany.* See TWYBLADE.

DOUBLE *Letter*, in *Grammar*, a letter, which has the force and effect of two; as the Hebrew *Tſade*, which is equivalent to *T* and *S*; or the Greek ξ, or Latin *x*, &c.

Theſe letters are evidently equal to two; when we pronounce the Latin *axis*, or the Engliſh *axillary*, we give the *x* the ſame ſound, as if it were written with two *cc*, *accis*, *accillary*; or a *c* and *s*, *acſis*, *acſillary*.

The Greeks have three, Z, Ξ, Ψ; the Latins only two, X and Z; and moſt of the modern languages have the ſame.

DOUBLE *Meaſure.* See MEASURE.

DOUBLE *Pedeſtal.* See PEDESTAL.

DOUBLE *Plea*, in *Law*, is where the defendant alleges for himſelf two ſeveral matters in bar of the action; whereof either is ſufficient to effect his deſire, in debarring the plaintiff.

This is not admitted in common law: for which reaſon it is to be well obſerved, when a plea is *double*, and when not: for if a man alleges ſeveral matters, one not at all dependent on another, the plea is accounted *double*; but if they be mutually depending on each other, then it is accounted but *ſingle*.

DOUBLE *Plough.* See PLOUGH.

DOUBLE *Point*, in the *Higher Geometry.* When all the right lines tending the ſame way with the infinite leg of any curve, do cut it only in one point (as happens in the ordinates of the Carteſian, and the cubical parabola, and in the right lines which are parallel to the abſciſſes of hyperbolas, and parabolas), then you are to conceive, that thoſe right lines paſs through two other points of the curve, placed, as it may be ſaid, at an infinite diſtance. Which coincident interſection, whether it be a finite, or an infinite diſtance, Sir Iſaac Newton calls the *double point.*

DOUBLE *Poſition.* See POSITION.

DOUBLE *Quarrel*, *Duplex querela*, a complaint made by a clerk, or other, to the archbiſhop of the province, againſt an inferior ordinary, for delaying juſtice in ſome eccleſiaſtical cauſe; as to give ſentence, inſtitute a clerk preſented, or the like.

Its denomination ſeems owing to this, that it is commonly made both againſt the judge, and him at whoſe ſuit juſtice is delayed.

DOUBLE *Ratio.* See DUPLE.

DOUBLE *Roads.* See ROADS.

DOUBLE *Tenaille.* See TENAILLE.

DOUBLE *Time.* See TIME.

DOUBLE *Tongue*, in *Botany*, a name ſometimes given to the BUTCHER'S *broom*, and GERANIUM.

DOUBLE *Vault.* See VAULT.

DOUBLE *Veſſel*, in *Chemiſtry*, is when the neck of one bolt-head, or matraſs, is put, and well luted, into the neck of another.

Of theſe there are divers kinds and forms, uſed in the circulation of ſpirits, in order to their being exalted, and refined, as high as can be. See CIRCULATION.

DOUBLE *wheeled plough.* See PLOUGH.

DOUBLE *winding ſtairs.* See STAIRS.

DOUBLE *inciſion, grafting by.* See ENGRAFTING.

DOUBLE *voucher, recovery with.* See RECOVERY.

DOUBLED *Column.* See COLUMN.

DOUBLES, in our *Statutes*, ſignify as much as letters patent, being a French word made of the Latin *diploma.* Anno 14 Hen. VI. cap. 6.

DOUBLETS, among *Lapidaries*, denote cryſtals wrought into ſuch a form, and ſo coloured, that the ſurfaces of two pieces thus coloured being laid together, might produce the ſame effect as if the whole ſubſtance of the cryſtal had been tinged. For this purpoſe, two plates of cryſtal muſt be cut in the manner of a brilliant, and fitted ſo exactly, that no diviſion can appear when they are laid together. The upper part muſt be poliſhed ready for ſetting, and then the colours may be put between them by the following proceſs: take of Venice, or Cyprus turpentine, two ſcruples, and add to it one ſcruple of the grains of pure maſtic powdered. Melt them together in a ſilver or braſs ſpoon ladle, or other veſſel, and mix with them any of the coloured ſubſtances propoſed, well powdered. Warm the *doublets* to the ſame degree of heat with the mixture, and paint the upper ſurface of the lower part, and put the upper one inſtantly upon it, preſſing them evenly together. When the cement is quite cold, ſcrape the edges, and let the *doublets* be ſkilfully ſet, by carrying the mounting over the joint, ſo that the two pieces may be well ſecured from ſeparating. The colour of the ruby may be imitated, by mixing a fourth part of carmine with fine crimſon lake; the ſapphire and amethyſt may be counterfeited by mixing very bright Pruſſian blue with a ſmall quantity of crimſon lake; the emerald may be imitated by diſtilled verdigris, with a little powdered aloes; the garnet may be counterfeited by dragon's blood, the brightneſs of which may be improved by the addition of a ſmall quantity of carmine; the yellow topazes may be imitated by mixing the powdered aloes with a little dragon's blood. Glaſs may be alſo prepared in the ſame manner.

Doublets may be eaſily diſtinguiſhed, by holding them betwixt the eye and the light, in ſuch poſition, that the light may paſs through the upper part and corner of the ſtone; which will then ſhew ſuch parts to be white, and that there is no colour in the body of the ſtone. Handmaid to the Arts, vol. ii. p. 328, &c.

DOUBLINGS, in *Heraldry*, the linings of robes, or mantles of ſtate; or of the mantlings in atchievements.

DOUBLING, in a *Military Senſe*, is the putting two ranks, or files of ſoldiers, into one.

When the word of command is, *double your ranks*, then the ſecond, fourth, and ſixth ranks are to march up into the firſt, third, and fifth; ſo that of ſix ranks they make but three, leaving double the interval there was between them before. But it is not ſo when they *double the half files*, becauſe then three ranks ſtand together, and the three others come up to *double* them; that is, the firſt, ſecond, and third, are *doubled* by the fourth, fifth, and ſixth; or on the contrary.

Double your files, directs each to march to that next to it on the right or left, according to the word of command; in which caſe the ſix ranks are turned into twelve, the men ſtanding twelve deep; the diſtance between the files being now *double* of what it was before.

DOUBLING *a Cape*, or *Point*, in *Navigation*, ſignifies the coming up with it, paſſing by it, and leaving it behind the ſhip.

The Portugueſe pretend to be the firſt that ever *doubled* the Cape of Good Hope, under their admiral Vaſquez de Gama; but we have accounts in hiſtory, particularly in Herodotus, of the Egyptians, Carthaginians, &c. having done the ſame long before them.

DOUBLING-*nails*, among *Shipwrights*, are the nails commonly uſed to faſten the lining of the gun-ports, &c.

DOUBLING-*upon*, in a *Naval Engagement*, is the art of encloſing any part of a hoſtile fleet between two fires, or of cannonading it on both ſides. It is uſually performed by the van or rear of that fleet which is ſuperior in number, taking the advantage of the wind; or of its ſituation, and tacking, or veering round the van or rear of the enemy, who are thereby expoſed to great danger, and can ſcarcely avoid being thrown into a general confuſion.

DOUBLON, DUBLOON, a Spaniſh and Portugueſe coin, being the *double* of a piſtole. See PISTOLE and COIN.

There are alſo *double dubloons* formerly current among us for three pounds twelve ſhillings.

DOUBTING, the act of with-holding a full aſſent from any propoſition; on ſuſpicion, that we are not thoroughly appriſed of the merits thereof; or from our not being able peremptorily to decide between the reaſons for, and againſt it.

The Sceptics and Academics *doubt* of every thing; the character of their philoſophy is, not to allow any thing for truth; but to with-hold the aſſent, and keep the mind free, and in ſuſpenſe. See SCEPTICS.

The Epicureans truſt their ſenſes, and *doubt* of their reaſon: their leading principle is, that our ſenſes always tell truth; that they are the firſt and only criterions of truth; and that if you go ever ſo little from them, you come within the proper province of *doubting*.

The Carteſians, on the contrary, of all things bid us *doubt* our ſenſes; they are perpetually inculcating the deceitfulneſs of our ſenſes; and tell us, that we are to *doubt* of every one of their reports, till they have been examined, and confirmed by reaſon. See CARTESIANS.

DOUBTING, in *Rhetoric*, a figure wherein the orator appears ſome time fluctuating, and undetermined what to do, or ſay. See APORIA.

Tacitus furniſhes us with an inſtance of *doubting*, almoſt to a degree of diſtraction, in thoſe words of Tiberius, written to the ſenate: *Quid ſcribam, P. S. aut quomodo ſcribam, aut quid omnino non ſcribam hoc tempore, dii me deæque pejus perdant quam perire quotidie ſentio, ſi ſcio.*

DOUCETS, or DOULCETS, among *Sportſmen*, denote the teſtes of a deer or ſtag. Dict. Ruſt.

DOUCINE,

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DOUCINE, in *Architecture*, a moulding, or ornament, on the higheſt part of the corniche, in form of a wave, half convex, and half concave. See *Tab. Archit. fig.* 8.

The *doucine* is the ſame with a *cymatium*, or *gula*. See CYMATIUM, and GULA *recta*, and *inverſa*.

DOVE, in *Ornithology*. See PIGEON.

DOVE, *ring*, in *Ornithology*, the name of a bird of the pigeon kind, called by Aldrovand, and other authors, the *palumbus torquatus*, and by the Greeks *phaſſa*. Its beak is yellow, its feet naked and red, its legs feathered almoſt down to the feet. The head, back, and coverts of the wings, are of a bluiſh aſh-colour; the lower ſide of the neck and breaſt are of a purpliſh red, daſhed with aſh-colour. The upper part of its neck has a very regular and beautiful white circle, from which the bird has its name; and its whole neck, above and below this, is beautifully variegated with changes of colours, according as it is oppoſed to the light. The belly is of a dirty white, the greater quill feathers are duſky, the reſt aſh-coloured; underneath the baſtard wing is a white ſtroke, pointing downwards. It is the largeſt pigeon we have, and may be diſtinguiſhed by its ſize. It ſeldom flies ſingle, but in large flocks, and builds on trees; its food is ivy-berries, and other vegetable matter. They begin to cooe in March, when they pair, and leave off in the beginning of winter. See *Tab. of Birds*, N° 13.

DOVE, *turtle*, *Turtur*, in *Ornithology*, a very beautiful little bird of the pigeon kind. The head, neck, and back, are of the bluiſh grey colour of the common pigeon, with ſome mixture of a reddiſh brown near the rump, and at the bottom of the neck. Its belly is white; but its breaſt and throat of a fine bright purple, having the verge of each feather yellow; and the ſides of the neck are variegated with a ſort of ringlet of beautiful white feathers, with black baſes. The tail is about three inches and a half long, having the two middlemoſt feathers of a duſky brown, and the others black, with white tips; and the end and exterior ſide of the outmoſt feathers wholly white. The weight of this bird is about four ounces. It feeds on hemp-ſeed, and other vegetable matters. It is remarkably ſhy, and breeds in thick woods, generally of oak.

DOVE, *ſea-turtle*, or *Greenland-dove*, in *Ornithology*, is a ſpecies of the DIVER, or the COLYMBUS *grylle* of Linnæus. The bill is an inch and a half long; ſtrait, ſlender, and black; on each wing is a large bed of white, which in young birds is ſpotted; the tips of the leſſer quill-feathers, and the inner coverts of the wings, are white; except theſe the whole plumage is black. In winter it is ſaid to change to white; and a variety, ſpotted with black and white, is not uncommon in Scotland. The tail conſiſts of twelve feathers; and the legs are red. Theſe birds always keep at ſea, except in breeding time, and they are ſhot with great difficulty, becauſe they dive at the flaſh of the pan. The Welch call this bird *caſganllongwr*, or the ſailor's hatred, from a notion that its appearance forebodes a ſtorm. It viſits St. Kilda's iſle in March, makes its neſt far underground, and lays a grey egg, or, as ſome ſay, a whitiſh egg, ſpotted with ruſt, and ſpeckled with aſh-colour.

DOVE's *foot*, in *Botany*. See GERANIUM.

DOVE-*tail*, in *Carpentry*, the ſtrongeſt of all the kinds of jointings; wherein the tenon, or piece of wood that enters the other, goes widening to the extreme, and ſo cannot be drawn out again, becauſe the tip, or extreme, is bigger than the hole.

It has its denomination from the reſemblance the tenon bears to a *dove's* tail. The French call it *queue d'aronde*, *ſwallow's tail*; which name the Engliſh themſelves alſo retain in fortification.

DOVELLA, in *Ichthyology*, a name given by the Maſſilians to the fiſh called the donzellina by the Italians: it is the julia, or julis, of authors; and, according to the Artedian ſyſtem, it is a ſpecies of the labrus. That author diſtinguiſhes it by the name of the labrus of variegated colours, with two large teeth in the upper jaw. See LABRUS.

DOULEIA, Δουλεια, among the Athenians, a kind of puniſhment, by which the criminal was reduced into the condition of a ſlave. It was never inflicted upon any but the ατιμοι, *ſojourners*, and *freed ſervants*. Potter's Archæol. Græc. lib. i. cap. 25. tom. i. p. 130.

To DOUSE, in *Sea Language*, is to lower ſuddenly, or ſlacken; and it is applied to a ſail in a ſquall of wind, an extended hawſer, &c.

DOWAGER, DOTISSA (q. d. a widow *endowed*, or that has a jointure), a title, or addition, applied to the widows of princes, dukes, earls, and perſons of high rank only.

DOWAGER, *queen*. See QUEEN.

DOWER, DOTARIUM, DOARIUM, or DOS, a portion of lands, or tenements, which a widow enjoys for term of life, from her huſband, in caſe ſhe ſurvives him; and which, at her death, deſcends to their children. But ſhe muſt have been the wife of the party at the time of his deceaſe; or not divorced *a vinculo matrimonii*: nor, if ſhe has eloped from her huſband, and lives with an adulterer, ſhall ſhe be entitled to *dower*, unleſs her huſband be voluntarily reconciled to her. The widows of traitors are alſo barred of their *dower* by 5 and 6 Ed. VI. cap. 11. but not the widows of felons. An alien cannot be endowed, unleſs ſhe be queen-conſort. And if a woman levies a fine with her huſband, or if a common recovery be had with the huſband and wife of the huſband's lands, ſhe is barred of her *dower*. A widow, clear of theſe impediments, is by law entitled to be endowed of all lands and tenements, of which her huſband was ſeiſed in fee-ſimple or fee-tail at any time during the coverture; and of which any iſſue ſhe might have had, might by poſſibility have been heir. See JOINTURE.

Our law-books diſtinguiſh five kinds of *dower*; viz. *dower per legem communem*; *per conſuetudinem*; *ex aſſenſu patris*; *ad oſtium eccleſiæ*; and *de la plus belle*. But the two firſt are now only in uſe.

DOWER *by the common law* is a third part of ſuch lands as the huſband was ſole ſeiſed of in fee during the marriage; which the wife is to enjoy during her life, and for which there lies a *writ of dower*.

DOWER *by cuſtom* gives the wife, in ſome places, half her huſband's lands, ſo long as ſhe lives ſingle, as in gavelkind. And as cuſtom may enlarge, ſo that the widow may have the whole during life, which is called her *free bench*, ſo may it abridge, *dower*, and reſtrain it to a fourth part.

In DOWER *ex aſſenſu patris*, and *ad oſtium eccleſiæ*, the wife may have ſo much *dower* as ſhall be aſſigned, or agreed upon; but it ought not to exceed the third part of the huſband's lands. If this be done before marriage, it is called a *jointure*.

DOWER *de la plus belle*. By this ſhe is *endowed* with the faireſt and beſt part of her huſband's eſtate.

DOWER, *admeaſurement of*. See ADMEASUREMENT.

DOWER, *aſſignment of*. See ASSIGNMENT.

DOWER, *tenant in*. See TENANT.

DOWLE and DEAL, in our *Old Writers*, are uſed to ſignify a diviſion. The word comes from the Saxon *dal*, i. e. *diviſio*, and that from *dælan*, *dividere*; whence our Engliſh word *dealing* is formed.

In this ſenſe it is, that the ſtones laid to the boundaries of lands are called *dowleſtones*.

DOWN, in *Natural Hiſtory*, denotes the firſt feathers of geeſe, with which beds and pillows are ſtuffed. The cottony ſubſtance on the tops of thiſtles, &c. is alſo thus called.

DOWNS, a bank, or elevation, of ſand, which the ſea gathers and forms along its ſhores; and which ſerves it as a barrier.

The word is formed from the French *dune*, of the Celtic *dum*, a *mountain*. Charles de Viſch. in his Compend. Chronolog. Exord. & Progreſſ. Abbat. Clariſſ. B. Mariæ, de Dunis, ſays, *Vallem reperit arenarum collibus (quos incolæ* Duynen *vocant) undique cinctam.*

DOWNS are particularly uſed for a famous road for ſhips, along the eaſtern coaſt of the county of Kent; from Dover to the North Foreland.

This road has excellent anchorage, and is well defended by the caſtles of Sandwich, Deal, and Dover.

Here it is the Engliſh fleets uſually meet.

DOWNY, ſomething partaking of the nature of *down*. Thus ſome leaves and fruit, &c. are ſaid to be covered with a *downy* matter.

DOWRY, Dos, is properly the money, or fortune, which the wife brings her huſband in marriage, to have the uſe of it, during her marriage, towards ſupporting the charge thereof.

It is otherwiſe called *maritagium*, *marriage goods*; by the Romans *dos*; and it differs from *dower*. See DOWER.

Among the Germans, it was anciently cuſtomary for the huſband to bring a *dowry* to his wife. *Romanos non in uſu fuit uxoribus* dotes *retribuere*; *ideo verbo genuino carent quo hoc dignoſcitur*; *& rem ipſam in Germanorum moribus miratur Tacitus:* dotem, *inquit*, *non uxor marito*, *ſed uxori maritus affert.* Spelman.

DOWRY is alſo uſed, in a monaſtic ſenſe, for a ſum of money given along with a maid, upon entering her in ſome religious order.

In France, the *dowry* of perſons entering a monaſtery, to make profeſſion of a religious life, is limited by law. That, e. gr. given upon entering a monaſtery of Carmelites, Urſelines, and others, not regularly founded, but eſtabliſhed ſince the year 1600, by letters patent, muſt not exceed the ſum of 8000 livres, in towns where parliaments are held; nor 6000, in other places.

DOWSEINES, a ſort of kerſeys made in Devonſhire, in

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length twelve yards; whence alſo their name, which is otherwiſe writ *doſens*, *dozens*, or *dozeins*.

DOXOLOGY, an appellation given by the Greeks to the fourteenth verſe of the ſecond chapter of St. Luke, *Glory be to God in the higheſt*, &c. becauſe beginning with the Greek word δοξα, *glory*.

This they diſtinguiſh by the name of *great doxology*; and the *Gloria Patria*, *Glory be to the Father*, they call the *leſs doxology*, as beginning with the ſame word δοξα.

Philoſtorgius, lib. iii. n. 13. gives three formulas of the *leſſer doxology*. The firſt is, *Glory be to the Father, and to the Son, and to the Holy Ghoſt*; the ſecond, *Glory be to the Father, by the Son, in the Holy Ghoſt*; and the third, *Glory be to the Father, in the Son, and the Holy Ghoſt*.

Sozomen, and Nicephorus, give a fourth; viz. *Glory be to the Father, and the Son, in the Holy Ghoſt*.

The firſt of theſe *doxologies* is that in common uſe throughout the weſtern church. It was firſt inſtituted about the year 350, by the Catholics of Antioch, then called *Euſtathians*.

The three others were compoſed by the Arians: the ſecond was that of Eunomius, and Eudoxus, and which was approved by Philoſtorgius. The three were all made about the year 341, in the council of Antioch, when they firſt began to diſagree among themſelves. Philoſtorgius aſſures us, that Flavian, afterward patriarch of Antioch, was the author of the firſt, or *catholic doxology*; but Sozomen, and Theodoret, ſay nothing of it; and Philoſtorgius's ſingle authority is hardly ſufficient.

There were anciently very great diſputes, and principally at Antioch, as to the form of *doxology*; that moſtly uſed among the orthodox was, the ſame as ſtill obtains; the reſt were affected by the Arians, and other Antitrinitarians; yet St. Baſil, in his book on the Holy Spirit, defends the ſecond as orthodox, and legitimate; and it is certainly more agreeable to Scripture authority; to which we muſt ultimately appeal, as the only infallible rule of our devotion, as well as of our conduct: and it has been urged, that no inſtance of the former *doxology* occurs in the New Teſtament.

Some authors write hymnology as ſynonymous with *doxology*; but there is a difference: hymnology is applied to Pſalms, or the recitation of Pſalms; and *doxology* only to the little verſe, *Glory be to the Father*, &c. repeated at the end of each Pſalm.

DOZEIN, *Decenna*. In the ſtatute for view of frankpledge, made 18 Edw. II. one of the articles for ſtewards in their leets to enquire of, is, if all the *dozeins* be in the aſſize of our lord the king, and which not, and who received them. Art. 3. See DECINERS.

DOZEIN is alſo uſed for a ſort of Devonſhire kerſeys. Anno 5 and 6 Edw. VI. cap. 6. See DOWSEINES.

DOZELLINA, in *Zoology*, a name by which ſome authors have called the muſtela of the common ſpecies, which we in Engliſh term the *ſea-loche*, and *whiſtle-fiſh*.

DRABA, in *Botany*, *Whitlow-graſs*, a genus of the *tetradynamia ſiliquoſa* claſs. Its characters are theſe: the flower hath four petals, in form of a croſs, and ſix ſtamina, four of which are as long as the empalement. In the center is ſituated a biſid germen, which afterward becomes an oblong, oval, entire pod, with two cells, ſeparated by the ſwelling ſtyle, which is oblique. The valves are parallel to the middle, and open oblique, each cell containing a ſingle ſeed. There are ſix ſpecies. See DITTANDER.

DRABLER, in the *Sea-Language*, a ſmall ſail in a ſhip, which is the ſame to a bonnet, that a bonnet is to a courſe, and is only uſed when the courſe and bonnet are too ſhoal to clothe the maſt. See BONNET and COURSE.

DRABS, in the Engliſh *Salt-Works*, a name given to a ſort of wooden caſes into which the ſalt is put, as ſoon as it is taken out of the boiling-pan. Theſe are partitions like ſtalls made for horſes; they are lined on three ſides and at the bottom with boards, and at the front have a ſliding-board to put in or take out occaſionally. Their bottoms are made ſhelving, being higheſt at the backſide, and gradually inclining forwards; by which means the ſaline liquor that remains mixed with the ſalt eaſily drains out from it, and the ſalt in three or four days becomes ſufficiently dry, and is then taken out and laid up in large heaps for ſale. In ſome places they uſe cribs inſtead of the *drabs*. See CRIBS.

DRACÆNA, in *Botany*, a genus of the *hexandria monogynia* claſs: the corolla is erect, and divided into ſix ſegments; the filaments are thickeſt in the middle, and the fruit is a three-celled berry, containing a ſingle ſeed.

DRACÆNA, in *Zoology*, is alſo the name of a ſpecies of American LIZARD.

DRACHM, Δραχμη, an ancient ſilver coin, uſed among the Greeks. See COIN.

This they divided into ſix OBOLI; and their larger coins above the *drachm* were the *didrachm*, *tridrachm*, and *tetra-drachm*, or *ſtater*. The *drachm* was likewiſe a weight as well as a piece of money; and their *mina* contained a hundred *drachmæ*, both as a ſum and a weight; and their talent ſixty *minæ*, or ſix thouſand *drachmæ*, both by weight and tale; and this method of reckoning was common to all Greece; ſo that if the *drachma* of one city differed from that of another, their talents differed in the ſame proportion. The Attic *drachma* has been ſuppoſed by moſt authors, before Greaves, who firſt ſuggeſted the contrary, to have been the ſame, among the Greeks, with the DENARIUS, among the Romans; which was equivalent to four ſeſterces. Of this opinion is Budæus, De Aſſe; who confirms it from the authorities of Pliny, Plutarch, Strabo, and Valerius Maximus, with whom δραχμη is ſynonymous with *denarius*. Plin. Nat. Hiſt. lib. xxi. fin.

A. Gellius, who reſided long at Athens, and could not be ignorant of the value of the current money of that city, ſays, that ten thouſand *drachms* were in Roman money ſo many *denarii*. Lib. i. cap. 8. See alſo Val. Maxim. lib. vii. cap. 6. and Strabo Geog. lib. v. the former of whom writes, that a certain commodity was ſold for two hundred *denarii*; and the latter, in ſpeaking of the ſame thing, ſays, that it was bought for two hundred *drachmæ*. But this is no ſtrong conviction, that the two coins were preciſely of the ſame value; thoſe authors, not treating expreſly of coins, might eaſily render the one for the other, provided there were no conſiderable difference between them. Greaves's Miſc. Works, by Birch, vol. i. p. 287, &c. 8vo.

Scaliger, in his diſſertation, De Re Nummaria, does not ſay abſolutely that the *denarius* and *drachma* were the ſame thing; but from a Greek paſſage in an ancient law, c. xxvi. *Mundati*, where the *drachma* is ſaid to be compoſed of ſix oboli, he concludes, that in the age of Severus, at leaſt, they were the ſame. But Agricola, De Menſ. & Ponder. lib. xiv. ſhews, from Pliny, Celſus, and Scribonius Largus, that the denarius contained only ſeven ounces; and from Livy, Appian, Cleopatra, &c. that the *drachma* contained eight; and maintains, that when ſome Greek authors ſpeak of the ounce as only containing ſeven *drachms*, that they do not mean the Attic *drachm*, but the Roman denarius, which Greek authors render by δραχμη. We learn from Galen, that the writers on weights and meaſures differed in the number of *drachms* or *denarii*, which they aſſigned to an ounce; moſt of them making it to contain ſeven and a half, ſome but ſeven, and others eight. De Med. Comp. ſec. Genera, lib. iii. cap. 3.

Gronovius agrees with Agricola, that the *drachma* was the eighth part of an ounce; and the opinion is confirmed by Iſidore, lib. xiv. cap. 24. by Fannius, who ſays as much in expreſs terms, and by Voluſius, who divides the ounce into twenty-four *ſcripturi*, or ſcruples, of which the *drachm* comprehended three.

It is probable, that, when the Romans became maſters of Greece and Aſia, the Athenians might find it their intereſt to lower their *drachm* to the weight of the denarius, long before they were reduced into the form of a Roman province by Veſpaſian. When they did this is uncertain; but it appears by the treaty between the Romans and Antiochus, recorded by Polybius, Excerp. Leg. ſect. 35. and by Livy, lib. xxxviii. cap. 38. which ſtates the Euboic TALENT at eighty Roman pounds; and ſuppoſing this to be equal to the Attic, and to contain ſix thouſand Attic *drachms*, and eighty Roman pounds to contain ſix thouſand ſeven hundred and twenty *denarii*, that the weight of the Attic *drachm* muſt have been to that of the denarius as 6720 to 6000; and this proportion is confirmed by an anonymous Greek fragment, publiſhed by Montfaucon, which makes a hundred Attic *drachmæ* equal to a hundred and twelve *denarii*. Anal. Græc. p. 393. Pariſ. 1688.

Greaves concludes, after weighing a number of Attic *tetradrachms*, and ſtating the weight of the *tetradrachm* at two hundred and ſixty-eight grains, that the Attic *drachm* was ſixty-ſeven grains. J. Caſpar Eiſenſchmid, in his book De Pond. & Menſ. Vet. from an ancient *tetradrachm* weighing three hundred and thirty-three Paris grains, and by eſtimating the proportion between the Roman pound and Attic talent, mentioned by Livy, lib. xxxviii. makes the *drachm* $83\frac{1}{4}$ Paris grains, or almoſt $68\frac{1}{10}$ troy.

Mr. Raper has eſtimated the weight of the Attic *drachm*, by comparing it with the gold coins of Philip and Alexander, which were probably formed upon that ſtandard. They both coined gold of 4, 2, 1, and $\frac{1}{2}$ an Attic *drachm*; and from a mean of twenty-one Philippics, which were equivalent to two *drachmæ*, preſerved in the Britiſh Muſeum, and in private collections, or mentioned by other writers, he infers, that the ſtandard weight of the Philippic was not leſs than 133 troy grains; which agrees very

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very nearly with the weights of ſome preſerved ſilver *drachms* of Philip and Alexander, and with the mean weight of ſeven perfect ſilver *tetradrachms* of Alexander, which give a *didrachm* a little more than 132½ grains. He obſerves, that the gold Philippics, both of Alexander and his father, are ſo correctly ſized, and ſo perfect, that the mean *didrachm*, derived from them of 133 troy grains, muſt be very near its juſt weight; and its half, 66½ grains, that of the Attic *drachm*. Then, for the value of it, as ſixty-two Engliſh ſhillings are coined out of eleven ounces two penny-weight troy, of fine ſilver, and eighteen penny-weight of allay, the troy grain of fine ſilver is worth $\frac{62}{1111}$ths of a farthing; and ſince the Greeks and Romans uſed no allay in their money, but eſteemed what they coined to be fine ſilver, the Attic *drachm* of 66½ grains will be found worth a little more than 9¼*d.* or, for the eaſe of reduction,

	£	s.	d.
The Attic *drachm* may be ſtated at	0	0	9.286
The *obolus* a little more than	0	0	1½
The *chalcus* about —	0	0	0 7/9 of a farthing
The *mina* —	3	17	4.6 or £3.869
The *talent* —	232	3	0 or £232.15

Phil. Tranſ. vol. lxi. part ii. art. 48.

Others eſtimating the ancient Roman ounce equal to the modern one, or to 536 French grains, and the Attic *drachma* at 67 grains, and ſuppoſing the ſilver at Athens of the ſame fineneſs with ours, make it equal to 7 pence ¾ ſterling. See COIN.

DRACHM, or DRAM, is alſo a weight uſed by our phyſicians; containing juſt ſixty grains, or three ſcruples, or the eighth part of an ounce troy, and the ſixteenth of an ounce avoirdupois.

DRACHM was likewiſe an ancient Jewiſh money; having on one ſide a harp, and on the other ſide a bunch of grapes.

This coin was a half ſhekel; and was ſo called by the Jews. It is only the Greeks called it δραχμη. It was equal to two Attic *drachmæ*. See SHEKEL.

DRACO, DRAGON, in *Aſtronomy*, a conſtellation of the northern hemiſphere; whoſe ſtars, according to Ptolemy, are 31; according to Tycho, 32; according to Hevelius, 40; according to Bayer, 33; and according to Mr. Flamſteed, 80. The longitudes, latitudes, magnitudes, &c. whereof, are as follows.

Names and ſituations of the ſtars.	Bayer's Cha.	Signs	Longitud. ° ′ ″	Latitude N. ° ′ ″	Magnitude
Laſt of the tail	λ	♌	5 58 30	57 13 3	3.4
			6 28 20	57 30 30	6
			10 35 20	56 6 30	6
Next the tail	κ		12 32 43	61 9 40	6
			11 51 40	61 43 20	3
5.					
			11 35 8	61 57 20	6
			18 32 2	61 4 10	6
			21 45 0	60 53 45	6
Preced. of the antepenult. of the tail	ι	♍	20 22 48	61 57 15	6
			0 31 5	65 21 38	5
10.					
Antepenult. of the tail	α		3 2 43	66 20 52	2
Preced. in the laſt bend	ε	♎	0 33 5	71 4 4	3
	θ		12 24 12	74 26 0	3
South of the 2 following the laſt bend	η		9 54 0	78 26 30	3
Northern	A	♍	0 48 52	81 0 5	4
15.					
		♏	8 36 47	72 59 16	5
Laſt of thoſe following the laſt bend	g	♍	8 35 32	73 1 0	5
			29 45 58	81 37 10	5
Middle in the 3d bend	b	♎	0 7 47	83 17 43	5
			1 3 28	83 18 40	6
20.					
In the tongue	μ	♏	20 27 45	76 17 10	5.4
Subſequent in the third bend	ζ	♍	28 39 5	84 47 0	2
Over the eye	β	♐	7 45 46	75 19 55	2.3
In the mouth; double	1. ν		6 1 18	78 11 50	4
	2. ν		6 6 33	78 11 18	4
25.					
		♏	22 17 40	84 34 30	6
1ſt of the 2 to the weſt in the preceding △	f	♌	21 59 50	86 50 45	5
Subſequent to the next to the pole of the ecliptic	ω	♋	8 13 33	86 52 10	4
		♐	9 5 40	81 58 33	6
			19 24 36	74 11 30	6
30.					
Next to the 3 in the preced. triangle	Ψ	♋	9 1 50	84 7 40	7
At the knee	ξ	♐	20 29 20	80 19 40	3
Above the head	γ	♊	23 42 48	74 58 20	2
			29 20 58	84 30 10	4.5
	2. ψ		29 11 0	79 27 50	6
35.					
		♒	1 3 10	87 27 10	6
	α		24 18 20	87 18 50	6
North. of the 3 in the bend of the knee	b	♑	20 33 48	87 17 55	6
			18 1 44	81 48 40	5
		♊	25 44 5	76 31 50	5
40.					
		♓	25 45 38	76 28 0	5
South. of the next z in the preced. △	φ		8 24 27	87 14 20	6
		♊	6 56 28	84 50 40	5
Northern	χ		12 16 57	83 31 20	4
Middle of the 3 in the bend of the neck	d		12 24 56	79 44 44	5
45.					
Southern	c	♑	25 43 36	77 54 0	5
Subſequent to theſe to the eaſt	o	♒	10 43 30	80 50 0	4
			9 26 5	79 7 0	6
			6 40 30	76 57 40	6
			8 27 2	80 24 25	4.5
50.					
Preced. of the 3 in the △ in the flexure, &c.	υ		4 28 0	74 42 0	5.6
		♉	16 8 5	83 11 30	4.5
		♒	15 12 6	77 13 48	5
			18 44 27	77 44 20	5
		♑	29 26 6	82 57 20	6
55.					
		♊	7 7 25	79 0 6	6
N. in the □ againſt the 1ſt bend, &c.	δ	♈	13 6 3	82 52 50	3.4
Southern	π	♓	29 22 35	81 48 30	4
		♊	5 7 40	78 39 16	6
North. of the 2 in the △, &c.	τ	♉	20 44 10	80 40 3	4.5
60.					
South.	σ	♈	27 9 35	80 55 14	4.5
		♉	13 37 30	79 4 50	6
N. of thoſe following in the □	ε	♈	28 31 40	79 27 40	3.6
			2 7 18	7 28 10	3.6
	e		1 25 10	77 19 10	6.5
65.					
		♓	22 0 8	75 47 46	6
South.	S	♈	16 13 43	78 7 40	5
		♓	23 42 52	75 15 20	6
		♉	25 23 29	76 36 10	6
		♈	4 46 8	76 16 45	6
70.					
		♓	26 12 33	74 33 10	6
			27 0 53	74 13 40	6
		♉	16 38 8	75 18 45	5.6
		♊	7 5 0	72 47 20	6
			8 6 48	72 36 50	6
75.					
			10 6 20	71 33 46	5
		♉	25 48 54	72 35 20	5
			7 16 6	70 22 7	5
			11 39 27	69 55 0	7
80.			8 7 10	68 18 20	6

DRACO, DRAGON, in *Natural Hiſtory*, a fabulous animal, which has been repreſented under the form of a ſerpent with wings and feet. The ancients have given various deſcriptions of this animal, with reſpect to its ſize, ſhape, and colour, and have attributed many ill qualities to it, without foundation. Their accounts of it are very various and contradictory. They were probably led to the idea they formed of it by ſome extraordinary animals of the genus of ſerpents, lizards, or crocodiles, &c. which were ſingular, either on account of their figure or ſize. See DRACO *Volans*.

DRACO, or DRAGON, in *Mythology*, is the ſymbol of Janus, and alſo of Bacchus Beſſarus. *Dragons* are likewiſe employed to draw the chariot of Ceres; and a *dragon* keeps the garden of the Heſperides.

DRACO *Marinus*, in *Zoology*, the name of a fiſh of the TRACHINUS, or COTTUS kind, known in England by the name of the weever. It is a very long-bodied fiſh, ſomewhat flat, with a crooked belly, and ſtrait back; the mouth is large, and the lower-jaw is longer than the upper. It has two fins on the back; the foremoſt of theſe is very ſhort, and the other very long. The foremoſt of theſe fins has ſeveral prickly points, tinged with black, and theſe are ſaid to inflict a ſort of poiſonous wound; the ſecond conſiſts of ſeveral ſoft rays; it commences juſt at the end of the firſt, and continues almoſt to the tail; the pectoral fins are broad and angular, and the ventral

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ventral fins ſmall. Its tail is but ſlightly forked, and is bluiſh in colour. The vent is placed very forward, very near the throat. The ſides are marked lengthways with two or three dirty yellow lines, and tranſverſely by a number of ſmall ones: the belly of this fiſh is ſilvery; its fleſh is delicate, and it grows in ſome ſeas to twelve, or even eighteen inches in length. The fiſhermen are much afraid of its pricking them, and always, as ſoon as they have caught it, cut off the back-fin. This fiſh buries itſelf in the ſands; and if trod on ſtrikes with great force. The wounds it gives are attended with pain and inflammation; ſea-ſand, or ſtale urine warmed, and rubbed on the place affected, is applied as a remedy; and when the wound has been dangerous, ſweet oil has been applied, and opium and Venice treacle taken internally with ſucceſs.

DRACO *Volans*, in *Natural Hiſtory*, a name given by ſome people to one of the flying LIZARDS. But, among *Meteorologiſts*, it is uſed for a fat, heterogeneous, earthy meteor, appearing long, and ſinous, ſomething in the ſhape of a flying dragon.

This ſhape is ſuppoſed to ariſe from the hind part of the matter of this meteor being fired with greater impetuoſity than what comes firſt out of the cloud; and it is ſuppoſed, that the broken parts of the cloud, and the ſulphureous matter which adheres to them, form the apparent wings of this imaginary *dragon*.

This ſort of exhalation is principally ſeen on the borders of rivers, and in marſhy places, and ſeldom riſes very high from the ground, but plays and dances about the ſurface in an agreeable manner; and if people go up to it, it will ſtick to their hands or cloaths without burning, or doing them any injury. They are more common in the ſummer-months than in the winter, and are more frequently ſeen in thick weather than in clear.

DRACOCEPHALUM, in *Botany*. See DRAGON'S *Head*.

DRACONARIUS, in *Antiquity*, *Dragon-bearer*. Several nations, as the Perſians, Parthians, Scythians, &c. bore dragons on their ſtandards; whence the ſtandards themſelves were called *dracones*, *dragons*. The Romans borrowed the ſame cuſtom from the Parthians, or, as Caſaubon has it, from the Dacæ; or, as Codin, from the Aſſyrians.

The Roman *dracones* were figures of dragons painted in red, on their flags; as appears from Ammianus Marcellinus; but among the Perſians, and Parthians, they were like the Roman eagles, figures in full relievo; ſo that the Romans were frequently deceived, and took them for real dragons.

The ſoldier, who bore the dragon, or ſtandard, was called by the Romans *draconarius*; and by the Greeks δρακονάριος, and δρακοντειοφόρος; for the emperors carried the cuſtom with them to Conſtantinople.

Pet. Diaconus, Chron. Caſin. lib. iv. cap. 39. obſerves, that the bajuli, cercoſtatarii, ſtaurophori, aquiliferi, leoniferi, and draconarii, all marched before king Henry when he entered Rome.

DRACONIS, *caput*. See CAPUT, and DRAGON.

DRACONIS, *cauda*. See CAUDA.

DRACONIS, *ſanguis*. See SANGUIS, and DRAGON.

DRACONIS, *venter*. See VENTER.

DRACONTEAS, a name given by Neophytus, and ſome others of the later Greek writers, to two plants diſtinguiſhed by the epithets of the great and the little kinds. The great *draconteas* is the plant we call dragons, and the ſmall *draconteas* is the arum. Neophytus ſays, that the roots of ſome ſpecies of the ſmall *draconteas* were eatable, which we alſo know to be true at this time; for though with us the juice of this plant is fiery and corroſive, yet we know that there are eſculent arums in other parts of the world. The Greek writers, from the earlieſt times we have accounts of, were not ignorant of this; and Theophraſtus in particular has deſcribed an eſculent-rooted arum under the name of arum edodimum.

DRACONTHEMA, a name uſed by ſome of the old writers in medicine for what we call *ſanguis draconis*, or dragon's blood, a red vegetable reſin.

DRACONTIA, or DRACONTIA *lapis*, in *Natural Hiſtory*, a name given by authors to a roundiſh or oval pellucid ſtone, which ſeems no other than a cryſtal cut into that form, and poliſhed by the ſavage inhabitants of ſeveral nations before the Roman conqueſts, and intended to be worn as ornaments. Authors tell a number of idle and fabulous ſtories about this ſtone, imagining it to be naturally of this figure and poliſh, and to be found in the head of a dragon. They are not indeed all agreed about the ſpecies of the ſtone; Ficinus deſcribing an aſtroites under this name, and others ſome other coloured ſtone; but the generality of writers, eſpecially the old ones, make it colourleſs and pellucid.

DRACONTIC *Month*, the ſpace of time wherein the moon going from her aſcending node, called *caput draconis*, returns to the ſame.

DRACONTIUM. The Greeks, from whom the botanical writers have taken this name, never uſed it ſingly as the denomination of a plant, but only as an adjective expreſſing ſome peculiarity in which that plant differed from ſome others of the ſame ſpecies. Thus the plant which we now call ſimply *dracontium*, was called by the Greeks *arum dracontium*, that is, the arum with ſtalks ſpotted like dragons or ſnakes-ſkins; and the plant we call dracunculus, or tarragon, had the ſame epithet from its fiery heat. See DRAGONS.

DRACUNCULI, in *Medicine*, a name uſed by authors for a ſort of long and ſlender worms, which breed in the muſcular fleſh of the arms, legs, &c. and from their being more frequent in ſome parts of Guinea than elſewhere, are called by many Guinea-worms. They have been long known in the world; and Plutarch quotes Agartharcides for an account of theſe animals, which, he ſays, the people about the Red-ſea were at a certain time very much afflicted with. It is more particularly a diſeaſe in children, wherein they feel a vehement itching; ſuppoſed to ariſe from theſe worms, called *dracunculi*, generated of a viſcid humour under the ſkin, about the back, ſhoulders, and arms.

Children ſeized with the *dracunculi* become hectic, and ſcarce receive any nouriſhment at all, though they eat plentifully. The diſeaſe, however, is not ſo peculiar to children, but that grown perſons have been ſometimes affected with it. The emperor Henry V. is ſaid to have died of it; having had it from his birth.

The women in Poland cure their children of the *dracunculi*, after the following manner: the child is waſhed, and bathed in warm water, wherein a quantity of crummed bread, and a handful of aſhes, have been caſt. The water being poured off, and the bread gathered into a maſs; when they come to break it again the next day, they find in it an infinite quantity of fine hairs, which ſome call *dogs hairs*, and others, *worms*; and it is thoſe hairs, or worms, which are ſuppoſed to be the cauſe of the diſeaſe.

After thus bathing the children, they rub their ſhoulders and arms with flour ſteeped in vinegar, or honey; upon which immediately there ariſes on the ſkin a great number of tubercles, like poppy-ſeed; ſuppoſed to be the heads of worms. Theſe they ſcrape off as faſt as they appear; otherwiſe they withdraw beneath the ſkin again. The operation is repeated till ſuch time as no more tubercles ariſe.

The *dracunculi* is a diſeaſe little known in England. The editors of the Leipſic Acts, ſpeaking of it, in the tome for the month of October, 1682, call the bodies, which put forth at the pores after bathing, thick hairs, *corpuſcula pilorum craſſiorum inſtar denſa & ſpiſſa*, and not fine ſlender hairs, as Degori calls them. They add, that theſe little corpuſcles are hence called CRINONES; and by reaſon of their devouring the food, which ſhould nouriſh the children, COMEDONES. Velſchius, in a curious diſſertation on the ſubject, calls them *capillary worms: exercitatio de vermibus capillaribus infantum*.

As to the nature and figure of theſe little bodies, the ſame editors obſerve, that the microſcopes have put it paſt doubt, that they are real living animals, of an aſh-colour, having two long horns, two large round eyes, and a long tail terminated with a tuft of hair; but that it is difficult to draw them out whole, by ſcraping the child's body; becauſe, being very ſoft, the leaſt rubbing bruiſes them, and breaks them.

They are no where ſo frequent as on the Gold-coaſt in Guinea about Anamaboe and Cormantyn. The worm is white, round, long, and uniform, very much reſembling a piece of white round tape or bobbin. It is lodged between the interſtices of the membranes and muſcles, where it inſinuates itſelf to a prodigious length, ſometimes exceeding five ells. It occaſions no great pain in the beginning; but when it is about to ſhow its head, a ſwelling and inflammation appear on the part, which is uſually the ankle, or ſome part of the leg or thigh.

The countries where this creature is thus produced are very hot, and ſubject to great droughts, and the inhabitants make uſe of ſtagnating and corrupted water, in which it is probable the ova of theſe animals lie: the white people and negroes, who drink this water, are equally ſubject to theſe worms.

The ſurgeons ſeldom attempt to extract this worm by inciſion; but when the tumor appears, they endeavour to bring it to a ſuppuration as ſoon as they can; and when they have broke the ſwelling, and the head of the worm appears, they faſten it to a ſtick, and continue gradually winding it round at the rate of an inch or two in a day, till they by this means have wound it all out. If it be wound too haſtily, it is apt to break in the operation; and if it does, the end is not eaſily recovered again; and if not, there are abſceſſes formed, not only at the place where it breaks, but all along the whole winding of the muſcles

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muſcles where the dead worm remains; ſo that often from one worm thus broken, there are produced a number of obſtinate ulcers in different parts. When the worm has not been broken, the ulcer out of which it was extracted heals eaſily, and there is no farther trouble about it. Town's Diſeaſes of the Weſt Indies, p. 561.

The daily uſe of aloes, or of any other anthelmintric medicine, is proper, during the extraction of the worm, in order to facilitate its diſcharge. See CHÆTIA.

DRACUNCULUS, in *Ichthyology*, the name of a ſea-fiſh, called by Bellonius and Geſner, a kind of the exocœtus. It is a ſmall fiſh, of about a hand's breadth long, and ſometimes a little larger. It is of a long and rounded body, and of a dead greeniſh or olive colour on the back, and white on the belly, and is marked on the ſides with a great number of bluiſh, white, and very light ſmall ſpots. On the upper part of the head, which is large, and flat at the top, below the eyes, it has a purpliſh triangular ſpot; the eyes are large, and ſo placed on the upper part of the head, as to look upwards, whence it has been ranked among the URANOSCOPI; the mouth wide, and furniſhed with ſmall teeth; and the upper-jaw is longer than the under. The apertures of the gills are cloſed; on the end of the bones that cover them is a very ſingular trifurcated ſpine. This fiſh has two pair of fins on the belly, and two fins on the back, ſituated in a kind of furrow; the tail is long and rounded, and conſiſts of ten rays. It is common in the Mediterranean, and other ſeas, and is brought to market among other ſmall fiſh at Rome, and in other places. In the Linnæan ſyſtem it is a ſpecies of the CALLIONYMUS. See *Tab.* II. *of Fiſh*, N° 10.

DRACUNCULUS, in *Botany*. See DRAGONS.

DRAFF, a name given in ſome places to the waſh given to hogs; and the grains given to cows.

DRAG, in *Building*. A door is ſaid to *drag*, when in opening or ſhutting it hangs, or grates upon the floor.

DRAG-*ropes*. See ROPES.

DRAG, in *Sea-Language*, is a machine, conſiſting of a ſharp, ſquare, iron ring, encircled with a net, and commonly uſed to take the wheel off from the platform or bottom of the decks.

DRAGGING *the anchor*. See ANCHOR.

DRAGMA, in *Pharmacy*, a name uſed by the ancients for a handful of any herb or other medicine.

DRAGMIS, in *Pharmacy*, a word uſed by the ancients to ſignify a pugil, or as much of any thing as can be taken up at a pinch, between the thumb and two fingers.

DRAGOMAN, or DROGMAN, a term of general uſe through the Eaſt, for an interpreter, whoſe office is to facilitate commerce between the orientals and occidentals. Theſe are kept by the ambaſſadors of Chriſtian nations reſiding at the Porte, for this purpoſe.

The word is formed from the Arabic *targeman*, or *targiman*, of the verb *taragem*, *he has interpreted*. From *dragoman* the Italians formed *dragomano*, and with a nearer relation to its Arabic etymology, *turcimanno*; whence the French, and our *trucheman*, as well as *dragoman*, and *drogman*.

DRAGON, in *Aſtronomy*. See DRACO.

Dragon's head, and *tail*, *caput & cauda draconis*, are the nodes of the planets; or the two points, wherein the ecliptic is interſected by the orbits of the planets, and particularly that of the moon; making with it angles of five degrees, and eighteen minutes.

One of theſe points looks northward; the moon beginning then to have northward latitude, and the other ſouthward; where ſhe commences ſouth.

This her deviation from the ecliptic ſeems (according to the fancy of ſome) to make a figure like to that of a *dragon*, whoſe belly is, where ſhe has the greateſt latitude; the interſection repreſenting the head and tail, from which reſemblance the denomination ariſes.

But note, that theſe points abide not always in one place, but have a motion of their own in the zodiac, and retrograde-wiſe, 3 minutes 11 ſeconds per day; completing their circle in 18 years 225 days; ſo that the moon can be but twice in the ecliptic, during her monthly period; but at all other times ſhe will have a latitude, or declination from the ecliptic.

It is about theſe points of interſection that all eclipſes happen.

They are uſually denoted by theſe characters, ☊ *dragon's* head, and ☋ *dragon's tail*.

DRAGON-*beams*, in *Architecture*, are two ſtrong braces or ſtruts, which ſtand under a breaſt-ſummer, and meet in an angle on the ſhoulder of the king-piece.

DRAGON'S *blood*, *ſanguis draconis*, in *Medicine*, a reſinous ſubſtance brought from the Eaſt, in oval drops, wrapped up in flag-leaves, of conſiderable uſe, as an agglutinant and deſiccative, againſt fluxes, both alvine and uterine, and ulcerations internal and external, &c.

It derives its name *dragon's blood* from the redneſs of its colour, and gives its name *dragon* to the tree that yields it. Some botaniſts talk of the figure of a *dragon*, finely repreſented under the rind of the fruit of that tree. But this is a mere fiction.

The genuine *dragon's blood* is the juice, or reſin, of a large tree, called *draco arbor*, the *dragon-tree*, reſembling the palm, growing in Africa, and America, as well as in China. The reſin is of a dark red, and in ſubſtance of no diſcernible ſmell or taſte, and eaſily diſſolves when brought towards the fire: if caſt into the fire, it flames; but it diſſolves with much difficulty in any watery liquor. It is ſoluble by the aſſiſtance of heat in rectified ſpirit, and in expreſſed oils, to which it communicates a deep red colour.

It is a good aſtringent; and is uſed in hæmorrhages and dyſenteries; as alſo to faſten the teeth, and ſtrengthen the gums. A ſolution of *dragon's blood* in ſpirit of wine is uſed for ſtaining marble, to which it gives a red tinge, which penetrates more or leſs deeply, according to the heat of the marble during application. But for fine deſigns, the marble ſhould be cold, becauſe it ſpreads whilſt it ſinks. Mr. Du Fay ſays, that by adding pitch to this ſolution, the colour may be rendered deeper.

There is alſo a counterfeit *dragon's blood*, made of the gum of the cherry, or almond-tree, diſſolved, and boiled in a tincture of Brazil wood; but this is of no uſe, except for external diſeaſes of horſes. Theſe adulterated reſins are diſtinguiſhed from the true by their diſſolving in water, and crackling in the fire without burning.

DRAGON *reverſed*, *Knights of*, an order of knighthood inſtituted by the emperor Sigiſmund, about the year 1418, after the council of Conſtance, in memory of the condemnation of John Huſs and Jerome of Prague. This order, which once flouriſhed in Germany and Italy, is now extinct.

DRAGON-*fly*, *Libella*, or *Libellula*, in *Natural Hiſtory*, the name of a very large genus of four-winged flies, called by us *adder-flies* and *dragon-flies*. They belong to the order of *neuroptera* in the Linnæan ſyſtem; they are characterized by having jaws, by antennæ ſhorter than the thorax, by extended wings, and by the male's tail being terminated by a hooked kind of forceps. See FLY. *Tab. Inſects*, *fig.* 1.

Theſe flies have all two very large and reticulated eyes, covering the whole ſurface of the head, which are a beautiful object for the microſcope. They fly very ſwiftly, and prey upon the wing, being of great uſe to mankind, in clearing the air of innumerable little flies.

They are produced of ſeveral ſpecies of ſix-legged worms living in the waters, and figured by Mouffett, and other authors, under the name of *pulices* and *locuſtæ aquaticæ*. Mr. Ray deſcribes twenty-three ſpecies of theſe flies.

Moſt of theſe ſpecies are found in Auguſt and September, in our fields and gardens, eſpecially near places where there are waters, as they have their origin from worms living in that element. The great ones uſually live all their time about waters, but the ſmaller are common among hedges, and the ſmalleſt of all are moſt frequent in gardens. The ſmaller kinds often ſettle upon buſhes, or upon the ground; but the large ones are almoſt always upon the wing, ſo that it is very difficult to take them. Ray's Hiſt. Inſect. p. 50.

The manner of this inſect's coupling with the female is a thing that has attracted the obſervation and admiration of multitudes, as they are frequently ſeen, in the hotter months, in that ſtate, flying together about the edges of waters.

Mr. Homberg, of the Academy of Paris, has taken great pains to inform the world of the whole ſecret of this ſtrange coitus, and of ſeveral other remarkable particulars in regard to the creature. The part to which the wings are fixed is called the breaſt in animals of this kind; but in this creature the lungs are not ſituated there, but in the middle of the belly, which is ſeen continually riſing and falling at inſpiration and expiration. The laſt joint of the body of the male is a ring containing the anus, and this is furniſhed with two pair of hooks; the one pair outward and larger, the other inward and ſmaller: theſe the creature is able to open and ſhut as lobſters do their claws. The extremity of the belly of the female ſeems to conſiſt of two tubes, or pipes, one placed upon the other; the upper one is the anus, at which it voids its excrements; the under one is the female part of generation, and the entrance to the womb of the animal. When the male of this ſpecies finds the female ſitting upon a leaf, or ſtick, he ſeizes her as ſhe flies, taking faſt hold of her with the hooks at the anus by the neck, or that part which joins the head to the breaſt, and immediately flies away with her, holding her fixed by the neck to the end of his tail.

The male does not carry his bride far before he ſettles himſelf upon ſome plant, and raiſes his tail ſo, that the female may be brought to ſit eaſily under him upon the ſame plant. As ſoon as the female is thus ſeated, ſhe

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turns up her tail, and brings it between the legs of the male, then places it to a certain part of the breaſt of the male, in which are the organs of generation in that ſex. All this while the male keeps his hold of her neck with his forceps, or hooks. They uſually remain in this poſture about three minutes; and after that the male gently raiſing up his breaſt, they become ſeparated, and leaving the hold he had on her neck, at the ſame time, he flies away as he pleaſes. The female uſually remains on the place for half a quarter of an hour, and then ſhe flies away alſo. Mr. Homberg having obſerved the coupling of theſe animals thus far, was determined to examine the organs uſed in it by diſſection. To this purpoſe he caught ſeveral of them, and on the whole collected ſeveral curious obſervations, which may be ſeen in Mem. Acad. Par. 1699.

DRAGON, *gum.* See TRAGACANTH.

DRAGON'S *Head*, *Dracocephalum*, in *Botany*, a genus of the *didynamia gymnoſpermia* claſs. Its characters are theſe: the flower has one ringent petal, with large, oblong, inflated chaps; the upper lip is obtuſe and arched, the under trifid. It has four ſtamina, two ſhorter than the other; and a four-parted germen, which becomes four oval, oblong ſeeds, encloſed in the empalement. There are eight ſpecies, one of which is the balm of Gilead; they all require little culture, except keeping clear from weeds.

DRAGON-*ſhell*, in *Natural Hiſtory*, a name given by people, curious in ſhells, to a ſpecies of concamerated patella or limpet. This has a top very much bent, and is of an aſh-colour on the outſide, but of an elegant and bright fleſh-colour within. This has been found ſticking on the back of a tortoiſe, as the common limpets do on the ſides of rocks; and ſome have been found affixed to large ſhells of the pinna marina, brought from the Eaſt Indies at different times.

DRAGON, *Sea*. See DRACO *Marinus*.

DRAGON, *ſnap*. See SNAP *Dragon*.

DRAGONS, *Dracontium*, in *Botany*, a genus of the *gynandria polyandria* claſs. Its characters are theſe: it hath a cloſe cylindrical ſpadix, and a boat-ſhaped ſheath; the flowers have no empalement, but have five oval concave petals. They have an oval germen, which afterward becomes a roundiſh berry, including ſeveral ſeeds. There are five ſpecies.

All the ſpecies are propagated by parting their knobby roots, which when they have ſtood undiſturbed for three years will afford a great number of off-ſets. Theſe are to be taken off and planted in autumn, ſoon after the green leaves decay; for if they are removed after they have taken freſh root, and began to ſhoot, they ſeldom produce flowers the ſucceeding ſummer; or if they do, they are very weak; they will thrive in almoſt any ſoil and ſituation.

Dragons are accounted a good alexipharmic, and uſeful in malignant contagious diſtempers, and peſtilential fevers; and, as the vulgar phraſe it, to drive any thing from the heart. Wherefore it is given in medicines to drive out the ſmall-pox and meaſles, and to cauſe ſweat. Miller's Bot. Off.

They have much the ſame medical virtues with the ARUM, or WAKE-*robin*.

DRAGON-*tree*. See PALM-*tree*.

DRAGON, *wild*, and *wort*. See SOUTHERNWOOD, and MUGWORT.

DRAGONET, in *Ichthyology*, a name given by Pennant to the DRACUNCULUS.

DRAGONNEE, in *Heraldry*. A *lion dragonnee*, is where the upper half reſembles a *lion*; the other half going off like the hind part of a *dragon*.

The like may be ſaid of any other beaſt as well as the lion.

DRAGOON, in *Ornithology*, the name of a ſmall kind of CARRIER-*pigeon*, called *columba tabellaria minima* by Moore. It is a baſtard-breed between the two ſpecies of pigeons called the *horſeman* and the *tumbler*. They are very good breeders, and as they are lighter than the horſeman, they are ſuppoſed more expeditious in flight for a few miles, but the horſeman outdoes them at greater lengths. One of theſe pigeons flew from St. Edmundſbury to London, being a diſtance of ſeventy-two miles, in two hours and a half.

DRAGOONS, in *War*, an order of ſoldiery, who march on horſeback, and fight on foot, though ſometimes, too, on horſeback.

Menage derives the word *dragoon* from the Latin *draconarius*, which in Vegetius is uſed to ſignify ſoldier. But it is more probably derived from the German *tragen*, or *draghen*, which ſignifies *to carry*; as being infantry carried on horſeback.

They are divided into brigades, and each regiment into troops. They encamp generally on the wings of an army, and ſometimes they cover the general's quarters.

The firſt regiment of *dragoons* raiſed in England was in 1681, and called the regiment of *dragoons* of North Britain. In battle, or attacks, they generally fight ſword in hand after the firſt fire. In the French army they are ſaid to ride without boots.

Their arms are, a ſword, firelock, and bayonet. In the French ſervice, when the *dragoons* march on foot, their officers bear the pike, and the ſerjeants the halbert; neither of which are uſed in the Engliſh ſervice.

DRAGS, in the *Sea-Language*, is uſed for whatever hangs over the ſhip in the ſea, as ſhirts, coats, or the like; and boats when towed, or whatever elſe that, after this manner, may hinder the ſhip's way when ſhe ſails.

DRAIN, or DREIN, in the *Military Art*, a trench made to draw the water out of a moat, which is afterward filled with hurdles and earth, or with faſcines, or bundles of ruſhes and planks, to facilitate the paſſage over the mud. See TRENCHES.

DRAINS, a name given in the fen-countries to certain large cuts or ditches, of twenty, thirty, nay ſometimes forty foot wide, carried through the marſhy ground to ſome river, or other place capable of diſcharging the water they carry out of the fen-lands. Moſt of theſe *drains* are made in our fen-countries by a body of men called the *undertakers*, whoſe reward is one third of the ground they *drain*. They alſo erect ſluices at a great expence, often not leſs than two thouſand pounds each. Yet theſe, with all the care they employ in erecting them, are ſubject to be blown up by the vaſt weight of water that lies upon them when the lands are overflown. Some of theſe ſluices have two or more pair of doors, of ſix, eight, or ten foot high, which ſhut when the water in the river is higher than in the *drains*, by the weight and force of it; and ſo *è contra*, throw out a body of eight foot ſquare of water for about ſix or ſeven hours during the ebb. The real uſe of theſe *drains* is very evident from the preſent ſtate of the land where they are cut, and that of it before. In Camden's time all this was bog, and now it is all firm land. The country about Crowland was in that author's time ſo ſoft, that it was not paſſable by carriages; and thus grew a witticiſm upon it, that all the carts that entered this town were caſed on the wheels with ſilver; but this is now ſo firm ground, that carriages of any kind paſs over it. The duck-ponds uſed to be called the fen corn-fields, and they now are ſuch in reality, their bottoms being dry, and producing oats, and rape-ſeed, or cole-ſeed, with great increaſe. Phil. Tranſ. N° 223.

Drains are alſo more generally uſed to carry off the ſuperfluous moiſture from wet and marſhy lands. For this purpoſe a deep *drain* muſt be cut in the loweſt part, ſo as to reach the bed, whether of gravel or ſand, through which the water flows; and ſmaller *drains* ſhould be made from this ditch to thoſe places which appear to be the heads of ſprings; and theſe ſhould be left open for ſome time, till the quantity of moiſture abates; they ſhould then be filled up about Michaelmas with ſtones, and over theſe heath, broom, or ſtraw, or with faggots made of the branches of trees. A foot depth of mould over the *drain* will be ſufficient in paſture-ground; and at leaſt a foot and a half in ploughed lands. But if the quantity of water to be diſcharged is conſiderable, the main *drain* ſhould either be left open, or made very deep and wide, and filled with ſtones. See BOG.

It may be neceſſary in many caſes, and has proved very uſeful, to flag the bottom, and to line the ſides of the *drains* with tiles, brick, or ſtone, to keep the earth from falling in, and to preſerve a free paſſage for the water. The clay which is dug out of theſe *drains* may be converted, either by burning, or laying up in heaps with quicklime, into an excellent manure, either for corn or graſs land, where it is moſt wanted.

When the ground in which the ſprings are, lies on a gentle declivity, Mr. Tull adviſes to plough it in an horizontal direction, by which means each furrow carries off the water, which would otherwiſe ſink into the next ridge. See FEN.

DRAINING *Plough*. See PLOUGH.

DRAM. See DRACHM.

DRAMS. See CORDIALS.

DRAMA, in *Poetry*, a piece, or poem, compoſed for the ſtage.

The word is Greek, δρᾶμα, which literally ſignifies *action*; becauſe in *dramas*, or dramatic poems, they act, or repreſent *actions*, as if they really paſſed.

A *drama*, or, as we popularly call it, a *play*, is a compoſition either in proſe or verſe, conſiſting, not in the ſimple recitation, but in the actual repreſentation of an action.

Our *dramas* are, TRAGEDIES, COMEDIES, OPERAS, and FARCES.

Some critics take the book of Canticles for a *drama*, or *dramatic poem*; others maintain the ſame of the book of Job. Some ſcrupulous authors would reſtrain *drama* to

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ſerious pieces, as tragedies; but with reſpect to the etymology, a comedy is as much a *drama*, as a tragedy.

The primary parts of the *drama*, as divided by the ancients, are the *protaſis*, *epitaſis*, *cataſtaſis*, and *cataſtrophe*. The ſecondary parts are, the *acts* and *ſcenes*. The acceſſary parts are, the *argument* or *ſummary*, the *prologue*, *chorus*, *mimus*, *ſatura*, and *atellana*. Laſtly, the *epilogue*, which pointed out the uſe of the piece, or conveyed ſome other notice to the audience in the poet's name.

DRAMATIC, in *Poetry*, is an epithet given to pieces written for the ſtage.

For the laws of *dramatic* poetry, ſee UNITY, ACTION, CHARACTER, FABLE, &c.

Style DRAMATICO. See STYLE.

DRANK, a name given by our farmers to the great wild oats. Theſe are often very troubleſome to the plowed lands, eſpecially after wet ſeaſons and much froſt. Many to deſtroy this weed ſow the land with black oats, which being ripe much ſooner than the ſeeds of this plant, are cut down before it can ſow itſelf for another year; eſpecially if they are cut a little the earlier, which will do them no harm, if they be ſuffered to lie a while upon the ground afterwards, for the grain to ſwell before they are carried in. But, in general, when plowed lands begin to run to theſe weeds and thiſtles, it is a token to the farmer that it is time to fallow them, or elſe to ſow them with hay-ſeed, and make paſtures of them. The ſowing beans upon a land ſubject to theſe weeds is alſo a good method, becauſe the farmer may ſend in his ſheep when they are about three inches high, which will eat up the *drank*, and all the other weeds, and will not hurt the beans. The general method is to put twenty ſheep to an acre; but they muſt be put in only in dry weather, and not left too long.

DRAPERY, in *Painting*, and *Sculpture*, the repreſentation of the garments, or cloathing of human figures.

The word is French, *draperie*, formed from *drap*, *cloth*.

In the general ſenſe, *drapery* includes not only the garments, but alſo the tapeſtry, linens, and moſt other things that are not carnations, nor landſcapes.

The art of *drapery* conſiſts chiefly in three points, viz. the ordering of the folds, or plaits; the different quality of the ſtuffs; and the variety of their colours.

As to the folds, they ſhould be ſo managed, that you may eaſily perceive what it is that they cover, and diſtinguiſh it from any thing elſe. For inſtance, that you ſee it is an arm that is under the *drapery*, and not a leg, &c. The folds, again, muſt be large, as breaking and dividing the ſight the leſs. There ſhould likewiſe be a contraſt between them, otherwiſe the *drapery* will appear ſtiff.

The quality of the ſtuffs ſhould likewiſe be well conſidered; ſome make their folds abrupt, and harſh; and others more ſoft and eaſy. The ſurface of ſome, again, has a luſtre; others are dull; ſome are fine, and tranſparent; others ſtrong, and ſolid.

The variety of colours, when well managed, makes the great beauty of a painting; all being not equally amicable, and friendly, with reſpect to each other; and ſome are never to be placed near certain others.

M. de Piles gives abundance of good obſervations, relating to *drapery*. Their firſt effect, he obſerves, and that which the painter ought to have principally in view, is, that they expreſs the thing they are ſuppoſed to cover; and they muſt never be made to adhere, and ſtick to the parts of the body; a great lightneſs, and motion of the *drapery*, are only proper for figures in great agitation, or expoſed to the wind. The nudities of the figures ſhould always be deſigned, before the painter proceed to the *draperies*. Titian, Paul Veroneſe, and Vandyke, excelled in *draperies*.

DRASTIC, from δραω, *I act*, a ſtrong and powerful medicine; more particularly, a purgative that works with ſpeed and vigour; as jalap, ſcammony, and the other ſtronger cathartics.

DRAUGHT, in *Medicine*. See POTION.

DRAUGHT, in *Trade*, is an allowance made in the weight of commodities; the ſame as clough. See CLOUGH.

DRAUGHT is alſo uſed ſometimes for a bill of exchange, and commonly for an order for the payment of any ſum of money due, &c. Then the perſon who gives the order is ſaid to *draw* upon the other.

DRAUGHT, in *Painting*, &c. See DESIGN.

DRAUGHT, or, as it is pronounced, DRAFT, in *Architecture*, the figure of an intended building deſcribed on paper; wherein are laid down, by ſcale and compaſs, the ſeveral diviſions and partitions of the apartments, rooms, doors, paſſages, conveniencies, &c. in their due proportion.

It is uſual, and even exceedingly convenient, before a building is begun to be raiſed, to have *draughts* of the ichnography, or ground-plot of each floor, or ſtory; as alſo of the form and faſhion of each front, with the windows, doors, ornaments, &c. in an orthography, or upright.

Sometimes the ſeveral fronts, &c. are taken, and repreſented in the ſame *draught*, to ſhew the effect of the whole building: this is called a *ſcenography*, or *perſpective*. See SCENOGRAPHY.

DRAUGHT, *reduction of a*. See REDUCTION, and PENTAGRAPH.

DRAUGHT-*compaſſes*, thoſe provided with ſeveral moveable points, to draw fine *draughts* in architecture, &c. See COMPASS.

DRAUGHT-*hooks*, are large hooks of iron fixed on the cheeks of a cannon-carriage, two on each ſide, one near the trunnion-hole, and the other at the train, and are called the fore and hind *draught-hooks*. Large guns have *draught-hooks* near the middle tranſum, to which are fixed the chains, which ſerve to eaſe the ſhafts of the limbers on a march The fore and hind-hooks are uſed for drawing a gun backwards or forwards by men with ſtrong ropes, called *draught*, or *drag-ropes*, fixed to theſe hooks.

DRAUGHT-*horſe*. See HORSE.

DRAW. A ſhip is ſaid to *draw* ſo much water, according to the number of feet ſhe ſinks into it.

Thus, if fifteen feet from the bottom of her be under water, or if ſhe ſink into the water fifteen feet perpendicularly, ſhe is ſaid to *draw* fifteen feet water; and according as ſhe *draws* more, or leſs, ſhe is ſaid to be of more, or leſs *draught*; and that this may be more readily known, the feet are marked on the ſtern and ſtern-poſt regularly from the keel upwards.

DRAW, in the *Foreſt Law*. See DOG-*draw*.

DRAW-*back*, in *Commerce*, a rebate, or diſcount, upon the price of commodities, purchaſed on certain conditions. See REBATE, and DISCOUNT.

Draw-back is more particularly uſed to denote certain duties, either of the cuſtoms or of the exciſe, that are allowed upon the exportation of ſome of our own manufactures, or upon certain foreign commodities that have paid a duty at importation.

The oaths of the merchants importing or exporting are required, to obtain the *draw-back* of foreign goods, affirming the truth of the officer's certificate of the entry, and the due payment of the duties; and theſe may be made by the agent or huſband of any corporation or company, or by the known ſervant of any merchant, uſually employed in making his entries, and paying his cuſtoms. 2 and 3 Ann. cap. 9. With reſpect to foreign goods entered outwards, if leſs in quantity or value be fraudulently ſhipped out than is expreſſed in the exporter's certificate, the goods therein mentioned, or their value, are forfeited, and no *draw-back* is to be allowed for the ſame. Foreign goods exported by certificate, in order to obtain the *draw-back*, not ſhipped or exported, or re-landed in Great Britain, unleſs in caſe of diſtreſs, to ſave them from periſhing, which muſt be immediately ſignified to the officers of the cuſtoms, are to loſe the benefit of the *draw-back*, and are forfeited, or their value, with the veſſels, horſes, carriages, &c. employed in the re-landing of them; and the perſons concerned in re-landing them, or by whoſe privity they are re-landed, or into whoſe hands they ſhall knowingly come, are to forfeit double the amount of the *draw-back*. 13 and 14 Car. II. cap. 11. 8 Ann. cap. 13. This is to be paid for within five years after the offence. And the ſeizure of the horſes, &c. may be adjuſted by two or more juſtices of the peace. 6 Geo. I. cap. 21. 8 Geo. I. cap. 18. and 11 Geo. I. cap. 29. Officers of the cuſtoms conniving at, or aſſiſting in any fraud relative to certificate goods, beſide other penalties, are to forfeit their office, and to ſuffer ſix months impriſonment, without bail or mainprize; as are alſo maſters or perſons belonging to the ſhips employed in this buſineſs. 8 Ann. cap. 13. Bonds given for the exportation of certificate goods to Ireland muſt not be delivered up, nor *draw-back* allowed for any goods, till a certificate under the hands and ſeals of the comptroller, or collector, &c. of the cuſtoms of ſome port in Ireland be produced, teſtifying the landing, which certificate muſt be produced in ſix months from the date of the bond. 8 Ann. cap. 13. 5 Geo. I. cap. 11. 9 Geo. I. cap. 8. 2 Geo. II. cap. 28. See CUSTOMS, DEBENTURES, DUTIES, &c.

DRAW-*bridge*, a bridge made after the manner of a floor, to be *drawn* up, or let down, as occaſion ſerves, before the gate of a town or caſtle. See BRIDGE.

DRAW-*gear*, in *Huſbandry*, any kind of harneſs for drawing a waggon or other carriage.

DRAW-*net*, a kind of net for taking the larger ſort of wild fowl, which ought to be made of the beſt packthread, with wide meſhes: they ſhould be about two fathoms deep, and ſix long, verged on each ſide with a very ſtrong cord, and ſtretched at each end on long poles.

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It ſhould be ſpread ſmooth and flat upon the ground, and ſtrewed over with ſedge, graſs, or the like, to hide it from the fowl; and the ſportſman is to place himſelf in ſome ſhelter of graſs, fern, or ſome ſuch thing.

DRAWER *of a bill of exchange*, &c. the perſon who draws the bill upon his correſpondent. See BILL, and EXCHANGE.

DRAWING *a caſt*, among *Bowlers*. See BOWLING.

DRAWING *medicines*, or DRAWERS. See EPISPASTIC, and RIPENERS.

DRAWING, *tooth*. See TOOTH-*drawing*.

DRAWING *of gold*, or *ſilver*, is the paſſing it through a number of holes in an iron, each leſs than another, to bring it into a wire. See WIRE-*drawing*, and DUCTILITY.

DRAWING *of a bill of exchange*, is the writing, ſigning, and giving it to the perſon, who has already paid the value, or content thereof, to receive it in another place.

A perſon ſhould never *draw* a bill of exchange, unleſs he be well aſſured it will be accepted, and paid. See BILL *of Exchange*.

DRAWING, in *Painting*, &c. See DESIGNING, and COUNTER-DRAWING.

DRAWING, among *Hunters*, is, when they beat the buſhes after a fox.

DRAWING *amiſs* is, when the hounds, or beagles, hit the ſcent of their chace the contrary way, ſo as to purſue it up the wind, when they ſhould have done it down the wind.

DRAWING *on the ſlot* is, when the hounds touch the ſcent, and *draw* on, till they rouſe, or put up the chace.

DRAWING, *fine*. See FINE-*drawing*.

DRAY, a name given by ſportſmen to ſquirrel neſts, built on the tops of trees. See SQUIRREL.

DRAY is alſo a cart uſed by brewers to carry beer on; likewiſe a ſledge without wheels.

DRAY-*plough*. See PLOUGH.

DREAMS. According to Wolfius every *dream* takes its riſe from ſome ſenſation, and is continued by the ſucceſſion of phantaſms in the mind. His reaſons are, that when we *dream* we imagine ſomething, or the mind produces phantaſms; but no phantaſm can ariſe in the mind, without a previous ſenſation: hence neither can a *dream* ariſe without ſome previous ſenſation. He obſerves farther, that though it be certain *à priori*, from the nature of the imagination, that *dreams* muſt begin by ſome ſenſation, yet that it is not eaſy to confirm this by experience; it being often difficult to diſtinguiſh thoſe ſlight ſenſations, which give riſe to *dreams*, from phantaſms, or objects of imagination. Yet this is not impoſſible in ſome caſes, as when the weak ſenſation ſufficient to give riſe to a *dream* gradually becomes ſtronger, ſo as to put an end to it, as it often happens in uneaſy and painful ſenſations. Wolf. Pſychol. Empir. § 123.

The ſeries of phantaſms, or objects of imagination, which conſtitute a *dream*, ſeem to be ſufficiently accounted for, from the law of imagination, or of aſſociation; though it may be extremely difficult to aſſign the cauſe of every minute difference, not only in different ſubjects, but in the ſame, at different times, and in different circumſtances. We have an eſſay on this ſubject by M. Formey, in the Mem. de l'Acad. de Berlin. tom. ii. p. 316. He expreſly adopts Wolfius's propoſition above mentioned, that every *dream* begins by a ſenſation, and is continued by a ſeries of acts of imagination, or of phantaſms; and that the cauſe of this ſeries is to be found in the law of the imagination. *Si naturale ſomnium eſt, initium capere debet per legem ſenſationis, & continuari per legem imaginationis.* Hence he concludes thoſe *dreams* to be ſupernatural, which either do not begin by ſenſation, or are not continued by the law of the imagination.

This opinion is as ancient as Ariſtotle, who expreſly aſſerted, that a *dream* is only the φαντασμα, or *appearance* of things, ariſing from the previous motions excited in the brain, and remaining after the objects are removed. Hobbes has adopted this hypotheſis: he aſcribes different *dreams* to different diſtempers of the body, and whimſically enough obſerves, that lying cold breedeth *dreams* of fear, and raiſeth the thought and image of ſome fearful object. Thus he accounts for that which was in reality the waking viſion of Brutus, which addreſſed him the night before the battle of Philippi. "I am, Brutus, "thine evil genius; but thou ſhalt ſee me again near "Philippi." And Mr. Locke, though he does not expreſly declare how *dreams* are excited during ſleep, ſeems to aſcribe the perfection of rational thinking to the body; and traces their origin to previous ſenſations, when he ſays, "The *dreams* of ſleeping men are all made up of "the waking man's ideas, though for the moſt part "oddly put together." He urges the incoherence, frivolouſneſs, and abſurdity, of many of our *dreams*, as well as the ſuppoſed fact that ſome ſleep without *dreaming*, as objections to the notion that men think always: to which it has been replied, that *dreams* may be entirely, imperfectly, or not at all remembered, according to the various degrees in which the nerves are impreſſed by the motion given to the animal ſpirits in ſleep. Ariſt. de Inſomn. cap. 3. Hobb. Lev. cap. 2. & cap. 45. Lock. Eſſ. book ii. ch. i. § 10, &c. Watts's Eſſ. § 2. p. 120, &c.

Dr. Hartley explains all the phænomena of the imagination by his theory of vibrations and aſſociations. *Dreams*, he ſays, are nothing but the imaginations or reveries of ſleeping men, and they are deducible from three cauſes, viz. the impreſſions and ideas lately received, and particularly thoſe of the preceding day, the ſtate of the body, and particularly of the ſtomach and brain, and aſſociation. Obſ. on Man, vol. i. § 5. p. 383, &c.

Democritus and Lucretius account for *dreams*, by ſuppoſing that ſpectres and *ſimulacra* of corporeal things, conſtantly emitted from them, and floating up and down in the air, come and aſſault the ſoul in ſleep. Lucret. De Rer. Nat. lib. iv.

Thoſe who have maintained the eſſential difference between ſoul and body have ſolved the common phænomena of *dreams* by the union of theſe two ſubſtances, and the neceſſary connection ariſing thence between ideas in the mind, and certain motions in the body, or in thoſe parts more immediately united to the ſoul; whilſt others, who have denied the exiſtence of matter, account for them in the ſame manner as for our other ideas, which may not be improperly called *waking dreams*.

A learned author has not long ſince aſſerted, that our *dreams* are prompted by ſeparate immaterial beings; an opinion which was advanced long ago by the heathens, and maintained very generally, and applied to a ſpecies of DIVINATION. He contends, that the phantaſm, or what is properly called the viſion, is not the work of the ſoul itſelf, and that it cannot be the effect of mechanical cauſes; and therefore aſcribes it to ſeparate ſpirits, having acceſs to our minds, and furniſhing us with ideas while we ſleep. See Mr. Baxter's Eſſay on the Phæn. of Dreaming, in his Enquiry into the Nature of the human Soul, vol. ii. 3d edit. 1745.

The phyſicians who have accurately examined the ſtate of their patients in every particular circumſtance, have not omitted, at times, to enquire into their *dreams* in thoſe hours of ſleep which their ill ſtate allows them, and partly from experience, partly from reaſon and analogy, have found, that there are many preſages of diſeaſes to come, and many indications of ſuch as are preſent, but unperceived, at leaſt not ſeen in their full extent, to be had from what the ſenſes ſuffer in *dreams*. Indeed, if *dreams* are different from what might be expected from the buſineſs of the day, or the turn of thought before, they may always be looked upon as ſigns of a more or leſs diſtempered ſtate of the body; and the true condition of that ſtate may often be better learned from them, than from any other means. What has been obſerved by phyſicians in regard to the prognoſtics from *dreams*, may be ſummed up in the following manner: to *dream* of fire, indicates a redundance of yellow bile; to *dream* of fogs or ſmoak, indicates a predominancy of black bile; to *dream* of ſeeing a fall of rain or ſnow, or a great quantity of ice, ſhews that there is a redundance of phlegm in the body; he who fancies himſelf among ſtinks may be aſſured, that he harbours ſome putrid matter in his body; to have red things repreſented before you in ſleep, denotes a redundance of blood; if the patient *dreams* of ſeeing the ſun, moon, and ſtars, hurry on with prodigious ſwiftneſs, it indicates an approaching delirium; to *dream* of a turbid ſea, indicates diſorders of the belly; and to *dream* of ſeeing the earth overflowed with water, or of being immerged in a pond or river, indicates a redundance of watery humours in the body; to *dream* of ſeeing the earth burnt or parched up, is a ſign of great heat and drineſs; the appearance of monſters and frightful enemies, indicates deliriums in diſeaſes; and to *dream* often of being thrown down from ſome very high place, threatens an approaching vertigo, or ſome other diſorder of the head, as an epilepſy, apoplexy, or the like. Theſe and a great many others are the obſervations of Hippocrates on the *dreams* of his patients. From thoſe, and from ſome farther aſſiſtances, Lomnius has carried the ſubject to a very great length, and given many rules of judging from them. Lomnii Med. Obſ. But quære, how true.

DREDGE, or DREG, a term uſed by the farmers for oats and barley mingled together.

DREDGERS, a term uſed in the admiralty-courts for the fiſhers for oyſters. See ſtat. 2 Geo. II. cap. 9.

DREGS *of oil*, a name given by the people who trade in oil, to that coarſe and thick part of it, which ſubſides to the bottom of the veſſels in which great quantities of it are kept. This is not fit for the common uſes of the clear oil

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oil at the top, but there are ſeveral purpoſes to which it ſerves very well. Great quantities of theſe lees or *dregs* of common oil are uſed by the ſoap-boilers, principally in making the common ſoft ſoap. The leather-dreſſers alſo uſe it in conſiderable quantities to ſoften the hides they are employed to prepare for the ſeveral artificers who uſe them. Some of theſe *dregs* are alſo uſed in the making of flambeaux, which inſtead of being made of yellow wax as pretended, are uſually compoſed of pitch, roſin, and this oil, mixed in ſuch a proportion as to make a maſs of a proper hardneſs and conſiſtence. People who uſe preſſes, and other works in which there are many ſcrews, ſometimes buy this to greaſe their ſcrews, inſtead of ſoap or ſuet. Theſe are the uſes mentioned by Savary; but beſide theſe we have in England another manufacture, which conſumes a greater quantity than all theſe put together. This is the making ſpermaceti; ſome perſons among us have found the art of making this out of the fæces of oil, and will give an oilman at any time as much clear oil in exchange of theſe *dregs*, as they are in quantity. All the other uſes of theſe *dregs* leave the trader at a great loſs; and as Savary obſerves, the more fæces the oil contains, the greater is the loſs to the buyer; but with us, this is rendered equal, and there is no loſs in it.

All ſorts of oil produce more or leſs fæces and *dregs*, but of all others, the whale-oil is obſerved to produce the largeſt quantity, and the nut-oil the leaſt.

DREIT DREIT, in our *Old Writers*, ſignifies a double right, that is, *jus poſſeſſionis & jus dominii*. Bracton, lib. iv. cap. 27. and lib. iv. tract. 4. cap. 4. and lib. v. tract. 3. cap. 5. Coke on Littl. fol. 266.

DRENCH, among *Farriers*, a phyſical draught, or potion, given a horſe, by way of purge.

DRENCHES, or DRENGES, DRENGI, or THRENGI, in our *Old Cuſtoms*, a term, about which the lawyers and antiquaries are a little divided. See THRENGUS.

Drenges, ſays an ancient manuſcript, were *tenentes in capite:* according to Spelman, they were *e genere vaſallorum non ignobilium, cum ſinguli qui in domes-day nominantur ſingula poſſiderent maneria:* ſuch as, at the coming in of the Conqueror, being put out of their eſtates, were afterwards, upon complaint, reſtored thereto; becauſe, they, being before owners thereof, were neither in auxilio, nor conſilio, againſt him.

DRENGAGE, DRENGAGIUM, vel *ſervitium drengagii*, in our *Old Writers*, the tenure by which the *drenches* held their lands; concerning which, ſee Term. Trin. 21 Ed. III. Ebor. and Northum. Rot. 191. *Notandum eſt, eos omnes eorumve anteceſſores, qui e* drengorum *claſſe erant, vel per* drengagium *tenuere, ſua incoluiſſe patrimonia ante adventum Normannorum.* Spelm. Gloſſ. Du-Cange, Gloſſ. Lat. in voc. *drenches.*

DREPANON, Δρέπανον, among the Greeks, an engine of iron crooked like a ſickle, and fixed to the top of a long pole. It was uſed in cutting aſunder the cords of the ſail-yards, in order to diſable the ſhip by letting fall the ſails, and was otherwiſe called *dorydrepanon.* Potter's Archæol. tom. ii. p. 141.

DRESSING *of hemp and flax.* See HEMP and FLAX.

DRESSING *of hops.* See HOPS.

DRESSING *of meats*, the preparing them for food, by means of culinary fire.

The deſign of *dreſſing* is, to looſen the texture of the fleſh, and diſpoſe it for diſſolution, and digeſtion in the ſtomach. Fleſh not being a proper food without *dreſſing*, is alleged as an argument, that man was not intended by nature for a carnivorous, or fleſh-eating animal.

The uſual operations are, *roaſting*, *boiling*, and *ſtewing*. In *roaſting*, it is obſerved, meat will bear a much greater and longer heat than either in *boiling*, or *ſtewing*; and in *boiling* greater and longer than in *ſtewing*. The reaſon is, that *roaſting* being performed in the open air, as the parts begin externally to warm, they extend and dilate, and ſo gradually let out part of the rarefied included air, by which means the internal ſuccuſſions, on which the diſſolution depends, are much weakened, and abated; *boiling* being performed in water, the preſſure is greater, and conſequently, the ſuccuſſions to lift up the weight are proportionably ſtrong; by which means the coction is haſtened; and even in this way there are great differences; for the greater the weight of water, the ſooner is the buſineſs done.

In *ſtewing*, though the heat be much leſs than what is employed in the other ways, the operation is much more quick, becauſe performed in a cloſe veſſel, and full; by which means the ſuccuſſions are more often repeated, and more ſtrongly reverberated. Hence the force of Papin's DIGESTOR; and hence an illuſtration of the operation of DIGESTION.

Boiling, Dr. Cheyne obſerves, draws more of the rank, ſtrong juices from meat, and leaves it leſs nutritive, more diluted, lighter, and eaſier of digeſtion: *roaſting*, on the other hand, leaves it fuller of the ſtrong, nutritive juices, harder to digeſt, and needing more dilution. Strong, grown, and adult animal food, therefore, ſhould be *boiled*; and the younger, and tenderer, *roaſted.*

DRESSING *of ore.* See BUDDLE, and ORE.

DRESSING, in *Surgery*, denotes the treatment of a wound, or any diſordered part. The apparatus for this purpoſe conſiſts of doſſils, tents, plaſters, compreſſes, bandages, bands, ligatures, &c.

DRESSING *a ſhip*, is the act of ornamenting a ſhip with a variety of colours, as enſigns, flags, pendants, &c. diſplayed from different parts of her maſts and rigging, on a day of feſtivity.

DRIE, or DRY. See DRY.

DRIFT, in *Mining*, a paſſage cut out under the earth betwixt ſhaft and ſhaft, or turn and turn, or a paſſage or way wrought under the earth to the end of a meer of ground, or part of a meer.

DRIFT *of the foreſt*, an exact view, or examination of what cattle are in the foreſt; that it may be known whether it be overcharged, or not, and whoſe the beaſts are; and whether they are commonable beaſts, or not. See FOREST, and COMMON.

DRIFT, in *Navigation*, denotes the angle which the line of a ſhip's motion makes with the neareſt meridian, when ſhe drives with her ſide to the wind and waves, and is not governed by the power of the helm; and alſo the diſtance which the ſhip drives on that line, ſo called only in a ſtorm.

DRIFT-*ſail*, in a *Ship*, a ſail uſed under water; veered out right a-head, by ſheets, as other ſails are: its uſe being to keep the ſhip's head right upon the ſea, in a ſtorm; and to hinder a ſhip's driving too faſt in a current; with which view it is generally uſed by fiſhermen, eſpecially in the North ſea.

DRILL, in *Mechanics*, a ſmall inſtrument for making ſuch holes as *punches* will not conveniently ſerve for. *Drills* are of various ſizes, and are chiefly uſed by ſmiths and turners.

It is a very well known fact, that a *drill* made of iron has frequently not only a polarity, but ſo ſtrong an attractive virtue of the magnetic kind, that it will ſuſpend a common needle from its point. It is uſually ſuppoſed that a *drill* acquires this polarity by boring iron. But it is not only by boring of iron, that this power is obtained, but in the very making. As ſoon as one of them is finiſhed and hardened, its point becomes a north pole before it has ever been worked either in iron or any other materials, ſo that of the great numbers of theſe inſtruments found in a ſhop, endued with this power, it is to be ſuppoſed that more of them owe it to their original make, than to any after uſe. All pieces of wrought iron which in ſhape reſemble *drills*, that is, which are of a long and ſlender form, will not only have this polarity, but they will change it on being placed for ſome time in an inverted poſture, and that which was the oppoſite to the north pole, by ſtanding downwards will be the north pole. This has been an old obſervation, but on a fair experiment it does not prove to be true in all things without exception, though it be ſo in moſt particulars. The larger pieces of iron ſeem to be moſt eaſily influenced in their polarity, by changing their poſition; but the ſmall ones will ſometimes be found to have fixed poles, which no change of poſture will alter. Phil. Tranſ. N° 246. See MAGNET.

DRILL, or DRILL-*box*, a name given to an inſtrument uſed in the new method of horſe-hoeing huſbandry for ſowing the land. See BROAD-*caſt*, and HUSBANDRY.

The *drill* is the engine that plants the corn and other ſeeds in rows; it makes the channels and ſows the ſeeds in them, and covers them with earth when ſown, and all this at the ſame time, and with great expedition. The principal parts of the *drill* are the ſeed-box, the hopper, the plough, and its harrow. The ſeed-box is the chief of theſe; it meaſures or rather numbers out the ſeeds which it receives from the hopper, and is for this purpoſe as an artificial hand, but it delivers out the ſeed much more equally, than that can be done by a natural hand. The plough and hopper are drawn by a horſe, and by theſe the ground is opened, and the ſeed is depoſited in it; the harrow follows, and lightly rakes in the earth over them. When the ground is fine, and the ſeeds ſmall, a hurdle with ſome prickly buſhes faſtened to its under part, will ſerve better than the harrow. The whole apparatus for this method of ſowing is deſcribed and illuſtrated with figures by Tull in his Horſe-hoeing Huſbandry. See *Drill*-PLOUGH.

DRILL-*rake*, in *Huſbandry*. See *Drill*-RAKE.

DRILLING is popularly uſed for exerciſing ſoldiers.

The word is derived from the French *drille*, which ſignifies a *raw ſoldier.*

DRINK,

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DRINK, a part of our ordinary nouriſhment, in a liquid form, ſerving to dilute, and moiſten the dry meat.

The *drinks*, in different countries, are different. Thoſe uſed among us, are water, malt-liquors, wine, cyder, punch, brandy, tea, &c. See each under its proper article, CYDER, &c.

The *malt-drink* brewed in England, in one year, Chamberlayne aſſures us, amounts to very near two millions of barrels, ſtrong and ſmall.

The firſt *drinks* of mankind were certainly water and milk; but luxury ſoon introduced the art of preparing intoxicating and inebriating *drinks* out of vegetables. The vine gave the firſt of theſe liquors; after this, wheat, barley, millet, oats, rice, apples, pears, and pomegranates; and after theſe the juices drained from the pine, ſycamore, and maple, were brought to this uſe; in latter times, roots, berries, and the pith of the ſugar-cane, have been employed for the ſame purpoſes. Honey alſo is at preſent in ſome repute; but before the uſe of the other things here mentioned, the vinous liquor made of honey and water was in the very higheſt eſtimation. The bees were natural purveyors, and their ſtores were one of the firſt delicacies probably of the human race. It was very natural to attempt the meliorating ſo raw a drink as water, by an addition of this ſweet ſubſtance; and ſuch a mixture needing only time for fermentation to become vinous, accident might ſoon lead to this diſcovery. Mead therefore may naturally be ſuppoſed to have been one of the firſt ſtrong liquors in uſe in the world; and among the very oldeſt writers among the Greeks we find it named as a thing well known. Homer, Heſiod, and Ariſtophanes, all give plain proofs of their having been acquainted with it. The people who have ſtudied the human frame to moſt purpoſe, all agree, that amongſt the ſtrong *drinks*, wine is the moſt pernicious; and that good water, milk, beer, and cyder, are greatly preferable to it, none of them bringing on the variety of diſorders, to which immoderate wine-drinkers are ſubject, ſuch as decay of ſight, trembling of the limbs, &c.

Water, Dr. Cheyne obſerves, is the only ſimple fluid (for there are but three more in nature, mercury, light, and air, none of which is fit for human *drink)* fitted for diluting, moiſtening, and cooling; the only ends of *drink*, appointed by nature; and happy had it been for the race of mankind, had other mixed, and artificial liquors never been invented. Water alone is ſufficient, and effectual, for all the purpoſes of human wants in *drink*. Strong liquors were never deſigned for common uſe. They were formerly kept here in England, as other medicines are, in apothecaries ſhops, and preſcribed by phyſicians, as they do diaſcordium, and Venice treacle, to refreſh the weary, ſtrengthen the weak, and raiſe the low-ſpirited. The effect of the ordinary uſe of wine, and ſpirituous liquors, as natural cauſes will always produce their effects, is to inflame the blood into gout, ſtone, and rheumatiſm, fevers, pleuriſies, ſmall-pox, &c. to dry up the juices, and ſcorch and ſhrivel the ſolids. Thoſe whoſe appetite and digeſtion are good and entire, never want ſtrong liquors to ſupply them with ſpirits; ſuch ſpirits are too volatile, and fugitive, for any ſolid or uſeful purpoſes of life. Two ounces of fleſh-meat, well digeſted, beget a greater ſtock of more durable and uſeful ſpirits, than ten times as much ſtrong liquors.

All ſtrong liquors are as hard to digeſt, and require as much labour of the concoctive powers, as ſtrong food itſelf. Water is the only univerſal diſſolvent, or menſtruum, and the moſt certain diluter of all bodies proper for food. There are a great many ſpirituous liquors, which not only will not diſſolve, but which will harden, and make more indigeſtible, certain parts, eſpecially the ſalts of bodies, wherein their active qualities, that is, thoſe which can do moſt harm to human conſtitutions, conſiſt. And we have known perſons of tender conſtitutions, who could neither eat, nor digeſt, upon *drinking* wine, who, by *drinking* at meals common water, warmed, have recovered their appetites, and digeſtion, and have thriven, and grown plump. It is true, ſtrong liquors, by their heat, and ſtimulation on the organs of concoction, by increaſing the velocity of the motion of the fluids, and thereby quickening the other animal functions, will carry off the load that lies upon the ſtomach, with more preſent chearfulneſs. But then, beſide the future damages of ſuch a quantity of wine to the ſtomach, and the fluids, by its heat, and inflammation, the food is hurried into the habit unconcocted, and lays a foundation for a fever, a fit of the colic, or ſome chronical diſeaſe. Eſſay on Health, &c. p. 47, & ſeq.

With reſpect to fermented liquors, which are commonly uſed, it may be obſerved, that thoſe which are too ſtrong hurt digeſtion, and are ſo far from ſtrengthening the body, that they weaken and relax it. They keep up a conſtant fever, which exhauſts the ſpirits, heats and inflames the blood, diſpoſes to numberleſs diſeaſes, and occaſions a premature old age. But fermented liquors may be too weak, as well as too ſtrong: theſe muſt either be drank new, before the fermentation is over, and in this caſe will generate air in the bowels, and occaſion flatulencies; or they ſoon become ſtale, ſour the ſtomach, and injure digeſtion. On this account all malt-liquors, cyder, &c. ſhould be ſufficiently ſtrong, to keep till they are ripe, and then they ſhould be uſed; and neither ſooner nor later. Liquors that are adulterated with a mixture of ingredients of the opiate kind, which are poiſonous in their quality, by thoſe who make them for ſale, hurt the nerves, relax and weaken the ſtomach, and ſpoil its digeſtive powers.

DRINKING-*glaſſes*. See GLASSES.

DRINKLEAN, in our *Old Writers*, a ſcot-ale or contribution of the tenants towards a potation, i. e. ale provided to entertain the lord or his ſteward. In ſome records it is written, *potura drinklean*.

DRIP, in *Architecture*. See LARMIER.

DRIPS is alſo uſed in building, for a kind of ſteps, on flat roofs, to walk upon.

This way of building is much uſed in Italy; where the roof is not made quite flat, but a little raiſed in the middle; with *drips*, or ſteps, lying a little inclining to the horizon. See ROOF.

DRIVE, in the *Sea-Language*. A ſhip is ſaid to *drive*, when an anchor being let fall, will not hold her faſt, but that ſhe ſails away with the tide, and wind.

The beſt way to prevent this, is to veer out more cable; for the more cable ſhe has, the ſurer, and ſafer ſhe rides; or elſe to let fall more anchors.

Alſo, when a ſhip is a-hull, or a-try, they ſay, ſhe *drives* to leeward, or in with the ſhore, according to the way ſhe makes.

DRIVE-*bolts*, in *Ship-Building*. See BOLTS.

DRIVER, the name given by our ſportſmen to an inſtrument uſed in taking pheaſant-powts, in the method called *driving*. This inſtrument conſiſts only of a parcel of ozier wands, ſuch as are uſed by the baſket-makers, which are made up into a bundle, or ſort of great whiſk, and faſtened in a handle; and to prevent their ſpreading too much at the points are tied round in one or two places in the length; with this inſtrument the ſportſman having fixed his nets, drives the young birds into them. See DRIVING.

DRIVER, in a *Ship*, is an oblong ſail, occaſionally hoiſted to the mizen-peak, when the wind is very fair. The lower corners of it are extended by a boom or pole, thruſt out acroſs the ſhip, and projecting over the lee-quarter.

DRIVERS, *wool*. See WOOL.

DRIVING, amongſt *Sportſmen*, a term applied to the taking of young pheaſants, and ſome other birds in nets of an open ſtructure. The method of doing this, is, when an eye of pheaſants is found, the ground all about is to be ſearched, for finding their principal haunts. The induſtrious ſearcher will ſoon be able to make out ſome one of their paths, which are beaten in the manner of ſheep-tracks, only more ſlightly. When one of theſe is found, the place is to be marked by ſetting up a ſtick with another tied to its top like the hand of a road poſt, marking out the place where the path ſeems to run to. On examining the reſt of the ground thereabouts, having regard to the ſame direction, it is highly probable, that ſeveral more of the ſame ſort of tracks will be found all running the ſame way. By one or other of theſe probably the ſportſman will be led to their haunt, which he will not miſs knowing by the nakedneſs and barrenneſs of the ground, and its being covered with the dung and feathers of the young birds. When this is found, the nets are to be placed near this ſpot, looſe and circularly, in ſuch a manner, that the under part being faſtened down to the ground, the upper part may be a hollow, and give a paſſage to the young birds in, and entangle them when there. When the nets are fixed, the perſon muſt go to the haunts and call them together by the artificial noiſe of the pheaſant-call, which is ſo like the real note of the pheaſant, that the powts, or young ones, will ſeldom fail being deceived by it. When they hear this, and begin to anſwer it with their chucking and piping, the call is to be ſtopped, and a perſon is to get behind them, taking the wind with himſelf, as they always run with the wind. He is to have in his hand the inſtrument called by the ſportſmen a *driver*.

When the perſon who carries this inſtrument perceives that he is come pretty near ſome of the powts, he muſt ſoftly beat the buſhes with the *driver*, or only lightly draw it over them; the little noiſe this makes will terrify theſe timorous creatures, and they will gather together in the track, and run a little way forward, and then all

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ſtop and turn about; on this the perſon is to make the ſame noiſe again, upon which they will run farther; and when they ſtop again, the ſame noiſe will again ſend them forward. Whatever other powts are in the way will join the main body in this fright, and the whole will be *driven* in this manner, like a flock of ſheep, and by a little addreſs of the ſportſman be ſent into the nets; ſo that out of a whole eye, it often happens that not one is miſſed. If in the fright the birds happen to run out of their track, and take a wrong way, then the *driver* is to make a raking noiſe with his inſtrument dragged along the ground, on that ſide on which they are running; this will amaze and terrify them ſo, that they will immediately ſtart back, and come into the beaten track that leads directly to the haunt. There are but two cautions neceſſary to the ſucceeding perfectly in this method of taking them: theſe are ſecreſy and patience. Whatever ſtops they make, or however tediouſly they move, the ſportſman who would make ſure of them, muſt bear with it; for over-raſhneſs and hurrying will ſpoil all, and he muſt content himſelf with terrifying them by the noiſe alone, keeping himſelf careſully out of their ſight; for if they eſpy him, all the plan is diſconcerted, and they will no more move forwards, but will every one run a different way, and hide under the roots of trees, and thick buſhes, and all the art in the world will never bring them out again till night, when it will be too dark to watch them.

DRIVING *of wild fowl*, is only practicable in the moulting time, which is in July and Auguſt; and it is to be done by means of a ſpaniel, well trained to the purpoſe. The nets are to be ſet in creeks and narrow places, or at their uſual night retreats, and the dog is to put them up, and *driving* them forward, they will be ſent immediately into the nets, not being able to fly away from the dog, from the want of their wing feathers. The people who live in the fens find great account in this practice, taking very great numbers of wild-ducks by it. They are uſually indeed poor and out of fleſh at this time, but as they are always taken alive, and without any hurt, the people find it eaſy to fatten them with beaſts livers, barley, paſte, ſcalded bran, and the like; and they will on this become, in a very little time, fat and well taſted, excelling in flavour both the tame ducks commonly kept in the yards, and the wild ducks in their natural ſtate. When the ſportſman takes the dog into places where they are not ſo frequent, he may hunt them ſingly, and the dog alone will take them.

DRIVING, in *Metallurgy*, is uſed by the refiners of ſilver, to expreſs the riſing up of copper from its ſurface in red fiery bubbles. When the lead that was added for refining the ſilver is burnt away before the copper is gone from it, theſe bubbles appear very fiercely on the ſurface. They ſay, on this occaſion, that the metal *drives*, and then add more lead till the remainder of the copper is conſumed. Phil. Tranſ. N° 142.

DROCK, in *Huſbandry*, a name given by our farmers to a part of the common plough. It is an upright piece of timber, running nearly parallel with the hinder part of the plough, but belonging to the right ſide of the tail, as that does to the left. The ground wriſt of the plough is faſtened to this, as alſo is the earth-board. See WRIST, EARTH-BOARD, and PLOUGH.

DROFFAND, or DRYFFAND, in our *Old Writers*, was a quit-rent, or yearly payment made by ſome tenants to the king or their landlords, for driving their cattle through the manor to fairs or markets.

The word comes from the Saxon *dryfene*, *driven*.

DROGMAN. See DRAGOMAN.

DROIT, Jus, in our *Law-Books*, ſignifies *right*, or *law*; whereof ſome diſtinguiſh ſix kinds, viz. 1. *Jus recuperandi*, right of recovering. 2. *Jus intrandi*, right of entering. 3. *Jus habendi*, right of having. 4. *Jus retinendi*, right of retaining. 5. *Jus percipiendi*, right of receiving. 6. *Jus poſſidendi*, right of poſſeſſing. See LAW, and RIGHT; as alſo RECTUM, ENTRY, POSSESSION, &c.

DROIT, *Right*, gives name to the higheſt writ of all real writs, becauſe the greateſt regard is paid to it, and it has the moſt aſſured and final judgment. Of this kind are the *droit de advowſon*, &c.

DROIT *cloſe*. See RECTO.

DROIT *de advowſon*. See RECTO *de Advocatione Eccleſiæ*.

DROIT DROIT, *Jus Duplicatum*, or double right, is the right of poſſeſſion, joined with that of property; and when actual poſſeſſion is united to this double right, then a title is completely legal.

DROIT *de dower*. See RECTO *De dote*.

DROIT *patent*. See RECTO.

DROIT *ſur diſclaimer*. See RECTO *ſur Diſclaimer*.

DROIT, *monſtrans de*. See MONSTRANS.

DROMEDARY, in *Zoology*, the name of a ſpecies of camel, which has only one bunch on its back. Its hairs are ſoft to the touch, and are ſhorter than thoſe of our oxen, except that there are ſome longer on the head, the throat, and the top of the neck; and on the middle of the back there are hairs of a foot long, which, though very ſoft and flexile, yet naturally ſtanding in an erect poſture, make the moſt viſible part of the bunch. For when theſe are removed by the hand, the fleſh ſcarce appears more prominent, than that of the back of a hog, and there is not the leaſt fleſhy or callous excreſcence there.

The head is ſmall in proportion to the body; the upper lip is divided as in the hare; the feet are not hoofed, but each terminated by two ſmall claws; the ſole of the foot is broad and very fleſhy, and ſeems ſoft to the touch, though the ſkin is very hard and callous; the feet are indeed cloathed as it were with living ſhoes, which are of very great ſervice to it in travelling over the ſandy countries. It has ſix callous hardneſſes on the knees and ſhoulders of the forelegs, and one on each of the hinder ones. And beſide theſe, there is another much larger, which adheres to the breaſt, on an eminence which is there, as if made to ſupport it; this is uſually eight inches long, ſix inches broad, and about two thick. The uſe of theſe is to ſuſtain the weight of the creature's body on occaſion of his ſtooping to reſt, or to be loaded.

Its ſtomach is very large, and divided into four parts as in other of the ruminating animals, but of a ſingular ſtructure; becauſe, at the upper part of the ſecond ventricle, there are ſeveral ſquare holes, which are the orifices of a great number of a ſort of bags placed between the membranes which compoſe the ſtomach, and theſe ſeem to be the receptacles of water kept for the time of neceſſity; for the creature always drinks a vaſt quantity at once, and will then live a great while without drinking again. It is yet a queſtion to be decided, whether this creature is of the retromingent kind, and whether it copulates backwards? This has been affirmed by ſome, but it is greatly doubted by others. See *Tab. of Quadrupeds*, N° 16. and CAMEL.

The *dromedary* is ſwift; and is trained in Arabia for races, and in ſome places for carrying couriers, who can travel above a hundred miles a day on them, for nine days together, over burning deſarts, uninhabitable by any living creature. Ray & Leo Afric. 338.

DROMEUS, from δρεμω, *I run*, in *Natural Hiſtory*, a word uſed by the ancients, as the name of two very different animals, the ſtag and the dromedary. The meaning of the word is *ſwift in running*; and the ſtag had this name as being ſwifter than any other animals, and the dromedary as being ſwifter than any of the camel kind beſide.

DROMONARII, in *Antiquity*, rowers belonging to the ſhips called *dromones*.

DROMONES, in *Antiquity*, a kind of yachts or expeditious ſhips uſed in carrying proviſions, or other neceſſaries. Pitiſc. Lex. Ant. in voc.

DROMONES, DROMOS, or DROMUNDA, in middle age writers ſignified any large ſhips; but afterwards it was uſed chiefly for men of war; and in this ſenſe it is uſed in Walſingham, anno 1292, and in Knighton, lib. iii. cap. 14, &c.

DRONE, in *Muſic*. See BURDEN.

DRONE, in *Natural Hiſtory*, a ſort of bee of a larger ſize than the common working bee, which being unprovided with the neceſſary apparatus, never goes out to work, in collecting either wax or honey, but lives on the honey collected by the reſt. Theſe are the males of the ſwarm; the common working bees are of no ſex at all, or rather females in diſguiſe, and the female is uſually only one in a hive: for there is reaſon to conclude, from numerous late experiments, that the queen-bee lays only two kinds of eggs, thoſe that are to produce *drones*, and thoſe from which the working bees are to proceed. The proportion of *drones* to other bees in ſwarms is various; ſome having more than others. See QUEEN-*Bee*.

This larger ſpecies of *drones* may be eaſily diſtinguiſhed from the working bees, by being nearly double their ſize. Their head is round, their eyes full, their tongue ſhort, and belly broader and more obtuſe than that of the other claſſes; they are likewiſe of a darker colour, and more thickly cloathed; and they make a much greater noiſe in flight, ſo that they may be eaſily known, though unſeen. They have alſo no ſting, as the other bees have.

The diſſection of the *drone*-bee gives as great proof of its being the male, as that of the queen does of her being female. In this creature there is no appearance of ovaries or eggs, nor any thing of the ſtructure of the common working bees, but the whole abdomen is filled with tranſparent veſſels, winding about in various ſinuoſities, and containing a white or milky fluid. This is plainly analogous to that fluid in the males of other animals,

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mals, which is deſtined to render the eggs of the female prolific; and this whole apparatus of veſſels, which much reſembles the turnings and windings of the ſeminal veſſels in other animals, is plainly intended only for the preparation and retention of this matter, till the deſtined time of its being emitted on the eggs. At the extremity of the laſt ring of the body is placed the aperture of the anus in the female, and in the working bees; and it is at this aperture, that the ſting is alſo thruſt forth; but the caſe is quite otherwiſe in the *drone* or male bee; for the extremity of that ring is not open, but abſolutely cloſed; and the aperture of the anus is in the under part of that ring about its middle. On preſſing the body of this bee, there is alſo forced out at this part the penis; this is a ſmall and ſlender fleſhy body, contained between two horns of a ſomewhat harder ſubſtance, which join at their baſe, but gradually part aſunder as they are continued in length. When the preſſure is continued, there are finally thruſt out at the ſame aperture a part of the internal apparatus of the ſeminal veſſels, and, in fine, there is uſually ſome of the milky liquor extravaſated; but this ſeems rather to be let out by the burſting of a veſſel, than by any natural paſſage. Theſe parts, found in all the *drones*, and none of them in any other bees except theſe, ſeem to prove very evidently the difference of ſex; but there is one thing extremely remarkable in regard to them, which is, that though they appear ſo evidently on being forced out of the body by preſſure, yet it is very difficult to find them in it on diſſection. The cauſe ſeems to be their ſwelling when expoſed to the air; and Swammerdam ſuppoſes, that to this purpoſe they are furniſhed with a great number of tracheæ, which readily admit the air as ſoon as ever they are expoſed to it.

Maraldi, as well as Swammerdam, diſcovered in the ſtructure of the *drones* ſome reſemblance to the male organs of generation, and from thence concluded that they were the males; but neither of theſe accurate and induſtrious obſervers could detect them in the act of copulation. Swammerdam, therefore, entertained a notion, that the female or queen-bee was fecundated without copulation; that it was ſufficient for her to be near the males, and that her eggs were impregnated by a kind of vivifying aura, exhaled from the body of the males, and abſorbed by the female. However, M. Reaumur thought, that he had diſcovered the actual copulation of the *drones* with the female bee, and he has very minutely deſcribed the proceſs of it. Hiſt. Inſect. tom. x. p. 128. 149. 157.

Nevertheleſs, many of the ancients, as well as moderns, have ſuppoſed that the eggs of the female bee are not impregnated with the male ſperm, while in the body of the creature; but that they are depoſited unimpregnated in the cells, and that the male afterwards ejects the male ſperm on them, as they lie in the cells; in the ſame manner as the generation of fiſhes is ſuppoſed to be performed by the males impregnating the ſpawn after it is caſt out by the females.

M. Maraldi long ſince conjectured that this might be the caſe; and he was confirmed in the opinion, by obſerving a liquid whitiſh ſubſtance ſurrounding each egg at the bottom of the cell, a little while after it had been laid, and that a great number of eggs, which were not encompaſſed by this liquor, remained barren in the cell. Hiſt. Acad. Sc. 1712. p. 332. See *Generation of* BEES.

This method of impregnation has been lately eſtabliſhed beyond all contradiction by the obſervations of Mr. Debraw of Cambridge. Having put ſome bees into glaſs-hives with a large number of *drones*, he obſerved on the firſt or ſecond day (always before the third) from the time in which the eggs were placed in the cells, which the queen generally lays on the fourth or fifth day after they are put into the hive, that a great number of bees faſtened themſelves to one another, and formed a kind of curtain from the top to the bottom of the hive, probably in order to conceal the proceſs of generation. Mr. Debraw, however, could ſoon perceive ſeveral bees, whoſe ſize he was not able to diſtinguiſh, inſerting the poſterior part of their bodies each into a cell, and ſinking into it; after a little while they retired, and he could ſee with the naked eye a ſmall quantity of whitiſh liquor left in the angle of the baſe of each cell, containing an egg; this liquor was leſs liquid than honey, and had no ſweet taſte. See *Generation of* BEES.

In order farther to aſcertain the fact, that the eggs are thus fecundated by the males, Mr. Debraw took a ſwarm of bees, and having ſeparated the *drones*, by ſhaking all the bees into a tub of water, and leaving them in it till they were quite ſenſeleſs, replaced the working bees and their queen, as ſoon as they were recovered, by ſpreading them on a brown paper in the ſun, in a glaſs hive. The queen laid eggs, ſome of which, at the end of twenty days, were hatched into bees, others withered away, and ſeveral of them were covered with honey. Suſpecting that ſome of the males, having eſcaped his notice, had impregnated only part of the eggs, he was anxious to aſcertain the fact; and with this view he removed all the brood-comb that was in the hive, and determined to watch the motions of the bees after new eggs were depoſited in the cells. On the ſecond day he perceived the operation, already related in a former caſe; and on taking out a piece of the comb, containing two of the bees which had thruſt the poſterior part of their bodies into the cell, he examined them, and found that they had no ſting; and upon diſſection, he diſcovered in them, by the help of a microſcope, the four cylindrical bodies, containing the whitiſh liquor above deſcribed, which Maraldi has obſerved in the large *drones*. In a ſubſequent experiment, Mr. Debraw ſeparated from the ſame parcel of bees all that had no ſtings; and he found no leſs than fifty-ſeven of the number exactly of the ſize of common bees, which on being preſſed between the fingers, yielded a ſmall quantity of whitiſh liquor. Having killed all theſe, the remainder of the ſwarm was reſtored to the hive. On the fourth or fifth day, the queen-bee depoſited her eggs in the cells, but no part of the proceſs of impregnation could be diſcovered; the eggs, after the fourth day, inſtead of changing in the manner of caterpillars, remained in the ſame ſtate they were in the firſt day, except that ſome of them were covered with honey: all the bees left their hive, and attempted to get into a neighbouring hive, probably in ſearch of males; but the queen was found dead, having been killed in the engagement. Mr. Debraw made another experiment, which muſt be conſidered as an *experimentum crucis*, and abſolutely deciſive on this ſubject. He took a part of the unimpregnated brood-comb, and placed it under a glaſs bell, in which he confined a queen, and ſome common bees, without any *drones*; the other part of the ſame brood-comb he put under another glaſs bell, with a few *drones*, a queen, and a number of common bees. In the former glaſs the eggs remained in the ſame ſtate; there was no impregnation; and when the bees were releaſed on the ſeventh day, they all flew away. The *drones*, in the other glaſs, were obſerved to impregnate the eggs in every cell, on the day after they were put in; the bees remained in the hive, and in the courſe of twenty days every egg underwent the neceſſary transformations, and a numerous young colony was thus produced. Phil. Tranſ. vol. lxvii. part i. art. 3. See QUEEN-*Bee*.

Maraldi and Reaumur had long ago diſcovered, that there were *drones* of the ſame ſize with the common bees; but theſe curious experiments, beſides aſcertaining the fact, throw new light on their importance and uſe, and remove conſiderable difficulties, which embarraſſed the proceſs of generation among theſe uſeful inſects. It is well known that the large *drones* never appear in the hive before the middle of April, and that they are all dead before the end of Auguſt, when the principal breeding ſeaſon terminates; and they are deſtroyed, together with all their worms or nymphs, by the working bees, probably by order of the queen to ſave honey; and yet it is equally certain that the bees begin to breed early in the ſpring, ſometimes in February, if the weather is mild; and that many broods are completed before theſe *drones* appear. But if *drones* of a ſmaller ſize are ſuffered to remain, which in a time of ſcarcity conſume leſs honey than the others, theſe will anſwer the purpoſe of ſupplying the early broods, and the larger *drones* are produced againſt a time of greater plenty.

An ingenious friend of the editor, who amuſes himſelf with obſerving the œconomy of bees, and who has long ſince diſcovered the ſmall *drones*, and from whoſe amuſements the world may probably derive uſeful information with regard to theſe inſects, aſſures him, that theſe ſmaller *drones* are all dead before the end of May, when the larger ſpecies appear, and ſuperſede their uſe.

It was not without reaſon that a modern author ſuggeſted, that a ſmall number of *drones* are reſerved to ſupply the neceſſities of the enſuing year; and that theſe *drones* are very little, if at all larger, than the common bees. Nat. Diſp. p. 90.

DRONE-*fly*, or BEE-*fly*, a two-winged fly, ſo extremely like the common bee as to be at firſt ſight not eaſily diſtinguiſhable from it. The diſtinction between the two inſects, however, beſide the different number of their wings, is, that the bee has a ſomewhat longer and leſs thick body, and the head is proportionably much ſmaller than that of the fly which ſo much reſembles them. The bee-fly alſo ever carries its wings parallel in their poſition, but without its body; whereas the bee itſelf uſually carries its wings croſſed on the back, and covers its body with them; this is not however an invariable poſ-

ture

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ture with the wings of the bee, though it is the moſt frequent one. The bee-fly is found among the flowers, as is the bee; and though it gathers no wax, it has a trunk by means of which it ſucks the honey.

The trunk, by means of which the fly is enabled to do this, has no teeth, and conſequently the fly belongs to Mr. Reaumur's firſt general claſs of the two-winged flies; and the form of its body, which is ſhort and flat, determines it to be of his firſt ſubordinate genus of that claſs.

The moſt ſingular and obſervable part of the life of this inſect is that which it paſſes without wings, and in form of a fly-worm and nymph. The general exterior form of the fly-worms of this genus has been well enough known to the generality of naturaliſts; and Goedart, Merian, and Albinus, were well acquainted with them ſo far; but they did not give themſelves the trouble of a farther examination, and were not ſenſible that theſe worms had many obſervable things to offer to our conſideration.

The matter among which they are found is that of all others the moſt offenſive and diſagreeable. They are of the claſs of thoſe with variable heads; but their great diſtinction from all others is their having a long ſlender tail. This at different times the worm makes of very different lengths, but in its ſhorteſt it is longer than the body of the creature. It is round, ſmooth, and at times extremely ſmall at the extremity, and ſometimes much reſembles the tail of a rat; whence the whole claſs of theſe worms are well diſtinguiſhed by the name of rat-tailed worms.

To know the uſe of the tail of this worm, it is however neceſſary firſt to underſtand the nature of the worm itſelf. Theſe worms being uſually found on dry land, and only picked up now and then ſparingly, gave the world for a great while no room to believe that they were ſo numerous as they really are; nor had people any idea that they were to look for them in the water. In examining veſſels of corrupted and ſtinking water, however, they have been found in very great multitudes together, lying among the mud at the bottom. Theſe taken out of this filth, and put into veſſels of clean water, will ſoon ſhew the curious obſerver the uſe of their long tails. Notwithſtanding that theſe worms are to live under water, and in mud, there is no doubt to be made but that, like other of water-fly worms, they have a neceſſity of breathing freſh air; and it is to this great purpoſe that their long tail ſerves them; for while they lie buried in the mud, this is extended up to the top of the water, and being open at the extremity lets the air into the body of the creature. It is a pleaſing ſight to obſerve, that theſe animals, after having been put into a veſſel of freſh water, all get quickly to the bottom, and each thruſts up the extremity of its tail to the ſurface.

It is very eaſy, from ſeeing that at whatever depths the worms lie, their tails ſtill reach the ſurface, to conclude, that they have a power of lengthening them at pleaſure. The ready way to be aſſured of this is to add depth to the water, by pouring more into the veſſel; for as the worms love the bottom, they muſt, if they will remain there, lengthen their trails proportionably, in order to breathe from the ſurface. The repeating ſeveral of theſe additions ſhews, that the worm is able to extend its tail to the length of five inches; an extremely remarkable length for a creature, whoſe body is not much more than half an inch, and whoſe tail in its more common ſtate is not much longer than that. Five inches is however the ſtint, beyond which they cannot go in this action; and when the water in the veſſel is made of a greater depth, the worms leave the bottom, and either crawl up the ſides of the veſſel to a proper height, or elſe ſwim in the water at the depth of five inches, which is the depth at which they carry their tails up to the ſurface.

The organization of ſo remarkable a part as the tail of this animal, cannot but appear to the curious greatly worth the enquiring into; and the tranſparence both of it, and of the body of the creature, is ſuch as to favour very greatly this examination. And indeed in many of the younger of theſe worms, and ſuch as have not yet come to the ſtate at which they quit the water, one may diſtinguiſh the parts within the body as plainly almoſt as if placed for examination in a glaſs tube. It is eaſy in all ſtates of the worm to diſtinguiſh that the tail is compoſed of two hollow tubes, the one of which nicely fits, and is eaſily retracted within the other, or thruſt out of it again, as the creature's occaſions require. The outter and larger tube ſeems an elongation of the fleſhy matter that forms the rings of the body. It is white like the body, and is compoſed of a vaſt number of rings, as the body is. Within this is lodged a leſſer pipe, a great part of which is of a blackiſh brown; and by means of this colour the inner tube may be diſtinguiſhed, even when it is wholly within the other. This inner one may be called the tube of reſpiration. It is eaſy to ſee now that the tail of the worm may be made more and more long, as his inner tube is thruſt out of the other, which ſerves it as a caſe or ſheath. But this is not all; it is eaſily known that theſe pipes are in themſelves capable of extenſion, by obſerving, that when the whole inner tube is lodged within the caſe, or outer one, yet this is of no determinate length, but is ſometimes longer, ſometimes ſhorter.

Many of the water-fly worms do not quit that element till they arrive to the fly ſtate; but this ſpecies, as ſoon as they have acquired their full growth, leave the water, and crawl upon the earth. Their bodies in this new element become dirty and greyiſh; and when they have found a proper ſpot of ground where the earth is ſoft and moiſt, they bury themſelves, and, after a neceſſary time for their change, come out in the form of flies.

Their changes are all made under a ſhell of their own ſkin, which in a few hours is found beginning to harden, and by degrees becomes very firm, of a yellowiſh colour, and is remarkable for having four horns, two larger, and two ſmaller, placed in different directions near the head; and theſe are the organs of reſpiration to the encloſed nymph.

Theſe are the changes of the flies of this claſs. They are of ſeveral ſpecies, and differ in ſize not leſs than the worms from which they are produced. Of theſe the largeſt are found in vaults and privies; and in winter, multitudes of them may be met with in the hollows of willows, and other trees where there is water. Reaumur.

DRONTE, in *Ornithology*. See DÓDO.

DROPAX, Δρωπαξ, in *Pharmacy*, an external medicine, in form of a plaſter, uſed to take off the hairs from any part. See HAIR, and DEPILATORY.

The *dropax* is of two kinds, *ſimple*, and *compound*. The *ſimple* is made of an ounce of dry pitch, and two drachms of oil.

The *compound* is made with pitch, wax, colophony, common ſalt, bitumen, ſulphur vivum, pepper, euphorbium, cantharides, and caſtor. There are alſo other ways of making it, to be found in the diſpenſatories.

It was anciently much in uſe alſo to warm the parts, to draw the blood and ſpirits to them, and to cure atrophies. To this purpoſe it was applied hot on the part affected, after firſt ſhaving it; and was pulled off again before it became quite cold; then heated afreſh, and applied again; and the operation thus repeated, till the part was rendered very red.

DROPPING, or DRIPPING, a term uſed among *Falconers*, when a hawk mutes directly downwards, in ſeveral *drops*, not throwing out her dung ſtraight forwards.

DROP, in *Sea-Language*, is a name ſometimes given to the depth of the principal ſails: thus, a main-top-ſail *drops* ſeventeen yards.

DROPS, in *Architecture*. See GUTTÆ, and TRIGLYPH.

DROPS, in *Medicine*, a liquid remedy, whoſe doſe is eſtimated by a certain number of *drops*.

DROPS, in *Meteorology*. See RAIN.

The ſpherical figure, into which the *drops* of fluids conform themſelves, is a phænomenon that has a little perplexed the philoſophers. The ſolution commonly given, was, that the equable, uniform preſſure of the ambient, or incumbent atmoſphere, cloſed them into this form. But this account will no longer paſs; now that we find that the phænomenon holds in vacuo as well as in air.

The Newtonian philoſophers, therefore, aſcribe it to their attraction, which being greater between the ſeveral particles of the fluids, than between them and thoſe of the medium, they are, as it were, concentrated, and brought as near each other, and into as little compaſs, as may be; which cannot be, without their being ſpherical.

Thus, Sir Iſaac Newton: *Guttæ enim corporis cujuſque fluidi, ut figuram globoſam inducere conentur, facit mutua partium ſuarum attractio; eodem modo quo terra mariaque in rotunditatem undique conglobantur, partium ſuarum attractione mutua, quæ eſt gravitas.* Opt. p. 338.

DROPS, *Engliſh*, or *volatile Engliſh drops*, *Guttæ Anglicanæ*. See GUTTÆ *Anglicanæ*.

DROPPER. See FISHING.

DROPSY, Υδρωψ, in *Medicine*, a preternatural collection of ſerum, or water, in ſome part of the body.

The word is compounded of the Greek ὑδωρ, *water*.

The *dropſy* acquires different names from the different parts it afflicts, or the different parts the waters are collected in. That of the abdomen, or lower belly, called ſimply, and abſolutely, *dropſy*, is particularly denominated ASCITES. That of the whole habit of the body, in which a ferous humour is collected through the whole cellular ſyſtem, and lodges under the ſkin, ανασαρκος, is called ANASARCA, or *leucophlegmatia*. That of the head, HYDROCEPHALUS. That of the ſcrotum, HYDROCELE. There is alſo a ſpecies of this diſeaſe, ſuppoſed to be cauſed, inſtead of water, by a collection of wind, called *tympanites*,

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tympanites, and by Hippocrates, the *dry dropſy*. See EMPHYSEMA.

We alſo meet with *dropſies* of the breaſt, lungs, pericardium, ovaries, uterus, &c.

Some think that the anaſarca, leucophlegmatia, hydrops aſcites, tympanites, hydrocele, &c. differ ſo exceeding little, that it is ſcarce worth while to retain ſo many pompous Greek names. Medic. Eſſ. Edinb. vol. i.

The general cauſe of all *dropſies* is the exhalent veſſels throwing off more fluid than the abſorbent veſſels can take up; and the remote cauſes are whatever may obſtruct the ſerous part of the blood, ſo as to make it ſtagnate in the veſſels; or burſt the veſſels themſelves, ſo as to let the blood out among the membranes; or weaken and relax the tone of the veſſels; or thin the blood, and make it watery; or leſſen the perſpiration, and the vital heat.

Theſe cauſes are various; viz. ſometimes acute diſeaſes, ſcirrhous tumors of any of the more noble viſcera, exceſſive evacuations, particularly hæmorrhages, and remote fluxes of the belly, ſuppreſſion of cuſtomary evacuations, as the menſes, hæmorrhoids, &c. want of exerciſe, hard drinking, eſpecially of ſpirituous liquors, drinking of cold, weak, watery liquors, after having been accuſtomed to liquor of a more generous kind, or when the body has been heated by violent exerciſe, the uſe of aliment that is viſcous, and hard of digeſtion, living in a low, damp, marſhy ſituation, &c.

The aſcites, or *water-dropſy* of the abdomen, is the moſt uſual caſe, and what we particularly call the *dropſy*. In this diſorder, the water is accumulated in the cavity of the belly, between the peritonæum and the viſcera, in the dilated cavities of the glands, or other veſſels contained in the abdomen, or in the duplicature of the peritonæum: its ſymptoms are tumors, firſt of the feet and legs, and afterwards of the abdomen, which keep continually growing; and if the belly be ſtruck, or ſhaken, with one hand, whilſt the other hand is placed on the oppoſite ſide, there is heard a quaſhing of water. Add to this three other attendants, viz. a dyſpnœa, intenſe thirſt, and ſparing urine; with which may be numbered heavineſs, liſtleſſneſs, coſtiveneſs, a ſlight fever, and an emaciation of the body.

This ſpecies of *dropſy* ſhould be carefully diſtinguiſhed from pregnancy, excreſcences, and other tumors in the belly, and from a tympany. In young and ſtrong patients, this diſeaſe, if taken betimes, may admit of a cure; but if the patient be old, or has led an irregular, or a ſedentary life, or if there be any reaſon to ſuſpect that the liver, lungs, or any of the viſcera, are unſound, there is ground to fear that the conſequences may prove fatal. When the anaſarca and aſcites are combined, the caſe is very dangerous.

The curative indications are two; viz. the evacuation of the water, and the ſtrengthening of the blood and viſcera. The firſt is effected by ſtrong purgatives, particularly elaterium, and the infuſion of crocus metallorum, though this laſt works upwards more than downwards. Purging medicines of different kinds will be required for different patients, and for the ſame patient at different times; but, in general, for the ſtronger, calomel and jalap; and for the weaker, calomel and rhubarb will be proper. Occaſional doſes of ipecacuanha in powder, and oxymel of ſquills, may be likewiſe adminiſtered as emetics.

But if the diſeaſe proceeds from a bad habit, or an unſound ſtate of the viſcera, ſtrong purges and vomits ſhould be avoided, and recourſe be had to ſuch medicines as will palliate the ſymptoms, by promoting the ſecretions, and to warm nouriſhing cordials for ſupporting the patient's ſtrength. For ſuch as are too weak to bear purgatives, Dr. Sydenham recommends diuretics, whereof the beſt are thoſe made of the lixivial ſalts; to which hellebore may be joined, for increaſing their effects.

Dr. Baker's tonic pills have been celebrated in *dropſies*, both as diuretic and purgative. The recipe for preparing them is as follows:

℞ Extract. helleb. nigr. myrrhæ ſolut. āā ℥i. card. bened. pulv. ʒiii. & ℈i. m. f. maſſa aere ſicco exſiccanda; donec formandis pillulis apta ſit; ſingul. ad gran. ſemiſſ.

Theſe pills have been given in different numbers, up to thirty, for a doſe, taken by ten at a time, and an hour between each portion.

The following diuretic infuſion, taken every four or five hours a day, may be of conſiderable ſervice: take juniper-berries, muſtard-ſeed, and horſe-raddiſh, of each half an ounce; infuſe them in a quart of Rheniſh wine, or ſtrong ale, for a few days, and ſtrain off the liquor. Or, take of zedoary root, two drams; dried ſquills, rhubarb, and juniper-berries bruiſed, of each a dram; cinnamon in powder, three drams; ſalt of wormwood a dram and a half; infuſe them in a pint and a half of old hock wine, and filter the liquor; and let a wine-glaſs of it be taken three or four times a day.

Nitre, taken in the quantity of a dram every morning, has produced a very good effect; and the ſame diuretic purpoſe may be anſwered by ſix or eight grains of the powder of ſquills, with a ſcruple of nitre, adminiſtered twice a day in a glaſs of ſtrong cinnamon-water. Others have extolled the efficacy of a large ſpoonful of unbruiſed muſtard-ſeed, taken every night and morning, with half a pint of the decoction of the tops of green broom drank after it. Cream of tartar, the doſes of which may be gradually increaſed to two or three ounces a day, have been uſeful in ſome caſes.

The decoction of ſeneka root, or Mindererus's ſpirit, taken in a doſe of two table ſpoonfuls, in a cup of wine, three or four times a day, will promote perſpiration. Dr. Percival, for this purpoſe, recommends rubbing the ſkin every night and morning with dry cloths, fumigated with camphor, and giving internally the julep and camphor; ſo that a dram of camphor may be taken in a day. Wainwright extols an infuſion of green tea in Rheniſh wine, and alſo briony juice, as excellent in this diſeaſe. Some alſo commend garlic.

Dropſies, attended with anaſarcous ſwellings, are not to be cured with purging alone, nor by ſoap, nor mercurials; but chiefly by the lixivial ſalts, either in the form of broom-aſhes, ſalt of wormwood, or ſalt of tartar. The common method is this: about thirty or forty grains of ſalt of tartar is diſſolved in an infuſion of wormwood, to which is added ſpirit of juniper; and this mixture is to be given in three doſes, and repeated daily. Beſides this it may be proper to give the patient, once in four or five days, half a dram of *pilulæ ex coloquintida cum aloe*, as a purge; and toward the decline of the diſeaſe, ſome common chalybeate. The diureſis may alſo be promoted by ſwallowing garlic, or muſtard-ſeed. See Pringle's Obſerv. on Diſeaſes of the Army, p. 213.

Dr. Buchan obſerves, that he has known an obſtinate *anaſarca* cured by the infuſion of broom-aſhes in wine. It may be obſerved in general, that, when the water of an *aſcites* is carried off by any other means than by a puncture through the peritonæum, it is done by that operation of nature called ABSORPTION; and hence is derived the principal uſe of purgatives, ſudorifics, and diuretics. Lond. Med. Obſ. vol. ii. art. 2.

For the ſecond intention, exerciſe, and change of air, wine, and other generous liquors, alſo ſtomachics, chalybeats, and other corroborating medicines, are preſcribed.

The diet ſhould be dry and nouriſhing; the pungent and aromatic vegetables, as garlic, muſtard, onions, horſe-raddiſh, &c. may be freely uſed. The beſt liquor is Spa water, or Rheniſh wine. The patient ſhould alſo have his body rubbed, two or three times a day, with a hard cloth, or the fleſh-bruſh; and always wear flannel next his ſkin.

Where other means fail for evacuating the water, recourſe is to be had to the PARACENTESIS, or operation of tapping. This will, at leaſt, prove a palliative; and if uſed ſoon enough may even effect a cure; but a delay is very dangerous.

Exerciſe is recommended to hydropic people immediately before tapping, that the groſſer particles in the water of their belly may be mixed with the thinner, and ſo run out with them. And if there is reaſon to ſuſpect any ſuch groſs parts remaining after the operation, ſome adviſe the injection of barley-water to dilute and bring them away.

We have lately had accounts, in the Philoſophical Tranſactions, of *dropſies* cured by tapping, and afterwards injecting Cahor wine, mixed with Briſtol water.

There is alſo an account of an uncommon *dropſy*, from the want of a kidney, in the Philoſophical Tranſactions. The ſubject was a young woman; the water evacuated from the abdomen on diſſection, meaſured near half a hogſhead, and was contained in a large ſack, which almoſt occupied the whole cavity of the abdomen above ſix feet in circumference, and extended upwards of four feet from the xyphoid cartilage, to the os pubis. The figure and deſcription of this ſack, and the adjacent parts, may be ſeen in Phil. Tranſ. N° 482. ſect. 2.

We read of an hydropic body becoming ſo infectious, that the ſurgeon who tapped the corpſe, was thrown into a peſtilential fever. Phil. Tranſ. N° 454. ſect. 4.

Baglivi notes, that in a *dropſy* ariſing from a morbid liver, there is always a vehement dry cough; which is never obſerved in any other ſpecies.

DROPSY *of the breaſt*, *Hydrops Pectoris*, ariſes from water extravaſated in the breaſt on one or both ſides of the mediaſtinum; or contained in *hydatides*, ſituated on the dia-

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phragm, pleura, lungs, heart, or pericardium. This may be occaſioned by a diſorder of the lungs, or the rupture of a lymphatic, or by any of the cauſes of a common *dropſy*. Inſtances have rarely occurred in which the water hath been abſorbed; but the diſeaſe is commonly very dangerous. When the water is perceived to fluctuate, it may be drawn off by a canula and trochar, introduced between the fourth and fifth of the falſe ribs, and about four finger's breadth from the ſpines. Le Dran's Oper. ed. 2. p. 117, 118. Motherby's Dict.

DROPSY *encyſted*. See DROPSY *of the lungs*.

DROPSY *of the head*. See HYDROCEPHALUS.

DROPSY *of the knee, Hydrops Genu*, is formed by water collected under the capſular ligament of the knee. Mr. Sharp recommends, for a cure, a tight bandage, leaving the ſuperfluity to be abſorbed by the bibulous veins; to which may be added ſome attenuating and diſcutient embrocations. Gooch's Caſes, &c. vol. ii. p. 259. 266. Motherby. See SPINA *ventoſa*.

DROPSY *of the lungs, Hydrops Pulmonum*, is ſeated in the cellular membrane of the lungs. This is a very uncommon diſtemper; but it has been ſometimes obſerved by the phyſicians of our own nation. The moſt perfect account, however, any where given of this diſeaſe, is that of Mr. Maloet, of the Paris academy, in the caſe of a poor invalid ſoldier, whom he had attended through all the ſtages of it. He had a very great difficulty of reſpiration, accompanied with a ſlow fever. When in bed he could neither lie with eaſe on either ſide, nor on his back; but was forced to lie upon his belly, and conſequently, as that was a very troubleſome poſture, he uſually took his reſt in a chair. His hands and arms were much ſwelled, as were alſo his legs and feet, and his urine was of a brick colour. Mr. Maloet, from all theſe circumſtances, ſuſpected water in the breaſt, but was never able to perceive any fluctuation, into whatever change of poſture he made the patient go, nor could he find that the man himſelf ever perceived any ſuch ſenſation within him. The unhappy creature died, after two years illneſs; and his body being opened, there was no water found looſe in the breaſt, but on each ſide of the lungs there was obſerved an oval tumor of ſix inches long, and four inches broad; they were both of the ſame ſize, and on touching them with the hand, there was a very ſenſible fluctuation obſerved. On opening theſe, water run out in a large quantity; and on examining their ſtructure, they were found encyſted tumors, with conſiderably thick membranes, compoſed of ſeveral beds, or coats of matter, but with no blood-veſſels diſtinguiſhable in them. Examining the liver, there was found another encyſted tumor there, the contents of which were a lymph, tinged to a yelloviſh green by gall. Mem. Acad. Par. 1732.

This diſorder may be relieved by a briſk mercurial cathartic, and liberal doſes of the ſeneka root, and other diuretics and ſudorifics. In a deſperate caſe an opening may be tried, as in the operation for the EMPYEMA, and a puncture may be made into the lungs for diſcharging its morbid contents. Edinb. Med. Eſſ. vol. vi. p. 126. Percival's Eſſ. Med. and Exp. p. 172. Motherby.

DROPSY *of the ovaries, Hydrops Ovarii*, is of the encyſted kind, and ſometimes happens to pregnant women, but moſt frequently to the barren and ſuperannuated. The patient in the commencement and firſt progreſs of this diſeaſe has neither bad health nor pain. It is not perceptible, while ſmall, except in particular ſituations. At firſt it is commonly ſituated towards one ſide, in the lower part of the belly, and is moveable under the hand; then it becomes gradually more fixed, more extended both forwards and upwards in the belly, and more painful and oppreſſive to the patient. When the cyſt is ſingle, and extended over the whole abdomen, it cannot be diſtinguiſhed by feeling from a common *aſcites*; but when there is a number of cyſts, the inequalities in the ſwelling are generally ſenſible from firſt to laſt. Dr. Hunter obſerves, that the *dropſy* of the ovarium is an incurable diſeaſe, and that a patient will have the beſt chance of living longeſt under it, who does the leaſt to get rid of it. He is of opinion, that the *trocar* is almoſt the only palliative; and that a radical cure by the exciſion of the cyſt can hardly be attempted; and that inciſion and ſuppuration are operations which cannot be recommended, but under very particular circumſtances, and that they change the *dropſy* into an incurable *fiſtula* in the belly. The diſorder generally terminates in an univerſal *leucophlegmatia*. However, Dr. Percival gives an inſtance of a cure being effected by a ſpontaneous vomiting. Lond. Med. Obſ. &c. vol. ii. p. 41, &c. Percival's Eſſ. Med. and Exp.

DROPSY *of the ſcrotum and teſtis*. See HYDROCELE.

DROPSY *of the Womb, Hydrops Uteri*, is ſeated in the cavity of the womb. It is diſtinguiſhed from the *aſcites*, by being confined to the region of the uterus, and by the thinneſs of the *os tincæ*. When it proceeds from a ſchirrhus, it is never in the middle, nor is it round, as in the common *dropſy*. A *canula* introduced into the womb promiſes the beſt and ſpeedieſt remedy; but this is ſometimes prevented by a ſchirrhus, cicatrix, or tubercles; in which caſe recourſe muſt be had to hard riding, emetics, ſternutatories, and briſk cathartics. Borax may be given from ten to twenty-five grains twice a day as a deobſtruent, and a peſſary may be alſo tried. Motherby, and James, art. HYDROPS.

DROPWORT, in *Botany*. For the characters, ſee SPIRÆA.

The common *dropwort* grows plentifully upon chalky grounds in many parts of England. The roots conſiſt of a great number of oval knobs or glandules, which are faſtened together by ſlender fibres, from whence it had the name of *dropwort*. The leaves are winged, and compoſed of many ſawed lobes, which are almoſt placed alternately along the mid-rib. Thoſe near the baſe are the ſmalleſt; the others increaſe in ſize to the middle; and decreaſe afterward again to the point. The flower-ſtalk riſes a foot or more in height, and has ſeldom more than one leaf upon it; the top is garniſhed with looſe bunches of ſmall white flowers, ſtanding upon ſlender foot-ſtalks, which are ſucceeded by ſeveral capſules, ranged circularly. The roots of theſe plants are uſed in medicine, and are accounted diuretic. It is rarely kept in gardens; but there is a variety with double flowers, which was found growing naturally in the north of England; that is kept in gardens for the ſake of variety.

They are propagated either by ſuckers, which they produce in great abundance, or by laying down the tender branches of the old plants. When they have taken root, they ſhould be removed into the nurſery for two or three years, and will then be fit for tranſplanting in the places where they are to remain.

DROPWORT, *Water, Oenanthe*, in *Botany*, a genus of the *pentandria digynia* claſs. Its characters are theſe; it is a plant with an umbelliferous flower; the principal umbel has but few rays; but the particular umbels have many ſhort ones; the rays of the principal umbel are difform. Thoſe flowers in the diſk are hermaphrodite, and are compoſed of five heart-ſhaped inflexed petals, which are almoſt equal. The germen is ſituated under the flower, ſupporting two awl-ſhaped permanent ſtyles, crowned by two obtuſe ſegments; the germen afterward becomes an oval fruit, divided in two parts, containing two almoſt oval ſeeds, convex on one ſide, and plain on the other. There are five ſpecies.

One of the ſpecies of this plant, diſtinguiſhed by its yellow juice, and by growing near waters, is a very terrible poiſon. Many accounts have been given of people dying by it, but none which ſets its terrible effects in ſo juſt a light, as one which happened very lately to ſome French priſoners with us, and which is recorded in the Philoſophical Tranſactions, N° 481.

It is extremely neceſſary that this dangerous plant ſhould be well known, as it grows very plentifully with us all about the banks of the Thames; and Mr. Watſon has cauſed a fine drawing, both of this, and of another poiſonous plant, which it is often confounded with, the cicuta aquatica, or water-hemlock of Wepfer, to be prefixed to that number of the Tranſactions where this account is given; and this ſeems the more neceſſary, as the plant ſeems to have been miſtaken in a manner by all the world, not only by the common people, but the more verſed in plants, having miſtaken it at times for ſeveral very different things. The ſame gentleman informs us, from various authors, that eight lads in Ireland had been poiſoned by it, miſtaking it for the root of the water parſnip; two men died by miſtaking it for the Macedonian parſley; and Wepfer, who wrote an expreſs treatiſe on the poiſonous nature of the water-hemlock, has confounded this plant with it, ſaying, that Lobel had deſcribed the water hemlock under the name of this *œnanthe*, or *dropwort*; and the generally accurate Hoffman, when treating of the vegetable poiſons, makes no mention of the difference between theſe two plants.

Neither the roots of this *œnanthe*, or thoſe of the cicuta aquatica, or water hemlock of Wepfer, have any diſagreeable flavour to deter thoſe who taſte of them from eating; and they both occaſion violent convulſions, and death, if not timely prevented. The intention of cure ſeems in both the ſame; firſt by emptying the ſtomach and inteſtines as ſoon as poſſible, and then cauſing the patient to drink largely of oleaginous fluids; there is great difficulty, however, in getting the patient to ſwallow any thing, the jaws being faſtened together by the ſpaſm. After the ſtomach has been freed from this pernicious vegetable, the ſymptoms have generally abated by degrees, and the patient has recovered.

Threlkeld

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Threlkeld mentions this plant as growing in Cumberland, where the people call it *dead tongue*, and uſe it as a poultice to the galled backs of their horſes. The German botaniſts do not mention it as growing among them, nor Haller in his Enumeratio Stirpium Helvetiæ; whence it ſeems to be ſeldom met with, except in England, Holland, and ſome parts of France.

DROSERA, in *Botany*. See SUN-*Dew*.

DROSOLITHUS, in *Natural Hiſtory*, the name of a ſtone to which many great virtues are attributed, by the writers of the middle ages; but the accounts they have left us of it, are too imperfect to give us any juſt idea of what ſtone it was. They ſay it was variegated with many colours; and that when laid upon the fire it ſweat or oozed out large drops of clear water, all over its ſurface.

DROVERS, are perſons that buy cattle in one place, and drive them for ſale to another. They are to be married men, and houſholders, and to be licenſed by ſtatute 5 Eliz. cap. 12. And if they drive their cattle on the Lord's day, they ſhall forfeit 20*s*. by 1 Car. I. cap. 1.

DROUGHT, in the *Natural Hiſtory of the Air*, is a long continuance of dry weather. Great *droughts* are very prejudicial to the farmer and his paſture; and ſuch years afford but very little reward for the labour and expence of keeping it in order. The only remedies are high incloſures, and plenty of water at hand. The firſt of theſe is always in the farmer's power, and ſhould be carefully provided by planting hedges in a proper manner, in counties moſt ſubject to ſuffer by this diſadvantage. The other is not always ſo eaſy, but may be managed ſeveral ways, as by ſinking wells; but theſe, when deep, are very expenſive; or by bringing the water in pipes, gutters, or other conveyances; and this is eaſily done where there is a ſpring or brook in the neighbourhood higher than the lands. Pumps, wheels, and ſuch other engines, are alſo uſed in ſome places to bring on the water; and in others, ponds, ciſterns, and receptacles, are made to take in the rains and winter floods, and retain the water till ſummer, when it is wanted.

The farmers of England are very deficient in this laſt method, which they might uſe to their great benefit in many places. In Spain they have no water in many parts but what they preſerve in this manner. And at Amſterdam and Venice they have whole cellars made into ciſterns, which receive the water that falls in rains, and preſerve it all the year. Want of water for the cattle in ſummer in many places might be eaſily remedied by ſome care of this kind; and many thouſand acres of land made uſeful, which are now left as waſte, by this means alone. The practicability of thus obtaining water is evinced by its being done in places where there falls much leſs rain annually than with us; and yet by this the inhabitants have always freſh water enough for the uſe of their houſes, cattle, and gardens, none of which ever fail. See CISTERN.

DROWNING, the act of ſuffocating, or being ſuffocated, by water.

People not accuſtomed to diving, Dr. Halley obſerves, begin to *drown* in about half a minute's time.

Drowning was anciently a kind of puniſhment. In the time of Louis XI. of France, the chronicles aſſure us, that they frequently *drowned* their criminals, inſtead of hanging them. Chron. Scand. See FOSSA and FURCA.

Natural hiſtorians and phyſicians furniſh us with divers well atteſted inſtances of ſurpriſing recoveries of perſons *drowned*; which, if maturely conſidered, might perhaps let a little light into the dark notions of life and death.

We ſhall not particularly recite the improbable ſtories mentioned by Pechlin, De Aer. & Alim. Def. cap. 10. of one who was under water ſixteen hours, of another who was under water three whole days, and of a third who was in this ſtate ſeven weeks, and recovered. *Sit penes ipſum fides*. But there are ſeveral unqueſtionable facts, though they have rarely occurred, in every country, which ſhew the poſſibility of a recovery from ſudden death, whether by apoplexy, convulſive fits, ſuffocation by noxious vapours, ſtrangulation by the cord, or *drowning*. However, inſtances of this kind merely excited tranſient attention and ſurprize, and many perſons were loſt for want of proper attempts for their recovery. This was particularly the caſe in Holland, where, from the great abundance of canals and inland ſeas, the inhabitants are much expoſed to accidents by water; and where many perſons were *drowned* every year for want of aſſiſtance. In 1767, a ſociety was formed at Amſterdam, which offered premiums to thoſe who ſhould ſave the life of a citizen in danger of periſhing by water; and which propoſed from time to time, to publiſh the treatment, and method of recovery, obſerved in ſuch caſes. This inſtitution was every where encouraged through the United Provinces, by the magiſtrates, and by the ſtates general, and has been attended with very conſiderable ſucceſs; and it appears that no leſs than two hundred perſons have been recovered from death, by this inſtitution, in the ſpace of about ſix years. In ſeveral of theſe caſes, the recovered patients had continued upwards of an hour, without any ſigns of life, after they had been taken out of the water. Inſtigated by this example, the magiſtrates of health at Milan and Venice iſſued orders, in 1768, for the treatment of *drowned* perſons. The city of Hamburgh appointed a ſimilar ordinance to be read in all their churches, extending their ſuccour not only to the *drowned*, but to the ſtrangled, to thoſe ſuffocated by noxious vapours, and to the frozen. The firſt part of the Dutch Memoirs was alſo tranſlated into the Ruſſian language, by command of the empreſs. In 1769, an edict was publiſhed in Germany, extending its directions and encouragement to every accident, like death, that afforded a poſſibility of relief. In 1771, the magiſtrates of the city of Paris alſo founded an inſtitution in favour of the *drowned*; and in France they have been inſtrumental in ſaving forty-five perſons out of ſixty-nine, in about ſixteen months. In 1773, Dr. Cogan, and Mr. Hawes, of London, propoſed a plan for the introduction of a ſimilar inſtitution into theſe kingdoms. The plan was ſo well received and encouraged, that they were ſoon, viz. in 1774, enabled to form a ſociety, ſince called the Humane Society, for promoting its laudable deſigns.

The following abſtract of the plan of this ſociety, and method of treatment recommended by it, will not, we apprehend, be unacceptable to our readers. This ſociety has undertaken to publiſh, in as extenſive a manner as poſſible, the proper methods of treating perſons in the unfortunate circumſtances, to which they extend their relief; to diſtribute a premium of two guineas among the firſt perſons, not exceeding four in number, who attempt to recover any perſon, taken out of the water for dead, within thirty miles of the cities of London and Weſtminſter, provided they have not been longer than two hours under the water, and provided the aſſiſtants perſevere in the uſe of the means recommended for the ſpace of two hours, whether their attempts are ſucceſsful or not. Theſe rewards are alſo to include every other inſtance of ſudden death, whether by ſuffocation from noxious vapours, hanging, ſyncopies, freezing, &c. They propoſe to diſtribute in like manner four guineas wherever the patient has been reſtored to life; to give to any publican, or other perſon, who ſhall admit the body into his houſe without delay, and furniſh the neceſſary accommodations, the ſum of one guinea, and to ſecure them from the charge of burial in unſucceſsful caſes; and to preſent an honorary medal to thoſe medical gentlemen, or others, who give their aſſiſtance *gratis*, and who are provided with a fumigator, and other neceſſaries always in readineſs, in all thoſe caſes in which they may prove inſtrumental of ſucceſs. The device on one ſide of their medal is a boy, who is repreſented blowing an extinguiſhed torch, with the hope, as the legend, *Lateat ſcintillula forſan*, imports, that a little ſpark may ſtill remain. The reverſe exhibits a civic wreath, which was the Roman reward for ſaving the life of a citizen, with a blank for the name of a perſon to whom the medal may be given; the inſcription round the wreath, *Hoc pretium cive ſervato tulit*, expreſſes the merit which obtained it. The following is the method of treatment recommended by the ſociety.

1. In removing the body to a convenient place, great care muſt be taken that it be not bruiſed, nor ſhaken violently, nor roughly handled, nor carried over the ſhoulders with the head hanging downwards, nor rolled upon the ground, or over a barrel, nor lifted up the hills. For experience proves, that all theſe methods are injurious, and often deſtroy the ſmall remains of life. The unfortunate object ſhould be cautiouſly conveyed by two or more perſons, or in a carriage upon ſtraw, lying as on a bed, with the head a little raiſed, and kept in as natural and eaſy a poſition as poſſible.

2. The body being well dried with a cloth ſhould be placed in a moderate degree of heat, but not too near a large fire. The windows or door of the room ſhould be left open, and no more perſons be admitted into it than thoſe who are abſolutely neceſſary; as the life of the patient greatly depends upon having the benefit of a pure air. The warmth moſt promiſing of ſucceſs is that of a bed or blanket, properly warmed. Bottles of hot water ſhould be laid at the bottom of the feet, in the joints of the knees, and under the arm-pits; and a warming-pan, moderately heated, or hot bricks wrapped in cloths, ſhould be rubbed over the body, and particularly along the back. The natural and kindly warmth of a healthy perſon lying by the ſide of the body has been found in many caſes very efficacious. The ſhirt or clothes of an attendant, or the ſkin of a ſheep freſh killed, may alſo be

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be uſed with advantage. Should theſe accidents happen in the neighbourhood of a warm bath, brew-houſe, baker, glaſs-houſe, ſaltern, ſoap-boiler, or any fabrick where warm lees, aſhes, embers, grains, ſand, water, &c. are eaſily procured, it would be of the utmoſt ſervice to place the body in any of theſe, moderated to a degree of heat, but very little exceeding that of a healthy perſon.

3. The ſubject being placed in one or other of theſe advantageous circumſtances as ſpeedily as poſſible, various ſtimulating methods ſhould next be employed. The moſt efficacious are, to blow with force into the lungs, by applying the mouth to that of the patient, cloſing his noſtrils with one hand, and gently expelling the air again by preſſing the cheſt with the other, imitating the ſtrong breathing of a healthy perſon. The medium of a handkerchief, or cloth, may be uſed, to render the operation leſs indelicate. If the lungs cannot be inflated in this manner, it may be attempted by blowing through one of the noſtrils, and at the ſame time keeping the other cloſe. Dr. Monro for this purpoſe recommends a wooden pipe, fitted at one end for filling the noſtril, and at the other for being blown into by a perſon's mouth, or for receiving the pipe of a pair of bellows, to be employed for the ſame purpoſe, if neceſſary. Whilſt one aſſiſtant is conſtantly employed in this operation, another ſhould throw the ſmoke of tobacco up by the fundament into the bowels, by means of a pipe, or FUMIGATOR, ſuch as are uſed in adminiſtering clyſters; or by a pair of bellows, till the other inſtrument can be procured. A third attendant ſhould, in the mean time, rub the belly, cheſt, back, and arms, with a coarſe cloth, or flannel, dipped in brandy, rum, or gin, or with dry ſalt, ſo as not to rub off the ſkin; ſpirits of hartſhorn, volatile ſalts, or any other ſtimulating ſubſtance, muſt alſo be applied to the noſtrils, and rubbed upon the temples very frequently. Electrical ſhocks made to paſs in different directions through the body, and particularly through the heart and lungs, have been recommended as very powerful *ſtimuli*; and from the trials that have already been made, promiſe conſiderable ſucceſs. The body ſhould at intervals be ſhaken alſo, and varied in its poſition.

4. If there be any ſigns of returning life, ſuch as ſighing, gaſping, twitching, or any convulſive motions, beating of the heart, the return of the natural colour and warmth, opening a vein in the arm or neck may prove beneficial; but the quantity of blood taken away ſhould not be large; nor ſhould an artery ever be opened, as profuſe bleeding has appeared prejudicial, and even deſtructive to the ſmall remains of life. The throat ſhould be tickled with a feather, in order to excite a propenſity to vomit; and the noſtrils alſo with a feather, ſnuff, or any other ſtimulant, ſo as to provoke ſneezings. A tea-ſpoonful of warm water may be occaſionally adminiſtered, in order to learn whether the power of ſwallowing be returned; and if it be, a table-ſpoonful of warm wine, or brandy and water, may be given with advantage; but not before, as the liquor might get into the lungs, before the power of ſwallowing returns. The other methods ſhould be continued with vigour, until the patient be gradually reſtored.

When the patient has been but a ſhort time ſenſeleſs, blowing into the lungs or bowels has been, in ſome caſes, found ſufficient; yet a ſpeedy recovery is not to be expected in general. On the contrary, the above methods are to be continued with ſpirit for two hours, or upwards, although there ſhould not be the leaſt ſymptoms of returning life. The ſame means of reſtoration are applicable to the various other caſes of ſudden death, recited in the beginning of this article.

When theſe meaſures prove unſucceſsful, the ſurgeon's laſt reſource is BRONCHOTOMY, or opening the *arteria trachæa*; for perhaps the air entering freely into the lungs, through the aperture made in the canal, through which they received it in their natural ſtate, will reſtore the play of the lungs, and all the motions of the breaſt.

Mr. Hunter, F. R. S. has, at the requeſt of a member of the Humane Society, publiſhed propoſals for recovering perſons apparently *drowned*. In the caſe of apparent death by *drowning*, he conſiders that a ſuſpenſion of the actions of life has taken place, owing to the loſs of reſpiration, and the immediate effects which this has on the vital motions of the animal: at leaſt, he ſays, this privation of breathing appears to be the firſt cauſe of the heart's motion ceaſing; therefore, moſt probably, the reſtoration of breathing is all that is neceſſary to reſtore the heart's motion. The loſs of life in *drowned* people has been accounted for, by ſuppoſing that the blood, damaged by want of the action of the air in reſpiration, is ſent, in that vitiated ſtate, to the brain, and other vital parts; by which means the nerves loſe their effect upon the heart, and the heart in conſequence its motion. But Mr. Hunter concludes from experiments on a dog, in which a large column of bad blood, viz. all that was contained in the heart and pulmonary veins, was puſhed forward, without producing any ill effect, and alſo from the recovery of *drowned* perſons, and ſtill-born children, that the heart's motion muſt depend immediately on the application of air to the lungs, and not on the effects which air has on the blood, and which that blood has on the vital parts. Therefore blowing air into the lungs, ſoon after the immerſion, may be ſufficient to effect a recovery; and the *dephlogiſticated* AIR of Dr. Prieſtley may prove more efficacious than common air. But if a conſiderable time, as an hour, has been loſt, it may be neceſſary to apply ſtimulating medicines, as the vapour of volatile alcali, mixed with the air; and theſe are beſt thrown in by the noſtrils, as applications of this kind to the olfactory nerves rouſe the living principle, and put the muſcles of reſpiration into action, while ſome applications to the mouth rather depreſs than rouſe, by producing ſickneſs. The larynx ſhould be at the ſame time preſſed againſt the œſophagus and ſpine, which will prevent the ſtomach and inteſtines from being too much diſtended by the air; however, the trachæa, and the aperture into the larynx, ſhould be both left perfectly free. Heat alſo is congenial with the living principle, which by increaſing the neceſſity of action, increaſes action; and to a due proportion of heat the living principle owes its vigour. Bed-clothes properly heated ſhould, therefore, be gently laid over the patient, and the ſteam of volatile alcali, or of warm balſams, and eſſential oils, may be thrown in, ſo as to come in contact with many parts of his body. The ſame ſteam may alſo be conveyed into the ſtomach by means of a hollow bougie, and a ſyringe; together with the ſpirits of hartſhorn, pepper-mint water, juice of horſe-raddiſh, and alſo balſams and turpentines, in ſuch ſmall quantities, as not to produce ſickneſs. Theſe may alſo be thrown up by the anus. When the heart begins to move, Mr. Hunter adviſes to leſſen the application of air to the lungs; he abſolutely forbids bleeding, becauſe it weakens the animal principle, or that principle which preſerves the body from diſſolution, and is the cauſe of all its actions, and which Mr. Hunter ſuppoſes to be inherent in the blood, and conſequently leſſens both the power and diſpoſitions to action. Nothing ſhould be adminiſtered that ordinarily produces a nauſea or vomiting, or by the anus, that has a tendency to produce an evacuation that way; becauſe every ſuch evacuation tends to leſſen the animal powers. On this account he does not particularly recommend the fumes of tobacco, becauſe they always produce ſickneſs or purging, according to the mode of their application. He recommends the following apparatus, with a view to the purpoſes of this ſociety. Firſt, a pair of bellows; ſo contrived with two ſeparate cavities, that by opening them, when applied to the noſtrils or mouth of a patient, one cavity may be filled with the common air, and the other with air ſucked out from the lungs; and by ſhutting them again, the common air may be thrown into the lungs, and that ſucked out of the lungs diſcharged into the room. The pipe of theſe ſhould be flexible, in length a foot or a foot and a half, and at leaſt three eighths of an inch in width; by this the artificial breathing may be continued, while the other operations, the application of the ſtimuli to the ſtomach excepted, are going on, which could not conveniently be the caſe, if the muzzle of the bellows were introduced into the noſe. The end next the noſe ſhould be double, and applied to both noſtrils. Secondly, a ſyringe with a hollow bougie, or flexible catheter, of ſufficient length to go into the ſtomach, and to convey any ſtimulating matter into it, without affecting the lungs. Thirdly, a pair of ſmall bellows, ſuch as are commonly uſed in throwing fumes of tobacco up the anus. Phil. Tranſ. vol. lxvi. part 2. p. 412. 425.

The Humane Society, ſince its firſt eſtabliſhment, to the beginning of the year 1779, has been inſtrumental in recovering two hundred and eighty-ſeven perſons out of the number of caſes, to which their attempts have been applied. See Reports of the Society for the Recovery of Perſons apparently *drowned*.

Societies of a ſimilar nature have been lately formed at Norwich, Briſtol, Liverpool, Colcheſter, and Hull; and likewiſe at Corke, in Ireland. The board of police in Scotland has alſo intereſted itſelf in favour of the ſame benevolent deſign.

DRUG, in *Commerce*, a general name for all ſpices, and other commodities, brought from diſtant countries, and uſed in the buſineſs of medicine, and the mechanic arts.

The *drugs* uſed in medicine are very numerous, and make the greateſt part of the commerce of our *druggiſts*. Some of them grow in England, France, &c. but the greateſt part are brought from the Levant, and the Eaſt Indies.

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A liſt of all of them would be endleſs. Some of the principal are, aloes, ambergris, amber, aſſa-fœtida, antimony, bezoar, borax, benjoin, camphor, cantharides, cardamum, caſſia, caſtoreum, coloquintida, civet, coral, cubebs, coffee, cocoa, gum animæ, armoniac, adraganth, elemi, gamboge, labdanum, opopanax, ſagapenum, ſandarac, lacca, jalap, manna, maſtic, myrrh, muſc, opium, pearls, quinquina, hellebore, galanga, zedoary, rhubarb, ſarſaparilla, ſtorax, galbanum, ſanguis draconis, ſenna, ſpermaceti, ſpica nardi, ſcammony, ſal ammoniac, tamarinds, tea, turpentine, turbith, tutia, &c.

The natural hiſtory, &c. whereof, ſee under their reſpective articles ALOES, AMBERGRIS, &c.

The *drugs* uſed by dyers are of two kinds: the *colouring*, which give a dye or colour; and *non-colouring*, which only diſpoſe the ſtuffs to take the colours the better, or to render the colours more ſhining. Of the firſt kind are, paſtels, woad, indigo, kermes, cochineal, madder, turmeric, &c. Of the ſecond kind are, alum, tartar, arſenic, realgal, ſalt-petre, common ſalt, ſal gemmæ, ſal ammoniac, cryſtals of tartar, agaric, ſpirit of wine, urine, pewter, iron, bran, ſtarch, lime, aſhes, &c.

There is a third ſort of *drugs*, which anſwer both intentions; as the root, bark, and leaf, of the walnut-tree, galls, copperas, &c.

DRUGGET, in *Commerce*, a ſort of ſtuff, very thin, and narrow, ſometimes all wool, and ſometimes half wool, and half thread; having ſometimes the whale, but more uſually without.

Thoſe without the whale in the plain *druggets* are woven on a loom with two treddles, after the ſame manner as linen, camblet, &c. Thoſe with the whale, or the corded *druggets*, are wrought on a loom with four treddles. Thoſe are called threaded *druggets*, that have the woof of wool, and the warp of thread. M. Savery invented a kind of gold and ſilver *druggets*; the warp being partly gold and ſilver thread, and the woof linen.

DRUIDS, DRUIDES, or DRUIDÆ, the prieſts, or miniſters of religion, among the ancient Celtæ, or Gauls, Britons, and Germans.

Some authors derive the word from the Hebrew דרושים, *deruſſim*, or *druſſim*, which they tranſlate, *contemplatores*. Picard, Celtopæd. lib. ii. p. 58, believes the *Druids* to have been thus called from *Druis*, or *Dryius*, their leader. the fourth or fifth king of the Gauls, and father of Saron, or Naumes. Pliny, Salmatius, Vigenere, &c. derive the name from δρυς, *oak*; on account of their inhabiting, or at leaſt frequenting, and teaching in foreſts; or perhaps, becauſe, as Pliny ſays, they never ſacrificed but under the oak. But it is hard to imagine, how the *Druids* ſhould come to ſpeak Greek. Menage derives the word from the old Britiſh *drus*, *dæmon*, *magician*. Borel, from the Saxon *dry*, *magician*; or rather from the old Britiſh *dru*, or *derw*, *oak*; whence he takes δρυς to be derived, which is the moſt probable ſuppoſition. Gorop. Becanus, lib. i. takes *druis* to be an old Celtic, and German word, formed from *trowis*, or *truwis*, a doctor of the truth and the faith; which etymology Voſſius acquieſces in.

The *Druids* were the firſt, and moſt diſtinguiſhed order among the Gauls and Britons; they were choſen out of the beſt families; and the honours of their birth, joined with thoſe of their function, procured them the higheſt veneration among the people. They were verſed in aſtrology, geometry, natural philoſophy, politics, and geography; and had the adminiſtration of all ſacred things; they were the interpreters of religion, and the judges of all affairs, indifferently. Whoever refuſed obedience to them, was declared impious and accurſed.

We know but little as to their peculiar doctrines; only that they believed the immortality of the ſoul; and, as is generally alſo ſuppoſed, the metempſychoſis; though a late author makes it appear highly probable they did not believe this laſt, at leaſt not in the ſenſe of the Pythagoreans.

The chief ſettlement of the *Druids* in Britain was in the iſle of Angleſley, the ancient *Mona*, which they might chuſe for this purpoſe, as it was well ſtored with ſpacious groves of their favourite oak.

They were divided into ſeveral claſſes, or branches; viz. the *vacerri*, *bardi*, *eubages*, *ſemnothii*, or *ſemnothei*, and *ſaronidæ*. The *vacerri* are held to have been the prieſts; the *bardi*, the poets; the *eubages*, the augurs; and the *ſaronidæ*, the civil judges, and inſtructors of youth. As to the *ſemnothei*, who are ſaid to have been immediately devoted to the ſervice of religion, it is probable, they were the ſame with the *vacerri*.

Strabo, however, lib. iv. p. 197, and Picard after him, in his Celtopædia, do not comprehend all theſe different orders under the denomination of *Druids*, as ſpecies under their genus, or parts under the whole; but make them quite different conditions, or orders.

Strabo, in effect, only diſtinguiſhes three kinds; *bardi*, *vates*, and *Druids*. The *bardi* were the poets; the *vates*, ουατεις (apparently the ſame with the *vacerri*), were the prieſts, and naturaliſts; and the *Druids*, beſide the ſtudy of nature, applied themſelves likewiſe to morality.

Diogenes Laertius aſſures us, in his Prologue, that the *Druids* were the ſame, among the ancient Britons, with the ſophi, or philoſophers, among the Greeks; the magi, among the Perſians; the gymnoſophiſts, among the Indians; and the Chaldeans, among the Aſſyrians.

The *Druids* had one chief, or *arch-druid*, in every nation, who acted as high-prieſt, or *pontifex maximus*. He had abſolute authority over the reſt; and commanded, decreed, puniſhed, &c. at pleaſure. At his death he was ſucceeded by the moſt conſiderable among his ſurvivors; and, if there were ſeveral pretenders, the matter was ended by an election, or elſe put to the deciſion of arms.

The *Druids*, we have obſerved, were in the higheſt eſteem. They preſided at ſacrifices, and other ceremonies; and had the direction of every thing relating to religion. The Britiſh and Gauliſh youth flocked to them in crowds, to be inſtructed by them. The children of the nobility, Mela tells us, they retired with into caves, or the moſt deſolate parts of foreſts, and kept them there, ſometimes, for twenty years, under their diſcipline.

Beſide the immortality and metempſychoſis, they were here inſtructed in the motion of the heavens, and the courſe of the ſtars; the magnitude of the heavens and the earth; the nature of things; the power and wiſdom of the gods, &c. They preſerved the memory and actions of great men in their verſes, which they never allowed to be wrote down, but made their pupils get them by heart. In their common courſe of learning, they are ſaid to have taught them twenty-four thouſand ſuch verſes.

They held the plant miſſetoe in ſingular veneration. Pliny relates the ceremony wherewith they gathered it every year, lib. xvi. cap. 44. They placed great confidence, alſo, in ſerpents eggs, gathered after a peculiar manner, and under a certain diſpoſition of the moon, deſcribed by Pliny; and imagined them effectual means for the gaining of law-ſuits, and procuring the good graces of princes. And hence the ſame author concludes it is, that the caduceus, or rod encompaſſed with two ſerpents interwoven, has been aſſumed as a ſymbol of peace. Suetonius, in his Life of Claudius, aſſures us, they ſacrificed men; and Mercury is ſaid to be the god to whom they offered theſe victims. Diod. Siculus, lib. vi. obſerves, it was only upon extraordinary occaſions they made ſuch offerings: as, to conſult what meaſures to take, to learn what ſhould befal them, &c. by the fall of the victim, the tearing of his members, and the manner of his blood guſhing out. Auguſtus condemned the cuſtom; and Tiberius, and Claudius, puniſhed and aboliſhed it. See Cæſar, lib. vi. cap. 13. and Mela, lib. iii. cap. 2.

We learn from Cæſar, that the *Druids* were the judges and arbiters of all differences and diſputes, both public and private; they took cognizance of murders, inheritances, boundaries, and limits, and decreed rewards and puniſhments. Such as diſobeyed their deciſions, they excommunicated, which was their principal puniſhment, the criminal being hereby excluded from all public aſſemblies, and avoided by all the world; ſo that no body durſt ſpeak to him, for fear of being polluted. Strabo obſerves, they had ſometimes intereſt and authority enough to ſtop armies, upon the point of engaging, and accommodate their differences.

They held an aſſembly, every year, at a certain ſeaſon, about the middle of the country; and there, in a place conſecrated for the purpoſe, they kept their aſſizes, and terminated the differences of the people, who flocked thither from all parts.

Cæſar, who had ſeen ſome of the *Druids* in Britain, was of opinion, they had come thence into Gaul: divers among the moderns take this for a miſtake, and believe the very contrary. In effect, it appears pretty probable, that the ancient Britons were originally Gauls; that ſome of the Celtæ, or Belgæ, Gauliſh nations, were the firſt that entered our iſland, and peopled it; and that the *Druids* went along with them.

Hornius, in his Hiſtory of Philoſophy, lib. ii. cap. 12. believes all the learning and philoſophy of the *Druids* to have been derived from the Aſſyrian magi; who are ſtill called, in Germany, *trutten*, or *truttner*; and that, as magus has loſt its ancient ſignification, which was honourable, and now ſignifies a magician, or ſorcerer; ſo *Druid*, which had the ſame ſenſe, has likewiſe degenerated, and now ſignifies no other than a perſon who has commerce with the devil, or is addicted to magic. And,

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accordingly, in Frieſland, where there anciently were *Druids*, witches are now called *Druids*. Gale, Dickenſon, and ſome others, vainly contend, that the *Druids* borrowed all their philoſophy, as well as religion, from the Jews.

There were alſo women who bore the appellation *Druides*, or *Druidæ*, among the Gauls, &c. The authors of the Hiſtoria Auguſta, particularly Lampridius, and Vopiſcus, make mention of theſe.

Salmaſius, in his notes on Lampridius, is a little in doubt who theſe women were; but he gives into the moſt eaſy and plauſible opinion, that they were either the wives or the children of the *Druids*.

DRUM, *Tympanum*, a military muſical inſtrument, ſaid by Le Clerc to be an oriental invention, and brought by the Arabians, or perhaps the Moors, into Spain; of uſe, both among the foot and dragoons, ſerving to call the ſoldiers together, and to direct their march, attack, retreat, &c.

The body of the *drum* is made of very thin oak, which is bent into a cylinder, and covered at each end with parchment, which is ſtrained, or braced, more or leſs, according to the height or depth of the ſound required, by ſmall cords and ſliding leathers; and is then ſtruck with ſticks. The depth of the *drum* is equal to its breadth, which does not exceed two feet and a half, becauſe no ſkins can be had to cover bigger. Every troop of dragoons, and every company of foot or artillery, has two or more *drums*, according to the number of men.

There are alſo *drums* whoſe body is of braſs, which are of uſe principally among the horſe. See KETTLE-*drums*.

DRUM, or DRUMMER, alſo denotes a ſoldier appointed to beat the *drum*. When a battalion is drawn up, the *drums* are on the flanks; and when it marches by diviſions, they march between them.

There are divers beats of the *drum*; as the *general march*, *double march*, *aſſembly*, *charge*, *retreat*, *alarm*, *chamade*, *retraite*, *reveille*, *tat-too*, &c. See ASSEMBLY, CHAMADE, &c.

DRUM-*major*, is that perſon in a regiment who beats the beſt *drum*, commands the others, and teaches them their duty. Every regiment has a *drum-major*.

DRUM, in *Anatomy*, or *Ear*-DRUM, denotes a cavity in the inner ear; thus called from the reſemblance it bears to the figure of a war-*drum*. See EAR.

Its outer extreme is covered with a membrane, by anatomiſts called alſo *tympanum*, *drum*; but, more properly, *membrana tympani*.

The office of this *drum*, or *membrana tympani*, has been greatly controverted by anatomiſts. The account beſt warranted is, that being a medium for the conveyance of the ſound to the auditory nerve, by its different degrees of tenſion, it ſerves to modify the ſound, and propagate it to the nerve well proportioned, and commenſurate thereto. See HEARING, and SOUND.

DRUM, *String of the*. See CHORDA *Tympani*, and EAR.

DRUM-*head of a capſtan*. See CAPSTAN.

DRUM, in *Architecture*. See TAMBOUR.

DRUM is uſed to ſignify a kind of fiſh in Virginia. The oil of this fiſh is ſaid to cure pains in the limbs, frequent in that country. See Phil. Tranſ. N° 454. § 1.

DRUM, *Mire*. See BITTERN.

DRUNGUS, Δρυγγος, a body, or company of forces; thus called in the latter times of the Roman empire.

The name *drungus*, as appears from Vegetius, lib. iii. cap. 16. was at firſt only applied to foreign, and even enemies troops; but, under the Eaſtern empire, it came in uſe for the troops of the empire itſelf; where it amounted, pretty nearly, to what we call a regiment, or brigade.

The ſame author notes, that δρυγγος, among the modern Greeks, ſignifies a *ſtaff*, or *rod*, the badge of a dignity, or office, as *agla* among the Turks; and he thinks, that the name may be formed from the Latin *truncus*. But it appears from Vegetius, that *drungus* is a barbarous, not a Latin word. Spelman takes it for Saxon; becauſe, at this day, *throng*, in Engliſh, ſignifies a *multitude*. Salmaſius derives it from ῥυγχος, *beak*; on account of the *drungus*'s being diſpoſed beak-wiſe, or terminating in a point.

Leunclavius obſerves, that the *drungus* was not leſs than one thouſand men, nor more than four thouſand.

DRUNKENNESS, *Ebriety*, phyſically conſidered, conſiſts in a preternatural compreſſion of the brain, and a diſcompoſure of its fibres; occaſioned by the fumes, or ſpirituous parts of liquors. It is accounted for thus: an immoderate quantity of wine taken into the ſtomach, is there heated, and undergoes a kind of efferveſcence; which ariſes the more readily, as the liquor abounds the more in ſulphur. By this action it becomes attenuated and rarefied; ſo that the groſſer parts being left behind, its finer parts are fitted to penetrate, and ſhoot through the veins to the brain, or are conveyed through the veins to the heart; whence, after a farther heat and rarefaction, they are ſent through the carotid arteries, &c. to the brain: hence neceſſarily ariſes a repletion of the meninges of the brain, and a compreſſion of the fibres of the brain itſelf, from the freſh ſtock of rarefied ſulphur continually aſcending into them: hence, alſo, ariſe obſtruction of the pores or paſſages of the brain, a frequent and diſorderly pulſation of the fibres, and the other ſymptoms of this diſtempered ſtate.

Hence it is, that all liquors will not give *drunkenneſs*; but only ſuch as, by their ſulphur, or ſpirit, are diſpoſed for an efferveſcence in the ſtomach and heart, to diffuſe their ſubtle attenuated parts plentifully to the brain.

It is a popular miſtake, that the only remedy for gluttony, is *drunkenneſs*; or that the cure of a ſurfeit of meat, is a ſurfeit of wine; than which nothing can be more contrary to nature. Cheyne.

The ancient Lacedæmonians uſed to make their ſlaves frequently *drunk*, to give their children an averſion and horror for this vice. The Indians hold *drunkenneſs* a ſpecies of madneſs; and, in their language, the ſame term *ramjam*, that ſignifies *drunkard*, ſignifies alſo a *phrenetic*.

Drunkenneſs is puniſhable by the laws of England. The penalty is five ſhillings fine, or the ſtocks in caſe of non-payment. For a ſecond offence, the guilty perſon may be bound to his good behaviour. And an alehouſe-keeper convicted of the ſame offence, ſhall be diſabled to keep any ſuch alehouſe for three years. All flag officers and perſons belonging to his majeſty's ſhips of war, being guilty of *drunkenneſs*, are liable to ſuch puniſhment, as a court martial ſhall think fit to impoſe. See ſtat. 4 Jac. I. c. 5. 21 Jac. I. c. 7. 22 Geo. II. c. 33.

Hobbes makes voluntary *drunkenneſs* a breach of the law of nature, which directs us to preſerve the uſe of our reaſon. The law of England alſo does not allow it to be an excuſe in any caſe whatſoever.

DRUPE, among *Botaniſts*, a ſpecies of pericarpium, conſiſting of a ſoft, fleſhy, and ſucculent pulp, without valves, in the center of which there is a nucleus. See PERICARPIUM.

DRUSA, in *Natural Hiſtory*, a name given by ſome of the Saxon miners to the common pyrites, and by others to ſome peculiar kinds of it. But in general it is underſtood to ſignify both the pyrites and the marcaſite.

DRUSES, or DRUSIANS, in *Eccleſiaſtical Hiſtory*, a people of Paleſtine, inhabiting the environs of mount Libanon, who call themſelves Chriſtians, and occaſionally profeſs themſelves Mahometans; but all their Chriſtianity conſiſts in ſpeaking with reſpect of Jeſus Chriſt and the Virgin Mary. They are ſomewhat jealous of their wives, who only among them know how to read or write. They conſider men as deſtined by their ſtrength, courage, and underſtanding, to more uſeful and exalted purſuits than tracing characters upon paper; and are not able to conceive how a man who is capable of bearing arms, can amuſe himſelf with turning over the leaves of a book. They carry on a trade in wine, ſilk, corn, and ſaltpetre. They have had ſeveral diſputes with the Turks, who govern them by emirs, that have ſeveral times been ſtrangled by them.

The *Druſes* are probably the remains of the Chriſtian armies in the holy war; and they themſelves now ſay, that they are deſcended from the Engliſh; though others ſay, they are deſcended from the Franks, whom Godfrey of Bulloign brought with him to the holy war. Pococke's Deſc. of the Eaſt, vol. ii. book i. chap. 1.

DRY. A *dry* air, *cæteris paribus*, leſſens the weight of the human body, and the contrary quality increaſes it. See MOISTURE *of the air*.

DRY *Baths*, *Confects*, *Dock*. See the ſubſtantives.

DRY *Exchange*, *Cambium ſiccum*, a ſoft appellation, anciently uſed to diſguiſe uſury under, intimating ſomething to paſs on both ſides; whereas, in truth, nothing paſſed but on one: in which reſpect it might be called *dry*. See INTEREST, and USURY.

Cambium ſiccum, ſays Lud. Lopes, *de Contract. & Negot. eſt cambium non habens exiſtentiam cambii, ſed apparentiam, ad-inſtar arboris exſiccatæ*, &c.

DRY *Fiſh*, *Fruits*, *Maſs*, *Meaſures*. See the ſubſtantives.

DRY *Meat*, in the *Manege*, is uſed for corn and hay. After taking the horſe from graſs, or houſing him, he is frequently put to *dry meat*.

DRY *Moat*, *Rent*, *Storax*, *Suture*, *Spavin*. See the ſubſtantives.

DRYADES, DRYADS, in the *Heathen Theology*, the nymphs of the woods; a ſort of imaginary deities, which the ancients believed to inhabit the woods and groves, and to hide themſelves under the bark of the oak, called by the Greeks δρυς.

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The *dryades* differed from the *hamadryades*, in that these latter were attached to some particular tree, with which they were born, and with which they died; whereas the *dryades* were the goddesses of the trees and woods in general, and lived at large, in the middle thereof. For, though δρυς properly signifies an oak, it was also used for tree in general.

We likewise find mention made, in divers authors, of a kind of propheteſſes, or witches, among the Gauls, called *dryades*, or rather *druides*. See DRUIDS.

DRYERS, in *Painting*, are ſubſtances ſo called from their uſe in remedying the fault of oils, which dry too ſlowly. See *Drying* OIL.

DRYAS, in *Botany*, the name of a genus of plants of the *icoſandria polygynia* claſs; called alſo by ſome *dryadæa*, and by Tournefort and others made a ſpecies of the *caryophyllata*. The characters are theſe: the perianthium is compoſed of one leaf divided into eight ſtraight obtuſe equal ſegments, ſomewhat ſhorter than the petals of the flower: the flower conſiſts of eight oblong expanded emarginated petals, inſerted into the cup: the ſtamina are numerous, very ſhort capillary filaments inſerted into the cup: the antheræ are ſimple and ſmall: the germina are numerous, ſmall, and ſet cloſe together: the ſtyles are capillary, and are inſerted into the ſides of the germina; and the ſtigmata are ſimple: there is no fruit, but the ſeeds ſtand naked together, and are numerous, and of a roundiſh compreſſed figure, and ſuſtain a number of hairy ſtyles.

DRYINUS, *Oak-ſnake*, a ſpecies of ſerpent, ſo called from its being uſually found about hollow oaks. Bellonius, who has mentioned it, ſays, that ſcarce any ſerpent grows to a larger ſize, or makes a more terrible hiſſing. Authors in general ſeem however ſo little agreed about its deſcription, that it is not eaſy to aſcertain the name to any peculiar ſpecies of ſnake.

DRYITES *lapis*, in *Natural Hiſtory*, a name given by authors to a ſubſtance but ill deſerving the name of a ſtone; it being only foſſile wood found in detached maſſes. There is much of this foſſile wood found in Italy, in the banks and on the ſhores of rivers. We know alſo by what we ſee of the foſſile wood of England, that it may be found in all degrees of petrifaction, from that of almoſt unaltered wood, to abſolute ſtone or mineral matter, with only the ſuperficial grain of wood. See *Foſſile* WOOD.

DRYOPEIA, Δρυοπεια, in *Antiquity*, an anniverſary day obſerved in memory of Dryops, one of Apollo's ſons.

DRYPIS, in *Botany*, a genus of plants of the *pentandria trigynia* claſs: the calyx is cut into five ſegments; the petals are five; and the fruit is a covered capſule, containing a ſingle ſeed.

DS JERENANG, a name by which ſome authors have called a ſpecies of palm-tree, from the fruit of which is procured dragon's blood. Kempfer, Amœn. Exot. p. 552.

DUALISM, or DITHEISM, an opinion which ſuppoſes two principles, two gods, or two independent uncreated beings, of which one is the firſt cauſe of good, the other of evil. See MANICHEES.

DUBBING *a cock*, cutting off his comb and wattles.

DUBIOUS *Acids*. See ACIDS.

DUBITATIVE *Conjunctions*. See CONJUNCTION.

DUCAL. The letters patent granted by the ſenate of Venice, are called *ducals*: ſo alſo are the letters wrote, in the name of the ſenate, to foreign princes.

The denomination of *ducal* is derived hence; that, at the beginning of ſuch patents, the name of the duke, or doge, is wrote in capitals, thus, *N—— Dei Gratia Dux Venetiarum*, &c. The date of *ducals* is uſually in Latin, but the body is in Italian. A courier was diſpatched with a *ducal* to the emperor, returning him thanks for renewing the treaty of alliance (in 1716) againſt the Turks, with the republic of Venice.

DUCAT, a foreign coin, either of gold or ſilver, ſtruck in the dominions of a duke; being about the ſame value with a Spaniſh piece of eight, or a French crown, or four ſhillings and ſix pence ſterling, when of ſilver; and twice as much, when of gold. See COIN.

The origin of *ducats* is referred to one Longinus, governor of Italy; who, revolting againſt the emperor Juſtin the Younger, made himſelf duke of Ravenna, and called himſelf *Exarcha*, i. e. *without lord or ruler*; and, to ſhew his independence, ſtruck pieces of money of very pure gold, in his own name, and with his own ſtamp, which were called *ducati*, *ducats*; as Procopius relates the ſtory.

After him, the firſt who ſtruck *ducats* were the Venetians, who called them alſo *Zecchini*, or *ſequins*, from Zecca, the place where they firſt were ſtruck. This was about the year 1280, in the time of John Danduli: but we have pretty good evidence, that Roger king of Sicily had coined *ducats* as early as 1240. And Du-Cange ſcruples not to affirm, that the firſt *ducats* were ſtruck in the duchy of Apulia, in Calabria. The chief gold *ducats* now current, are, the ſingle and double *ducats* of Venice, Florence, Genoa, Germany, Hungary, Poland, Sweden, Denmark, Flanders, Holland, and Zurich. The heavieſt of them weighs five penny-weights ſeventeen grains, and the lighteſt five penny-weights ten grains; which is to be underſtood of the double *ducats*, and of the ſingle in proportion.

The Spaniards have no *ducats* of gold; but, in lieu thereof, they make uſe of the ſilver one; which, with them, is no real ſpecies, but only a money of account, like our pound. It is equivalent to eleven rials. See RIAL. The ſilver *ducats* of Florence ſerve there for crowns.

DUCATOON, a ſilver coin, ſtruck chiefly in Italy; particularly at Milan, Venice, Florence, Genoa, Lucca, Mantua, and Parma: though there are alſo Dutch and Flemiſh *ducatoons*.

They are all nearly on the ſame footing; and, being a little both finer and heavier than the piece of eight, are valued at two pence or three pence more, viz. at about four ſhillings and eight pence ſterling.

There is alſo a gold *ducatoon*, ſtruck and current chiefly in Holland: it is equivalent to twenty florins, on the footing of one ſhilling and eleven pence halfpenny the florin.

DUCENARIUS, in *Antiquity*, an officer in the Roman army, who had the command of two thouſand men.

The emperors had alſo *ducenarii* among their procurators, or intendants, called *procuratores ducenarii*. Some ſay, that theſe were ſuch whoſe ſalary was two hundred ſeſterces; as in the games of the circus, horſes hired for two hundred ſeſterces, were called *ducenarii*. Others hold, that *ducenarii* were thoſe who levied the two hundredth penny, the officers appointed to inſpect the raiſing of that tribute. In the inſcription at Palmyra, the word *ducenarius*, in Greek διχεναρτος, occurs very often.

DUCENTESIMA, in *Antiquity*, a tax of the two hundredth penny, exacted by the Roman emperors.

DUCES *tecum*, a writ commanding one to appear at a day in chancery, and to bring with him ſome evidences, or other things, which the court would view.

DUCES *tecum licet languidus*, a writ directed to a ſheriff, who, having in his cuſtody a priſoner, in a perſonal action, returns, upon a *habeas corpus*, that he is *adeo languidus*, that, without danger of death, he cannot have his body before the juſtices.

DUCK, *Anas*, in *Ornithology*, the name of a very large genus of birds, of the order of *anſeres*; the characters of which are theſe: the beak is ſhorter in proportion than that of the gooſe, ſtrong, flat or depreſſed, and commonly furniſhed at the end with a nail, and the edges divided into ſharp lamellæ; and the feet proportionably larger, with the middle toe the longeſt: the legs are ſhorter, and are placed farther backward; and the back is flatter, and the body more compreſſed: the noſtrils are ſmall and oval; and the tongue broad, with the edges near the baſe fringed. Some of theſe love the freſh waters, others are found only at ſea, and of both theſe are very numerous ſpecies. See ANAS.

This fowl is furniſhed with a peculiar ſtructure of veſſels about the heart, which enable it to live without reſpiration a conſiderable time under water, as is neceſſary for it in diving. This made Mr. Boyle think it a more proper object for experiments by the air-pump, than any of the other birds. A full-grown *duck* being put into the receiver of the air-pump, of which ſhe filled one third part, and the air exhauſted, the creature ſeemed to bear it better for the firſt moments, than a hen or other ſuch fowl; but after about a minute, ſhe gave great ſigns of diſcompoſure, and in leſs than two minutes her head fell down, and ſhe appeared dying, till revived by letting in the air. Thus whatever facility of diving, this and other water-fowl may have, it does not appear, that they can ſubſiſt without air for reſpiration, any longer than other animals. A young callow *duck* was afterwards tried in the ſame manner, and with the ſame ſucceſs, being reduced very near death in leſs than two minutes. But it is obſervable, that both birds ſwelled extremely on the pumping out of the air, ſo as to appear much larger to the ſpectators, eſpecially about the crop. It not being intended that any water-fowl ſhould live in an exceedingly rarified air, but only be able to continue on occaſion ſome time under water; nature, though ſhe has provided them with the means of this, has done nothing for them in regard to the other.

The ſtrongeſt inſtance of this creature's being calculated to live any where, we have in the accounts of the blind *ducks* of the Zirchnitzer lake in Carniola: It is now well known, that this lake communicates with another

lake

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lake under ground in the mountain Savornick, and fills or empties itſelf according to the fulneſs or emptineſs of that lake; the waters of the upper lake running off at the time of its emptying by large holes in the bottom, and that in vaſt quantities. The *ducks*, which are very plentiful in the water, are often carried down with it, and forced into the ſubterraneous lake the waters retire to. In this unnatural habitation, many of them doubtleſs periſh, but ſome remain alive; theſe become blind and loſe all their feathers, and in the next filling of the lake, both they and vaſt numbers of fiſh are thrown up with the water. They are fat at this time, but make a ſtrange appearance in their naked ſtate, and are eaſily caught, for want of ſight to avoid the danger. In about a fortnight they recover their ſight and their feathers, and are then of the ſize of a common wild *duck*, but of a black colour, having a white ſpot upon their forehead. When opened on being taken at their firſt coming up in their blind ſtate, their ſtomachs are found full of ſmall fiſhes, and ſomewhat reſembling weeds. It ſeems from this, that they cannot be abſolutely blind, but that the degree of light to which they ſeem accuſtomed in their dark habitation, had formed their eyes to ſee by that ſmall quantity, ſo well as to get their food by it; and their blindneſs on coming into broad day-light again, is no other than that of a man who has been long in the dark, on having in an inſtant a large blaze of candles ſet juſt under his eyes. The eye in neither caſe can bear the ſudden change, and muſt be habituated to it, before it can ſee objects by it. Theſe blind *ducks* are not only caſt up in this lake, but after great rains they are frequently thrown up at a hole in the mountain Storſeg, near the town of Laas. The water guſhing out at this hole with great force on theſe occaſions, brings away with it theſe blind and bald *ducks*; and their frequency on theſe occaſions in theſe places, makes them be eſteemed no rarity; but the common people underſtand that there are under-ground lakes, which they inhabit, and out of which they are thus thrown. Phil. Tranſ. N° 191.

There are two ſorts of *ducks* common with us, the tame, and the wild; the *anas boſchas* of Linnæus, and *domeſtica* of other authors. The mallard of this ſpecies has its bill of a yellowiſh green; the head and neck are of a deep and ſhining green; more than half round the lower part of the neck is an incomplete circle of white; the upper part of the breaſt is of a purpliſh red, and the beginning of the back of the ſame colour; the breaſt and belly of a pale grey, marked with tranſverſe ſpeckled lines of a duſky hue. The ſcapulars are white, barred with brown; the ſpot on the wing is of a rich purple; the tail conſiſts of twenty-four feathers, the four middle ones of which are black and ſtrongly curled upwards, which diſtinguiſhes the male of this ſpecies from all others: but the females have not this mark. Their plumage is of a pale reddiſh brown, ſpotted with black: the legs are of a ſaffron colour. The common tame ſpecies take their origin from theſe: the drakes, however they vary in colour, always retain the curled feathers of the tail; and both ſexes the form of the bill of the wild kind. Pennant.

The firſt ſort is very beneficial to the huſbandman, and at the ſame time requires no charge to keep, as living on loſt corn, worms and ſnails, &c. Indeed once a year, this fowl is a great layer of eggs; and when ſhe ſits, muſt be carefully fed with barley or other grain. As to the ducklings, they are fed in the ſame manner as goſlins; and may be fattened in three weeks time with any kind of pulſe or grain, and plenty of water.

For preſerving wild *ducks*, a place, with a pond in it, muſt be walled in, and covered with a ſtrong net; the pond is to be ſet with tufts of oziers, and have many ſecret holes and creeks; whereby they will be induced to feed freely, though confined. Teal, widgeons, ſhel-drakes, and green plovers, may alſo be ordered in the ſame manner. See DECOY.

Of exotics or foreign *ducks*, authors deſcribe many ſpecies; as,

DUCK, *the Black* or *Velvet*, *Anas nigra* or *fuſca*. The male of this ſpecies is larger than the tame *duck*. The bill is broad and ſhort, yellow on the ſides, black in the middle, and the hook red: the head and part of the neck is black tinged with green; behind each ear is a white ſpot; and in each wing is a white feather; all the reſt of the plumage is of a fine black, and ſoft as velvet: the legs and feet are red; the webs black. The female is entirely of a deep brown colour, the marks behind each ear and on the wings excepted: the bill wants the protuberance at the baſe which Linnæus gives to the male. This ſpecies is common on the coaſts of Norway, but ſeldom appears with us except in hard winters. Ray and Pennant.

DUCK, *Braſilian*, is about the ſize of a gooſe. Its beak, legs and feet are brown, and its body wholly black, with a green gloſs, except the upper part of the wings, which is white. It has a creſt compoſed of black feathers on its head, and a large red fleſhy tubercle over the origin of the bill, and a naked red membrane round its eyes. It flies to the top of the higheſt trees, and is a very fleſhy and delicately-taſted bird. Margraave.

DUCK, *St. Cuthbert's*, *Anas molliſſima* of Linnæus, and *Eider* of Wormius, is a ſpecies of *duck* found in the Weſtern iſles of Scotland, and in the Farn iſles, but in greater numbers in Norway, Iceland, and Greenland, from which a great quantity of ſoft down, called *eider* or *edder*, produced from the breaſt of the bird in breeding ſeaſon, is annually imported. It is much valued for ſtuffing beds, coverlets, &c. The male and female differ very much in this ſpecies; the male very much reſembles the common *duck*, but is about twice its ſize; its bill is black; the feathers of the forehead and cheeks advance far into the baſe, ſo as to form two very ſharp angles; the forehead is of a full velvet black; from the bill to the hind part of the head is a broad black bar, paſſing acroſs the eyes on each ſide. On the hind part of the neck, juſt beneath the ends of theſe bars, is a broad pea-green mark, that appears like a ſtain; the crown of the head, the cheeks, the neck, back, ſcapulars and coverts of the wings are white; the lower part of the breaſt, the belly, tail, and quill feathers, are black, and the legs are green. The female is a duſky brown, ſpotted with black. This ſpecies forms its neſts in the holes of rocks, and among the ſtones on the ſea-ſhore, and lays a number of eggs, which are of a pale olive colour, large, gloſſy, and ſmooth, and well taſted. Ray and Pennant.

DUCK, *Decoy*. See DECOY.

DUCK, *The Fly-Catching*, *Anas Muſcaria*, is a name given to a kind of *duck* from its catching flies which play about the waters. This is deſcribed as a diſtinct ſpecies, but Mr. Ray ſuppoſes it to be the ſame with our wild *duck*. Linnæus makes it the *Anas Clypeata*, or ſhoveler.

DUCK, *Anas Strepera*, is a ſpecies of *duck* which frequents freſh water, uſually called the *gadwall* and *gray*. It is about the ſize of the widgeon. The bill is black and flat; the head and upper part of the neck are of a reddiſh brown, ſpotted with black; the lower part, the breaſt, the upper part of the back, and the ſcapulars, are beautifully marked with black and white lines; the belly is of a duſky white; the rump above and below is black; the tail aſh-coloured, edged with white; the coverts on the ridge of the wing are of a pale reddiſh brown; thoſe beneath are of a purpliſh red, the loweſt of a deep black; the greater quill-feathers are duſky; the inner web of three of the leſſer quill-feathers are white, which forms a conſpicuous ſpot; the legs are orange-coloured. The breaſt of the female is of a reddiſh brown, ſpotted with black; the back of the ſame colour; and though it has the ſame marks on the wings, they are much leſs bright than thoſe of the male. Ray and Pennant.

DUCK, *Anas Clangula*, or *Platyrynchos*, a ſpecies of *duck* commonly called *golden-eye*, found about the ſea-coaſts, and frequently freſh waters. Its body is ſhort and thick; its head large, of a deep black, gloſſed with green, and its neck ſhort; its beak is ſhort and broad at the baſe, and black; at each angle of the beak there is a large white ſpot, whence the Italians call this bird *quatt' occhii*, or *four-eyes*; the *irides* are of a bright yellow; the neck, ſhoulders, breaſt, and belly, are white, and the back black; the wings are black and white, and the tail is wholly black; the legs are very ſhort, the feet broad, and both of an orange-colour; the hinder toe is ſmall, but is edged on each ſide by a membrane which adds much to its breadth. The head of the female is of a deep brown, tinged with red; the neck grey; breaſt and belly white, coverts and ſcapulars duſky and aſh-coloured; the legs duſky. See *Tab. Birds.* No. 50. Ray and Pennant.

DUCK, *broad-beaked*, *Anas clypeata*, or *Latiroſtra*, a ſpecies of ſea-*duck*, known with us by the name of *ſhoveler*. It is ſomewhat ſmaller than the common *duck*; the beak is remarkably broad, whence its name, and grows broader and rounder toward the end, where it is hollowed like a ſhield, and the edges of each mandible are pectinated or ſupplied with thin laminæ, that lock into each other when the mouth is cloſed. The irides are of a bright yellow; the head and upper part of the neck of a blackiſh green; the lower part of the neck, the breaſt, and the ſcapulars are white; the back brown; the coverts of the wings of a fine ſky-blue; thoſe next to the quill feathers tipt with white: the greater quill feathers are duſky; the exterior webs of thoſe in the middle are of a gloſſy green; the tail is ſhort and variegated with black and white; the belly of a bay-colour; the vent-

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feathers black, and the legs and feet red. The female has the ſame marks in the wings as the male, but the colours are leſs bright. The reſt of the plumage reſembles that of the common wild *duck*. Ray and Pennant.

DUCK, *Hook billed*, *Anas adunca*, *roſtro incurvato*, is of the ſhape and ſize of the common *duck*, but differs from it in the ſhape of the bill, which is ſomewhat longer and hooked downwards; and in the head, which is ſmaller and ſlenderer. Ray.

DUCK, *Horn*, *Anas cornicenſis*, an American *duck*, deſcribed by Nieremberg, and named from the ſimilitude of its note to that of a huntſman's horn. It is very imperfectly deſcribed. Ray.

DUCK, *Indian and Lybian*. See *Muſcovy* DUCK.

DUCK, *Morillon*, or *Grey-headed*, *Anas glaucion*, is a ſmall ſpecies of ſea-*duck*, ſomewhat larger than the teal. The bill is of a yellowiſh brown; the irides gold-coloured; the head of a duſky ruſt colour; round the upper part of the neck is a collar of white; beneath that a broader of grey. The back and coverts are duſky, with a few white lines; the greater coverts duſky, with a few large ſpots of white. The breaſt and belly are white; the tail is duſky; the ſides above the thighs black; the legs yellow. This is ſuppoſed to be the ſame with the *capo roſſo*. Ray and Pennant.

DUCK, *Muſcovy*, *Anas Moſchata*, is the largeſt ſpecies of the *duck* kind. The general colour both in the male and female is a purpliſh black, variegated with white, though the female is ſometimes quite white. The beak and feet are red. It has red fleſhy protuberances about its beak and eyes; its voice is hoarſe, and ſcarce audible, unleſs when it is angry. Its eggs are remarkably round. Ray and Linnæus.

DUCK, *black*, *Anas nigra*. See SCOTER.

DUCK, *Burrough*, *Anas Tadorna*. See TADORNA.

DUCK, *Northern*, *Anas arctica* of Cluſius. See PUFFIN.

DUCK, *Scaup*, *Anas marila*, is a ſpecies of *duck* ſomewhat ſmaller than the common *duck*, and of a ſtrange diverſity of colours, even in the different birds of the ſame ſpecies, inſomuch, that it is not eaſy to find two perfectly alike in a flock of forty or fifty. The beak is blue, and the moſt common colours of the other parts are theſe: the head, and part of the neck, are of a greeniſh black; the lower part of the neck has ſome whiteneſs, and the breaſt is black; the belly is white, with a mixture of yellow in the lower part, and near the anus it becomes black. The upper part of the neck is a ſooty black; the middle of the back is white, variegated with duſky browniſh lines, and the rump and tail are brown, as are alſo the wings, with ſome tranſverſe ſtreaks of white; the tail is not above two inches long; the legs are bluiſh. Theſe birds take their name from feeding on *ſcaup*, or broken ſhell fiſh. Ray.

DUCK, *Long-tailed*, *Anas glacialis*, is a ſpecies of *duck* which breeds in the moſt northern parts of the world, and only viſits our coaſts in the ſevereſt winters. The bill of this ſpecies is ſhort, black at the tip and baſe, and orange-coloured in the middle; the feet are red; the head, throat, breaſt, and belly, are white; the four middle feathers of the tail are black, and longer than the other, which are white. Linnæus and Pennant.

DUCK, *Pintail*, or *ſharp-tailed*, *Anas acuta*, or *caudacuta*, a ſpecies of *duck*, ſometimes called the *cracker* and *ſea-pheaſant*, is of the ſize of the common wigeon. Its head is all over of a ferruginous brown, but behind the ears there is a ſlight tinge of purple; its neck is ſomewhat longer than that of the wigeon, and its beak of a bluiſh black; the head is ſmall, and on each ſide of it is a white ſtreak, which reaches down to the throat; the throat is grey, variegated with tranſverſe lines, as is alſo the back; but the ſhoulder-feathers are, in a great meaſure, black; the tail is grey, with a mixture of white about the edges of the feathers; the two middle feathers are black, and longer than the others, and run out into narrow points, whence this bird has the name of ſea-pheaſant; the feet are of a lead colour. The female is of a light brown colour, ſpotted with black. Ray.

DUCK, *Tufted*, *Anas fuligula*, is ſometimes called *capo negro*, *querquedula criſtata*, and the little *morillon*. The bill is broad, of a bluiſh grey, and the hook black; the irides are of a fine yellow; the head is adorned with a thick but ſhort pendent creſt; the belly and under coverts of the wings are of a pure white; the quill-feathers duſky without; and at their extremities, and part within, white, and the ſecondaries are white tipt with black. The reſt of the plumage is black, varied about the head with purple; the tail is very ſhort, and conſiſts of fourteen feathers; the legs of a bluiſh grey; the webs black. The female has no creſt. Ray and Pennant. For other ſpecies of *duck*, ſee TEAL and WIGEON.

DUCK's *foot*, or *May apple*, *podophyllum*, in *Botany*, a genus of the *polyandria monogynia* claſs. Its characters are theſe: the bud of the flower is incloſed in a large three-leaved empalement, in form of a ſpatha or ſheath; it has nine roundiſh concave petals, plaited on their borders, and ſmaller than the empalement; and a roundiſh germen, without a ſtyle, crowned by a plaited obtuſe ſtigma. The germen turns to an oval capſule of one cell, crowned by the ſtigma, and filled with roundiſh ſeeds. There is but one ſpecies, a native of North America.

DUCK's *meat*, *Lemna*, or *Lenticula*, in *Botany*, a genus of the *monoecia diandria* claſs, whoſe characters are theſe: it grows in the water, and is ſeated at the ſuperficies; its appearance is quite ſimple and foliaceous, and its roots ſlender, capillaceous, and pellucid. This genus produces male and female flowers, neither of which have any *corolla*. The calyx is ſingle-leaved; the fruit is an unilocular capſule. Boerhaave mentions three ſpecies of this plant.

This is a ſmall plant which frequently covers the whole ſurface of ponds and ditches, conſiſting only of ſmall round green leaves, having neither flower nor ſeed perceivable; only from the middle of the under ſide of each leaf, ſmall white thready roots.

Duck's meat, is of a cooling, mollifying nature, good to be applied to inflammations, St. Anthony's fire, or the ſhingles; alſo for the gout, either applied by itſelf, or mixed with barley meal. Six ounces of a ſtrong infuſion made in white wine, taken for nine days together, is commended as a cure for the jaundice.

The *duck's meat* is thought to be very cooling and lenifying; ſome apply it as a cataplaſm to eaſe the gout and inflammation of the parts; but the repelling the humours is to be feared in theſe ſorts of remedies; for which reaſon, to aſſuage the pain of the hæmorrhoids, powder two handfuls of *duck's meat* with half an ounce of myrrh; put it all in a linen bag, and bathe the piles with the water which drops through the bag.

DUCK's *meat*, *Starry*, in *Botany*. See CALLITRICHE.

DUCKING, or plunging in water. Olaus Magnus tell us, this was a diverſion anciently practiſed among the Goths, by way of exerciſe; but among the Celtæ, and Franks, it was a ſort of puniſhment. Tacitus likewiſe aſſures us, that it was executed among the ancient Germans, on the lazy and infamous. At Marſeilles, and Bourbon, their men and women of ſcandalous life are condemned to the *cale*, as they call it; that is, to be ſhut up, naked to the ſhift, in an iron cage, faſtened to the yard of a ſhalop, and *ducked* ſeveral times in the river. The ſame is done alſo at Tholouſe, to blaſphemers.

DUCKING is alſo a puniſhment for ſeamen; who are thrown into the ſea from the top of the yard of the main-maſt ſeveral times, according to the quality of their offence. Sometimes a cannon-ball is faſtened to their feet, to make the fall the more rapid.

There is alſo a kind of *dry ducking*, wherein the patient is only ſuſpended by a rope, a few yards above the ſurface of the water: this is a ſpecies of ſtrapada.

The puniſhment is uſually made public by the diſcharge of a cannon.

DUCKING is alſo a penalty, which veteran ſailors pretend to inflict on thoſe, who, for the firſt time, paſs the tropic of Cancer, the equator, or the Streights of Gibraltar, in conſequence of their refuſal or incapacity to pay the uſual fine levied on this occaſion.

DUCKING-*Stool*, in our *Cuſtoms*. See CUCKING-*Stool*.

DUCKUP, a word uſed at ſea by the ſteerſman, or him that is at the helm, when either main-ſail, fore ſail, or ſprit-ſail hinder his ſight ſo that he cannot ſee to ſteer by a land-mark, or the like; for then his word is, *duckup* the clew lines of thoſe ſails; and as to the ſprit-ſail, when a ſhot is to be made by a chaſe-piece, and the clew of that ſail hinders the ſight, they ſay, *duckup* the clew lines of the ſprit-ſail; that is, hale the ſail out of the way.

DUCT, DUCTUS, in *Anatomy*, is applied in a general ſenſe to all the canals, or tubes, in the animal body, as veins, arteries, &c. through which the humours or juices are conveyed.

DUCT has alſo a more immediate application to ſeveral particular veſſels: as the

DUCTUS *Alimentalis*, a name given by Dr. Tyſon to the gula, ſtomach, and inteſtines; all which make but one continued canal, or *duct*. This *duct* he makes the proper characteriſtic of an animal.

DUCTUS *Adipoſi*, are little veſicles in the omentum, which either receive the fat ſeparated from the adipoſe loculi, or cells, or elſe bring it to them; for the extreme fineneſs of theſe veſſels renders it very difficult to trace their origin, or courſe.

Indeed, it remains ſomewhat doubtful, whether they be hollow, and real *ducts*; or, whether they be not real

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fibres, ſuch as are obſerved in the ſpleen, along which the liquid fat does, as Dr. Drake expreſſes it, drill its way, as the eaſieſt it can find. Malpighi, their firſt diſcoverer, inclines to the former opinion. All we know for certain, is, that they terminate in little globules of fat, concerning the uſe and progreſs whereof, much remains to be conſidered.

Malpighi ſtarts a doubt, whether the adipoſe *ducts* may not be propagated from fibres which abound in the ſpleen, or thoſe fibres from them? As alſo, whether there be not a yet undiſcovered communication between the adipoſe membrane and the omentum?

DUCTS, *Aqueous.* See AQUEOUS *Humour.*

DUCTUS *Chyliferus*, or *Roriferus*; the ſame as *ductus thoracicus.* See THORACIC.

DUCTUS *Communis Choledochus*, a large canal, formed by an union of the *ductus* cyſticus, and hepaticus. This *duct*, deſcending about four inches, diſcharges itſelf into the duodenum, by an oblique inſertion, which does the office of a valve, in preventing the regreſs of the bile, conveyed hereby into the inteſtines. See *Tab. Anat.* (Splanch.) *fig.* 5. *lit.* k. See BILE, and CHOLEDOCHUS.

The *ductus communis* ſometimes opens into the duodenum at the ſame aperture with the pancreatic *duct.*

DUCTUS *Cyſticus*, or *Meatus Cyſticus*, a large canal, about the bigneſs of a goose-quill, which ariſing from the neck of the gall-bladder, about two inches diſtance therefrom, joins the porus biliarius; and, together with it, conſtitutes the *ductus* communis. See *Tab. Anat.* (Splanch.) *fig.* 1. *lit. d. fig.* 5 *lit. g g.*

DUCTS, *Excretory.* See EXCRETORY.

DUCTS, *Galactophorous.* See GALACTOPHOROUS.

DUCTUS *Hepaticyſticus.* See CYST-HEPATIC.

DUCTUS *Hepaticus*, called alſo *Meatus Hepaticus*, and *Bilary Pore.* See *Porus* BILARIUS.

DUCTUS *Lachrymales*, the excretory veſſels of the glandulæ lachrymales, ſerving for the effuſion of tears. See LACHRYMALIA.

DUCTUS *Pancreaticus*, a little canal, ariſing from the pancreas, and opening into the duodenum; ſerving to diſcharge the pancreatic juice into the inteſtines. See PANCREAS, and PANCREATIC *Juice.*

This *duct*, being firſt diſcovered by Wirtſungus, is frequently called *ductus* VIRTSUNGIANUS.

DUCT, *Pecquets.* See PECQUETS.

DUCTUS *pneumaticus*, in *Ichthyology*, the name of a certain *duct* or canal, found in all thoſe fiſh which have an air-bladder, reaching from that bladder to the orifice of the ſtomach, or ſome other part of it. This *duct* is variouſly ſituated in the different kinds. Artedi Ichthyolog. See AIR BLADDER.

DUCTUS *Salivales*, the excretory tubes of the ſalival glands; ſerving to diſcharge the ſecreted ſaliva into the mouth. See SALIVAL *ducts.*

DUCTUS *Thoracicus.* See THORACIC *duct.*

DUCTUS *Umbilicalis.* See UMBILICALIS *Funiculus.*

DUCTUS *Urinarius*; the ſame as *Urethra.* See URETHRA.

DUCT, DUCTUS, in *Building.* See CALIDUCTS, VENTIDUCTS, SEWERS, CLOACA, &c.

DUCTILITY, in *Phyſics*, a property of certain bodies, whereby they become capable of being beaten, preſſed, drawn, or ſtretched forth, without breaking; or whereby they are capable of great alterations in their figure and dimenſions; and of gaining in one way as they loſe in another.

Such are metals, which, being urged by the hammer, gain in length and breadth what they loſe in thickneſs; or, being drawn into wire through holes in iron, grow longer as they become ſlenderer.

Such, alſo, are gums, glues, reſins, and ſome other bodies; which, though not malleable, yet may be denominated *ductile*; inaſmuch as, when ſoftened by water, fire, or ſome other menſtruum, they may be drawn into threads.

Some bodies are *ductile* both when they are hot and cold, and in all circumſtances: ſuch are metals, and particularly gold and ſilver; other bodies are *ductile*, only when they have a certain degree of heat; ſuch as wax, and ſubſtances of the ſame kind, and glaſs; and others again, as ſome kinds of iron, viz. thoſe called by workmen *red-ſhort*, braſs, and ſome other metallic allays, are *ductile* only when cold, and are brittle, when hot.

So that we have two claſſes of *ductile* bodies; the one hard, and the other ſoft; on each of which we ſhall below ſome conſiderations.

The cauſe of *ductility* is very obſcure; as depending, in great meaſure, on hardneſs; than which there is nothing in nature we know leſs of. It is true, we uſually account for hardneſs, from the force of attraction between the particles of the hard body; and for *ductility*, from the particles of the *ductile* body being, as it were, jointed, and entangled with each other.

Inſtead of fanciful hypotheſes to account for *ductility*, we ſhall here entertain the reader with ſome truly amazing circumſtances and phænomena thereof, in the inſtances of gold, glaſs, and ſpider's-webs.

Obſerving, however, that the *ductility* of metals decreaſes in the following order: gold, ſilver, copper, iron, tin, lead.

DUCTILITY *of gold.* One of the properties of gold is, to be the moſt *ductile* of all bodies; of which the gold-beaters, and gold wire-drawers, furniſh us with abundant proof. Fa. Merſenne, M. Rohault, Dr. Halley, &c. have made computations thereof: but they truſted to the reports of the workmen. M. Reaumur, in the Memoires de l'Académie Royale des Sciences, an. 1713. took a ſurer way; he made the experiment himſelf. A ſingle grain of gold, he found, even in the common gold-leaf, uſed in moſt of our gildings, is extended into thirty-ſix and a half ſquare inches; and an ounce of gold, which, in form of a cube, is not half an inch either high, broad, or long, is beat under the hammer into a ſurface of 146 and a half ſquare feet; an extent almoſt double to what could be done in former time. In Fa. Merſenne's times, it was deemed prodigious, that an ounce of gold ſhould form 1600 leaves; which, together, only made a ſurface of 105 ſquare feet.

But the diſtenſion of gold under the hammer (how conſiderable ſoever) is nothing to that which it undergoes in the drawing-iron. There are gold leaves, in ſome parts, ſcarce the $\frac{1}{300000}$ part of an inch thick; but $\frac{1}{3600000}$ part of an inch is a conſiderable thickneſs, in compariſon of that of gold ſpun on ſilk in our gold thread.

To conceive this prodigious *ductility*, it is neceſſary to have ſome idea of the manner wherein the wire-drawers proceed. The wire, and thread we commonly call gold-thread, *&c.* which is only ſilver wire gilt, or covered over with gold, is drawn from a large ingot of ſilver, uſually about thirty pounds weight. This they round into a cylinder, or roll, about an inch and a half in diameter, and twenty-two inches long, and cover it with the leaves prepared by the gold-beater, laying one over another, till the cover is a good deal thicker than that in our ordinary gilding; and yet, even then, it is very thin; as will be eaſily conceived from the quantity of gold that goes to gild the thirty pounds of ſilver: two ounces ordinarily do the buſineſs; and, frequently, little more than one. In effect, the full thickneſs of the gold on the ingot rarely exceeds $\frac{1}{4000}$, or $\frac{1}{3000}$ part; and, ſometimes not $\frac{1}{10000}$ part of an inch.

But this thin coat of gold muſt be yet vaſtly thinner: the ingot is ſucceſſively drawn through the holes of ſeveral irons, each ſmaller than the other, till it be as fine, or finer than a hair. Every new hole leſſens its diameter; but it gains in length what it loſes in thickneſs; and, of conſequence, increaſes in ſurface: yet the gold ſtill covers it: it follows the ſilver in all its extenſion, and never leaves the minuteſt part bare, not even to the microſcope. Yet, how inconceivable muſt it be attenuated while the ingot is drawn into a thread, whoſe diameter is 9000 times leſs than that of the ingot!

M. Reaumur, by exact weighing, and rigorous calculation, found, that one ounce of the thread was 3232 feet long; and the whole ingot 1163520 feet, Paris meaſure, or 96 French leagues; equal to 1264400 Engliſh feet, or 240 miles Engliſh; an extent which far ſurpaſſes what Fa. Merſenne, Furetiere, Dr. Halley, &c. ever dreamt of.

Merſenne ſays, that half an ounce of the thread is 100 toiſes, or fathoms long; on which footing, an ounce would only be 1200 feet: whereas, M. Reaumur finds it 3232. Dr. Halley makes ſix feet of the wire one grain in weight, and one grain of the gold ninty-eight yards; and, conſequently, the ten thouſandth part of a grain, above one third of an inch. The diameter of the wire he found one 186th part of an inch; and the thickneſs of the gold one 154500th part of an inch. But this, too, comes ſhort of M. Reaumur; for, on this principle, the ounce of wire would only be 2680 feet.

But the ingot is not yet extended to its full length. The greateſt part of our gold thread is ſpun, or wound on ſilk; and, before they ſpin it, they flat it, by paſſing it between two rolls, or wheels of exceedingly well poliſhed ſteel; which wheels, in flatting it, lengthen it by above one ſeventh. So that our 240 miles are now got to 274. The breadth, now, of theſe laminæ, or plates, M. Reaumur finds, is only one 8th of a line, or one 96th of an inch; and their thickneſs one 3072d. The ounce of gold, then, is here extended to a ſurface of 1190 ſquare feet; whereas, the utmoſt the gold-beaters can do, we have obſerved, is to extend it to 146 ſquare feet. But the gold, thus exceedingly extended, how thin muſt it be! From

M. Reaumur's

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M. Reaumur's calculus, it is found to be one 1750000th of a line, or one 21000000th of an inch; which is ſcarce one 13th of the thickneſs of Dr. Halley's gold. But he adds, that this ſuppoſes the thickneſs of the gold every-where equal, which is no-ways probable; for in beating the gold-leaves, whatever care they can beſtow, it is impoſſible to extend them equally. This we eaſily find, by the greater opacity of ſome parts than others; for, where the leaf is thickeſt, it will gild the wire the thickeſt.

M. Reaumur, computing what the thickneſs of the gold muſt be where thinneſt, finds it only one 31500000th part of an inch. But what is the one 31500000th part of an inch? Yet this is not the utmoſt *ductility* of gold: for, inſtead of two ounces of gold to the ingot, which we have here computed upon, a ſingle one might have been uſed; and, then, the thickneſs of the gold, in the thinneſt places, would only be the 63000000th part of an inch.

And yet, as thin as the plates are, they might be made twice as thin, yet ſtill be gilt; by only preſſing them more between the flatter's wheels, they are extended to double the breadth, and proportionably in length. So that their thickneſs, at laſt, will be reduced to one thirteenth, or fourteenth millionth part of an inch.

Yet, with this amazing thinneſs of the gold, it is ſtill a perfect cover for the ſilver: the beſt eye, or even the beſt microſcope, cannot diſcover the leaſt chaſm, or diſcontinuity. There is not an aperture to admit alcohol of wine, the ſubtileſt fluid in nature, or even light itſelf, unleſs it be owing to cracks occaſioned by repeated ſtrokes of the hammer. Add, that if a piece of this gold-thread, or gold-plate be laid to diſſolve in aqua-fortis, the ſilver will be all excavated, or eat out, and the gold left entire, in little tubules.

It ſhould be obſerved, that gold, when it has been ſtruck for ſome time by a hammer, or violently compreſſed, as by gold wire drawers, becomes more hard, elaſtic, and ſtiff, and leſs *ductile*, ſo that it is apt to be crackt or torn: the ſame thing alſo happens to the other metals by percuſſion and compreſſion. But *ductility* and tractability may be reſtored to metals in that ſtate, by ANNEALING them, or making them red hot. Gold ſeems to be more affected by percuſſion and annealing, than other metals.

As to the DUCILITY *of ſoft bodies*, it is not yet carried to that pitch. The reader, however, muſt not be ſurpriſed, that, among the *ductile* bodies of this claſs, we give the firſt place to the moſt brittle of all other, glaſs.

DUCTILITY *of Glaſs*. We all know, that, when well penetrated with the heat of the fire, the workmen can figure and manage *glaſs* like ſoft wax; but what is moſt remarkable, it may be drawn, or ſpun out into threads, exceedingly fine and long.

Our ordinary ſpinners do not form their threads of ſilk, flax, or the like, with half the eaſe, and expedition, as the glaſs-ſpinners do threads of this brittle matter. We have ſome of them uſed in plumes for children's heads, and divers other works, much finer than any hair, and which bend and wave like it with every wind.

Nothing is more ſimple and eaſy than the method of making them: there are two workmen employed; the firſt holds one end of a piece of glaſs over the flame of a lamp; and, when the heat has ſoftened it, a ſecond operator applies a glaſs hook to the metal thus in fuſion; and, withdrawing the hook again, it brings with it a thread of glaſs, which ſtill adheres to the maſs: then, fitting his hook on the circumference of a wheel about two feet and a half in diameter, he turns the wheel as faſt as he pleaſes; which, drawing out the thread, winds it on its rim; till, after a certain number of revolutions, it is covered with a ſkain of glaſs-thread.

The maſs in fuſion over the lamp, diminiſhes inſenſibly; being wound out, as it were, like a pelotoon, or clue of ſilk, upon the wheel; and the parts, as they recede from the flame, cooling, become more coherent to thoſe next to them; and this by degrees: the parts neareſt the fire are always the leaſt coherent, and, of conſequence, muſt give way to the effort the reſt make to draw them towards the wheel.

The circumference of theſe threads is uſually a flat oval, being three or four times as broad as thick: ſome of them ſeem ſcarce bigger than the thread of a ſilk-worm, and are ſurpriſingly flexible. If the two ends of ſuch threads be knotted together, they may be drawn and bent, till the aperture, or ſpace in the middle of the knot, doth not exceed one 4th of a line, or one 48th of an inch diameter.

Hence M. Reaumur advances, that the flexibility of glaſs increaſes in proportion to the fineneſs of the threads; and that, probably, had we but the art of drawing threads as fine as a ſpider's web, we might weave ſtuffs and cloths hereof, for wear. Accordingly, he made ſome experiments this way; and found he could make threads fine enough, as fine, in his judgment, as any ſpider's web; but he could never make them long enough to do any thing with them.

DUCTILITY *of Spider's-webs*. See WEB.

DUEL, a ſingle combat, at a time and place appointed, in conſequence of a cartel, or challenge.

The word is uſually derived from *duellum*, uſed by the barbarous Latin writers, *quaſi duorum bellum*.

Duels were anciently allowed by common law, in caſes where proof could not be had. In which view, Fleta defines *duel, ſingularis pugna inter duos ad probandam veritatem litis; & qui vicit, probâſſe intelligitur*. Stat. de Finib. Levat. 27 Edw. I.

This *duelling* was ſo general a method of terminating differences among the nobility, that even eccleſiaſtics, prieſts and monks, were not excuſed from the ſame; only, to prevent their being ſtained with blood, they obliged theſe to procure champions to fight in their ſtead; as is ſhewn at large by father Dacheri, in his Spicilegium, tom. viii.

None were excepted from theſe legal *duels*, but women, ſick people, and cripples, and ſuch as were under twenty-one years of age, or above ſixty.

The cuſtom was, for the two champions to enter a liſt, or ſmall incloſure, appointed by the authority of the ordinary judge, not only on criminal occaſions, but on ſome civil ones, for the maintenance of their right.

The monk Sigebert even relates, that a queſtion on a point of law being preſented to the emperor Otho I. viz. whether repreſentation had place in direct ſucceſſion? and the doctors finding themſelves embarraſſed in the reſolution thereof; the emperor remitted the deciſion of ſo critical a point to the judgment of arms, and pitched on two bold fellows to maintain the *pro* and the *contra*. The victory fell to him who contended for repreſentation; in favour of whom a law was immediately made, which is in force to this day.

This cuſtom came originally from the northern nations; among whom it was uſual to end all their differences by arms, as we are aſſured by Paterculus. It afterwards paſſed as a law among the Germans, Danes, and Franks; eſpecially after Gondebaud, king of the Burgundians, admitted it in lieu of ſwearing. Towards the concluſion of the fifth century, M. Godeau, in his hiſtory of the church, VII. cent. ſays, it was the Lombards who firſt introduced into Italy the barbarity of ſingle combats, whence the cuſtom ſpread throughout the reſt of Europe.

This mode of trial was introduced into England, among other Norman cuſtoms, by William the Conqueror; but was only uſed in three caſes, viz. one military, in the court-martial, or court of chivalry and honour; the ſecond, criminal, in appeals of felony; and the third, civil, upon iſſue joined in a writ of right, which was the only deciſion of ſuch writ of right after the Conqueſt, till Henry II. with conſent of parliament introduced the alternative of the grand aſſize, or a peculiar ſpecies of trial by jury. See BATTLE.

The preparation for the combat, and the proceſs of it, are deſcribed under the article CHAMPION. We ſhall only farther obſerve, that when the day of combat was come, they made choice of four cavaliers to guard the field; and performed diverſe ceremonies, prayers, oaths, &c. deſcribed by Paſquier, and other authors, and quoted by Du-Cange, who mentions an ordonnance of king Philip the Fair in 1306, preſcribing the ſeveral rules, conditions, and ceremonies, to be obſerved herein.

The method of trial by *duel* was inſtituted as a way of conſulting Providence, to learn who was the criminal; and it was imagined, that God, thus interrogated, would not fail to declare himſelf in favour of the innocent. But it happened ſo often, that the unjuſt accuſer came off victorious; that they at length began to be convinced, they muſt not preſcribe to his wiſdom, the neceſſity of interrupting the courſe of ſecond cauſes. This was giving rules to murder, and diſguiſing aſſaſſinations under method and meaſure.

Saxo Grammaticus obſerves, that as early as the year 981, the kings of Denmark had abrogated the proof by *duel*; and in lieu thereof, appointed the proof by red-hot iron, which was alſo annulled in its turn.

But *duels* were condemned before by a council held at Valentia, in 855, where the perſon who killed his enemy, was excommunicated; and the perſon killed was pronounced unworthy of burial. Afterwards, the popes Nicolas I. Celeſtine III. and Alexander III. likewiſe interpoſed; and Frederic I. and II. prohibited them in Germany; Louis VII. began to reſtrain them in France, in the year 1168; and St. Louis proceeded to aboliſh them, but his ordonnance, A. D. 1260, only took place in his own territories, and not in thoſe of his vaſſals. After his example, the counts d'Auvergne and Poictou, and ſeveral other lords, forbad them likewiſe. Philip the Fair, following the footſteps of his grandfather, St. Louis, at one time forbad all gages, or pledges of battle; and

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and yet he permitted them in four cases, in the ordonnance above mentioned of the year 1306. The last *duel* of note was in the year 1547, before king Henry II. between Jarnac and Chastaignerie, mentioned by Thuanus, and de Serres.

In England, the trial by *duel* is disused; though the law on which it is founded be still in force. It appears from Madox's History of the Exchequer, that trials of this kind were so frequent in England, that fines, paid on these occasions, made no inconsiderable branch of the king's revenue, vol. i. p. 349. The last trial of this kind was appointed in the year 1631, between Donald lord Rey, or Rhee, appellant, and David Ramsay, esq. defendant, in the painted chamber at Westminster. But that quarrel terminated without bloodshed, being accommodated by Charles I. as was also another of the same kind in 1571, by the interposition of Queen Elizabeth. Another instance occurs seven years after that, in 1631. Rushworth's Observations on the Statutes, &c. p. 266. See BATTLE and COMBAT.

DUEL is also used for a single combat on some private quarrel or occasion. See CHALLENGE.

The *duel* must be premeditated; otherwise it is only a rencounter.

The folly, or rather madness, of *duelling* reigned for some ages in France; where the flower of the nobless perished thereby. It is one of the glories of the late Louis XIV. to have used all his power and authority for abolishing *duels*. The severe edicts and laws he made against *duellists*, have, in a great measure, put a stop to the custom.

Deliberate *duelling* is by the law of England a species of murder; and accordingly, it charges both the crime and punishment of murder on the principals; and as some say, on their seconds also. Blackst. Com. vol. iv. p. 199. And yet, as Dr. Robertson observes, so powerful is the dominion of fashion, that neither the terror of penal laws, nor reverence for religion, have been able entirely to abolish a practice unknown among the ancients, and not justifiable by any principle of reason; though, at the same time, it must be admitted, that, to this absurd custom we must ascribe, in some degree, the extraordinary gentleness and complaisance of modern manners, and that respectful attention of one man to another, which, at present, render the social intercourses of life far more agreeable and decent than among the most civilized nations of antiquity. Hist. Ch. vol. iii. p. 16, &c. 8vo.

DUKE, Dux, a sovereign prince, without the title, or quality, of king. Such are the *duke* of Lorraine, *duke* of Holstein, &c.

The word is borrowed from the modern Greeks, who call *doucas* what the Latins call *dux*.

There are also two sovereigns, who bear the title of *grand-duke*; as, the *grand-duke* of Tuscany, and the *grand-duke* of Muscovy, now called the *czar*, or emperor of Russia. The heir of the throne of Russia is now called *grand-duke* of Russia. The emperor of Germany is *arch-duke* of Austria. The king of Poland assumes the title of *grand-duke* of Lithuania.

DUKE, Dux, is also a title of honour, or nobility, the next below princes.

The *dukedom*, or dignity of *duke*, is a Roman dignity, denominated *a ducendo*, leading, or commanding. Accordingly, the first *dukes*, *duces*, were the *ductores exercituum*, commanders of armies. Under the late emperors, the governors of provinces in war-time were intitled *duces*. In after-times the same denomination was also given to the governors of provinces in time of peace. The first governor under the name of *duke*, was a *duke* of the Marchia Rhætica, or Grisons, whereof mention is made in Cassiodorus; and there were afterwards thirteen *dukes* in the eastern empire, and twelve in the western. The Goths, and Vandals, upon their over-running the provinces of the western empire, abolished the Roman dignities wherever they settled. But the Franks, &c. to please the Gauls, who had long been used to that form of government, made it a point of politics, not to change any thing therein; and accordingly they divided all Gaul into duchies and counties; and gave the names sometimes of *dukes*, and sometimes of counts, *comites*, to the governors thereof.

In England, during the Saxons time, Camden observes, the officers and commanders of armies were called *dukes*, *duces*, after the ancient Roman manner, without any addition. After the Conqueror came in, the title lay dormant, till the reign of Edward III. who created his son Edward, first called the Black Prince, *duke* of Cornwall, which hath ever since been the peculiar inheritance of the king's eldest son, during the life of his father, so that he is *dux natus*, *non creatus*. After whom, there were more made, in such manner as that their titles descended to their posterity. They were created with much solemnity, *per cincturam gladii, cappæque, & circuli aurei in capite impositionem*. However, in the reign of queen Elizabeth, A. D. 1572, the whole order became utterly extinct; but it was revived about fifty years afterwards, by her successor, in the person of George Villiers, *duke* of Buckingham.

Though the French retained the names, and form of the ducal government, yet, under their second race of kings, there were scarce any such thing as *dukes*; but all the great lords were called *counts*, *peers*, or *barons*: excepting, however, the *dukes* of Burgundy, and Aquitain; and the *duke* of France, which was a dignity Hugh Capet himself held, corresponding to the modern dignity of maire de palais, or the king's lieutenant.

By the weakness of the kings, the *dukes*, or governors, sometimes made themselves sovereigns of the provinces trusted to their administration. This change happened chiefly about the time of Hugh Capet; when the great lords began to dismember the kingdom, so that that prince found more competitors among them than subjects. It was even with a great deal of difficulty they could be brought to own him their superior, or to hold of him by faith and homage.

By degrees, what with force, and what by marriages, these provinces, both duchies and counties, which had been rent from the crown, were again united to it. But the title *duke* was no longer given to the governors of provinces. From that time *auke* became a mere title of dignity, annexed to a person, and his heirs male, without giving him any domain, territory, or jurisdiction over the place whereof he is *duke*. All the advantages thereof now consist in the name, and the precedence it gives.

The *dukes* of our days retain nothing of their ancient splendor, but the coronet on their escutcheon; which is the only mark of their departed sovereignty. They are created by patent, cincture of the sword, mantle of state, imposition of a cap, and coronet of gold on the head, and a verge of gold in their hand.

The eldest sons of *dukes* are by the courtesy of England styled *marquisses*, though they are usually distinguished by their fathers second title, whether it be that of marquis or earl; and the younger sons, *lords*, with the addition of their christian name, as lord James, lord Thomas, &c. and they take place of viscounts, though not so privileged by the laws of the land.

A *duke* has the title of *grace*; and being writ to, he is styled, in the heralds language, *most high, potent, and noble prince*. *Dukes* of the blood royal are styled, *most high, most mighty, and illustrious princes*.

DUKE, among Hebrew grammarians, is an appellation given to a species of accents, answering to our comma. See ACCENT.

DUKE-DUKE, a quality given in Spain to a grandee of the house of Sylva, on account of his having several duchies from the uniting of two considerable houses in his person. Don Roderigo de Sylva, eldest son of Don Ruy Gomez de Sylva, and heir of his duchies and principalities, married the eldest daughter of the *duke* de l'Infantado; in virtue of which marriage, the present *duke* de Pastrana, who is descended therefrom, and is grandson of Don Roderigo de Sylva, has added to his other great titles, that of *duke-duke*, to distinguish himself from the other *dukes*, some whereof may enjoy several duchies, but none so considerable ones, nor the titles of such eminent families.

DULCIFYING. See EDULCORATION in, *Chemistry*.

DULCIMER, a musical instrument in the shape of a small chest or box, with strings on the lid of it.

DULCINISTS, in *Ecclesiastical History*. See APOSTOLICI.

DULCINO, in the *Italian Music*, a wind instrument, otherwise called *quart fagotto*. It serves for tenor to the hautboy, and is no more than a little bassoon. Bross. Dict. Mus. in voc.

DULCIS *Assa*, or *Asa*. See ASA.

DULEDGE, in *Gunnery*, a peg of wood which joins the ends of the six fellows, which form the round of the wheel of a gun-carriage; and the joint is strengthened on the outside of the wheel by a strong plate of iron, called the *duledge plate*.

DULIA, ΔΟΥΛΕΙΑ, *Service*. See WORSHIP, LATRIA, and HYPERDULIA.

DULKAK, among Arabian writers, a fabulous sea monster, in form of a man, riding on an ostrich, which is said to attack ships, and fight with the men on board. Hosm. Lex. in voc.

DULMA, a Turkish dish, made of any vegetable, as cucumbers, onions, cabbage leaves, &c. stuffed with forced meat. Pococke's Egypt, p. 183.

DULNESS *of hearing*. See HEARING.

DULWICH *Water*, a well-known mineral water near London. It contains a kind of cathartic bitter salt: it seems not to have any iron in it. Phil. Trans. N° 461. § 22.

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DUM *non fuit compos mentis*, in *Law*, a writ that lies for one, who aliens any lands or tenements while not of ſound memory or judgment, in order to recover the ſame from the *alienee*, againſt whom the writ is taken.

DUM *fuit infra ætatem*, in *Law*, a writ which lies for him, who, before he came to full age, made a feoffment of his land, to recover it again of the *vendee*. Fitz. Nat. Br. fol. 192.

DUMBNESS, the ſtate of a perſon who wants the natural uſe of ſpeech.

People born deaf, are ſaid to be all naturally *dumb*, as not being able to learn words.

Dumbneſs is ſometimes the reſult of the want, or even the ill conformation, of the tongue. Yet in the third tome of the Ephem. German. we have an account of a book, intituled, Jac. Rolandi Agloſſoſtomographia, ſive Deſcriptio Oris ſine Lingua, quod perfecte loquitur. See TONGUE and MUTE.

When this diſorder ariſes from deafneſs, it ſometimes admits of a cure. See Phil. Tranſ. N° 61. where Dr. Wallace gives an account of two perſons deaf and *dumb*, who were taught to underſtand and ſpeak a language. And in N° 245, the doctor gives an account of his method for this purpoſe.

DUN, in the *Manege*, a colour partaking of brown and black.

DUNDIVER, in *Zoology*, the name of a water-fowl, eſteemed a diſtinct ſpecies of bird, not only by the vulgar, but by the generality of authors, but being in reality no other than the female MERGANSER or gooſander. This is leſs than the male; the head and upper part of the neck are ferruginous; the throat white; the feathers on the hind part are long, and form a pendent creſt; the back, coverts of the wings, and tail, are of a deep aſh-colour; the greater quill-feathers are black, and the leſſer white; the breaſt and middle of the belly are white, tinged with yellow. The wings, both in this and in the male, are very ſhort in proportion to the ſize of the body; yet they fly along the ſurface of the water very ſwiftly. Ray and Pennant.

DUNG, in *Agriculture*, &c. All kinds of *dung* contain ſome matter; which, when mixed with the ſoil, ferments therein, and by that fermentation, diſſolves the texture of the earth, and divides and crumbles its particles very much. This is the real uſe of *dung* in agriculture; for as to the pure earthy part of it, the quantity is ſo very ſmall, that after a perfect putrefaction, it bears an extremely inconſiderable proportion to that of the earth it is intended to manure.

The fermenting quality of *dung* is principally owing to the ſalt it contains; and yet thoſe, or any other ſalts, applied immediately to the roots of plants, always deſtroy them. This proves, that the buſineſs of the *dung* is not to nouriſh, but to divide and ſeparate that terreſtrial matter, which is to afford the nouriſhment to vegetables through the mouths of their roots. And the acrimony of the ſalts of *dung* is ſo great, that the niceſt managers of vegetables we have, the floriſts, have wholly baniſhed the uſe of it from their gardens. The uſe of *dung* ſhould be alſo forbid in kitchen-gardens; for it is poſſible to ſucceed full as well without it; and it gives an ill taſte to all the roots and plants that are to ſtand in the earth, in which it is an ingredient. The water of a cabbage raiſed in a garden, manured with *dung*, if boiled, is of an intolerable ſtink; but this is not ſo much owing to the nature of the plant, as of the manure uſed to it; for a field-cabbage being boiled, the water has ſcarce any ſmell, and what it has, is not diſagreeable.

It is alſo a well-known fact in the country, that a carrot raiſed in a garden has nothing of that ſweet flavour, that ſuch as grow in the fields have; but inſtead of this natural reliſh, the garden one has a compound taſte, in which the matter of the manure has no ſmall ſhare. And there is the ſame ſort of difference in the taſte of all roots nouriſhed with ſuch different diet. *Dung* not only ſpoils the flavour of the eſculent vegetables, but it ſpoils the drinkables into the original compoſition of which it enters: they are obliged to uſe *dung* to the poor vineyards in Languedoc; and the conſequence is, that the wine is nauſeous. The poor, who only raiſe a few vines for the wine they drink themſelves, and cannot be at the expence of this manure, have the leſs of it, but then it is better, by many degrees, than the other; and it is a general obſervation which the French expreſs in theſe words, that the poor people's wine in Languedoc is the beſt, becauſe they carry no *dung* into their vineyards. Tull's Horſehoeing Huſbandry, p. 20. Another diſadvantage attending the uſe of *dung* is, that it gives riſe to worms. It is for this reaſon, that garden carrots are generally worm-eaten, and field carrots ſound; and the ſame obſervation will hold good in other vegetables, in the field and in the garden. Vegetable and animal *dung* are, in fact, only the putrefaction of earth, after it has been altered, by paſſing through vegetable or animal veſſels. Vegetable *dung*, unleſs the vegetable be buried alive in the ſoil, makes a much leſs ferment in it than animal *dung* does; but the *dung*, or putrid matter of vegetables, is much more eligible and wholeſome for the eſculent roots and plants, than that of animals is. Venemous animals are found to be very fond of *dung*, and are brought into gardens by the ſmell of the *dung* uſed in them as manure. The ſnakes uſually frequent *dung*-hills, and lay their eggs in them; and gardens where *dung* is much uſed, are always frequented by toads; whereas the fields where roots are planted, are much leſs infeſted by them.

However unneceſſary and prejudicial *dung* is in gardens, it is, however, very neceſſary in the corn-fields; and little can be done without it in the old method of huſbandry. *Dung* is not ſo injurious in fields as in gardens, becauſe it is uſed in much ſmaller quantities, in proportion to the quantity of ſoil; and cabbages, turneps, potatoes, and other things growing in fields, and intended only for the food of cattle, will not be injured by *dung*, tillage, and hoeing all together; for the crops will by this means be the greater, and the cattle will like the food never the worſe. *Dung* is very beneficial in giving very large crops of wheat; and it is found by experience, that the country farmer, at a diſtance from a large town, can never have ſo good crops by all his tillage, as thoſe who live in the neighbourhood of cities, where *dung* is produced in great plenty, and eaſily had. The *dung* uſed in fields, beſides its diſſolving and dividing virtue, is of great uſe in the warmth its fermenting gives to the young plants of the corn in their weakeſt ſtate, and in the moſt ſevere ſeaſons; the laſting of this ferment is not eaſily determined, becauſe the degrees of heat are very difficult to be judged of when they become ſmall.

The farmers uſually underſtand by the term *dung*, not only the excrements of animals, with the litter, but every thing that will ferment with the earth; ſuch as the green ſtalks and leaves of plants buried underground, and the like; and every thing they add to it, except fire.

The uſes of the *dungs* of ſeveral animals are ſufficiently proved every day. They are uſed to repair the decays of exhauſted and worn-out land, and to cure the ſeveral defects in different natural bad ſoils; the faults of which are as different as the nature of the different *dungs* uſed to improve them. Some land is too cold, moiſt, and heavy, and the other too light, and dry; and to improve and meliorate theſe, we have ſome *dung* hot, and light, as ſheep's, horſe's, pigeons, &c. and others fat and cooling, as that of oxen, hogs, &c. There are two remarkable qualities in *dung*; the one is to produce a ſenſible heat, capable of bringing about great efforts; the other is to fatten the ſoil, and render it more fertile. The firſt of theſe is ſeldom found in any but the *dung* of horſes or mules; the great effects of which, when newly made, and a little moiſt, are ſeen in the kitchen-garden, where it invigorates, and gives a new life to every thing, ſupplying the place of the ſun; and to this, in a great degree, we owe all the vegetable delicacies of the ſpring. Beſides, Horſe *dung* is the richeſt of all improvements that can be had in any quantity for poor hungry lands; yet, when either too new, or when uſed alone, it is very prejudicial to ſome lands; and if ſpread too thin on dry lands in ſummer, it becomes of very little ſervice; the ſun ſoon exhaling all its riches, and leaving it little more than a heap of ſtubble or dry thatch.

Horſe *dung* is always beſt for cold lands, and cow *dung* for hot ones; but being mixed together, they make a very good manure for moſt ſorts of ſoils, and for ſome they are very properly mixed with mud.

Sheep's *dung*, and deer's dung, differ very little in their quality, and are eſteemed by ſome the beſt of all *dung* for cold clays; for this purpoſe, ſome recommend the beating them to powder, and ſpreading them thin over the autumn or ſpring crops, at about four or five loads to an acre, after the ſame manner as aſhes, malt-duſt, &c. are ſtrewed. And in Flanders, and ſome other places, they houſe their ſheep at nights in places ſpread with clean ſand, laid about five or ſix inches thick; which, being laid on freſh every night, is cleared out once a week, and with the *dung* and urine of the ſheep is a very rich manure, and ſells at a very conſiderable price. It is principally uſed for ſtubborn lands; but Mr. Quinteney is of opinion, that it is the beſt of all manure for land in general.

Hog's *dung* is by many recommended as the fatteſt and richeſt of all *dung*; and is found on experience, to be better than any other kind for fruit trees, apples, pears, and the like. It is alſo a very rich *dung* for graſs; and is

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ſaid to do as much good in one load, as any other *dung* whatever in two.

The *dung* of pigeons, hens, and geeſe, are great improvers of meadow and corn land. That of pigeons is unqueſtionably the richeſt that can be laid on corn land; but before it is uſed, it ought to be expoſed for ſome time out of the dove-houſe to the open air, to take off its fiery heat. It is in general very proper for cold clay lands; but then it always ſhould be well dried before it is laid on, becauſe it is apt to clod in the wet. It is beſt alſo to mix it with ſome dry earth, to break its parts, that it may be ſpread the more regularly; and it is in itſelf ſo very rich and hot, as to bear ſuch an admixture without greatly impoveriſhing it. This *dung* is alſo by ſome recommended as better than any other for aſparagus, and ſtrawberries, and for the propagation and culture of the tender garden flowers. The *dung* of pigeons is alſo particularly recommended by Mr. Gentil for thoſe trees whoſe leaves are apt to turn yellow, if they grow in cold ſoils; but for this uſe, it ſhould firſt lie three years in a dunghill, and then be applied ſparingly in autumn, laying about an inch thickneſs of it at the root of the tree, and ſuffering it to remain there till the March following.

The *dung* of poultry being hot, and full of ſalts, tends much to facilitate vegetation, and is abundantly quicker in its operation than the *dung* of animals which feed on the leaves of plants. It is an obſervation of Sir Hugh Plat, that one load of grains will enrich ground, more than ten loads of common *dung*; and it is eaſy to infer from hence, that the ſame grain muſt needs be of greatly more virtue, when it has paſſed through an animal body. Human *dung* is alſo a great improver of all cold and ſour lands, but ſucceeds beſt when mixt with other *dungs* or earths, to give it a fermentation.

But for all ſtubborn clayey ſoils, there is no manure ſo good as the cleanſing of London ſtreets; the parts of tough land will be more expeditiouſly ſeparated by this than by any other compoſt; and where it is to be had, it is of the greateſt value both for field and garden land. Miller's Gard. Dict.

DUNG, *Gooſe*. This is a very valuable manure, and as uſeful to the farmer as pigeon's dung, or that of any other fowl. The ancients thought otherwiſe, and condemned it as prejudicial both to corn and graſs; and many are of the ſame opinion ſtill; but without any foundation in fact. Indeed where corn is high, and when graſs is ready to be mown, theſe birds, if they get among it, will do great damage, by treading it down with their broad feet; but their *dung*, inſtead of being hurtful to the land, does it great ſervice. Near Sutton, in Nottinghamſhire, there is a barren piece of land given by the town for a gooſe-paſture; the geeſe have been kept in it many years; and their dung has ſo enriched it, that it is one of the moſt fruitful pieces of ground in the whole country. There has been an opinion alſo, that cattle feeding on graſs, where theſe creatures had much dunged the ground, would ſuffer by it; but it appears from trial, that cattle are moſt fond of all of thoſe parts of paſtures where the geeſe have dunged moſt; and that they ſuffer no alteration by it, except the growing fat upon it. The *dung* of fowls in general is very enriching to land. And Fowley Iſland, in Lancaſhire, a place ſo called from the abundance of wild fowl continually found on it, is ſo enriched with their *dung*, that it fattens ſheep in a ſurprizing manner. See COMPOST and MANURING.

DUNG *in Medicine, the properties of*. The following properties are attributed by medical writers to the ſeveral kinds of *dung*.

Neat's *dung*, applied freſh, mitigates inflammations in wounds. The *dung* of goats, eſpecially of ſuch as live on the mountains, drank in wine, cures the jaundice; and exhibited with ſpices, provokes the menſes, and expels the dead fœtus. The *dung* of ſheep, applied as a cataplaſm, with vinegar, cures *epinyctides*, corns, *thymi*, and *acrochordones*; burnt and ſpread upon cerate of roſes, it ſerves for the ſame purpoſe. The *dung* of ſwine, dried, and drank in wine or water, ſtops vomiting of blood, and eaſes inveterate pains of the ſides; drank in vinegar, it is effectual in ruptures and ſpaſms; and applied in cerate of roſes, it cures luxations. The *dung* of horſes and aſſes, mixed with vinegar, repreſſes hæmorrhages. The *dung* of cattle, which feed on herbs, dried, infuſed in wine, and drank, is an excellent remedy for the poiſon of the ſcorpion. The *dung* of ſtorks, drank in water, is ſuppoſed to be good for the epilepſy; and the *dung* of a vulture, in a ſuffumigation, is ſaid to expel the dead fœtus. The *dung* of mice, pounded in vinegar, and rubbed on the part, cures an *alopecia*; and drank in mulſum, with frankincenſe, expels the ſtone; uſed in a ſuppoſitory for children, it ſtimulates the belly to excretion. The *dung* of dogs, evacuated in the canicular ſeaſon, dried, and drank in wine, or water, ſtops a looſeneſs. Human *dung*, applied freſh, preſerves wounds from inflammation, and at the ſame time conglutinates them: dried, and rubbed on the parts with honey, it is reported to give relief in a quinſey. The *dung* of the land crocodile, ſerves the women as a coſmetic, to render the ſkin of the face of a lively colour, and ſhining. James Med. Dict.

DUNG-*meers*, or *dung-hills*, in *Huſbandry*, places where ſoils and *dungs* are mixed and digeſted together. For this purpoſe, it is uſual to dig a pit, ſufficient to hold the ſtock of ſoil the huſbandman is capable of making; and to prepare it at the bottom with ſtone and clay, that it may hold the water and moiſture of the *dung*; and it ſhould be ſo ſituated, that the drips of houſes or barns may run into it. Into this pit they caſt refuſe fodder, litter, dung, weeds, &c. where they lie and rot together, until the farmer has occaſion for it. Where ſuch a pit is wanting, it is neceſſary to cover the dung with turf, or other ſtuff, to prevent the ſun and wind from drawing off its virtues. Compoſt *dung-hills*, which are formed by a mixture of earth with *dung*, lime, and other manure, are made with leaſt expence on the field for which they are intended.

DUNG-WORMS, a ſpecies of fly-worms, of a ſhort and ſomewhat flat body, found in great plenty among the cow-*dung* in the months of September and October. Theſe have all their metamorphoſes into the fly ſtate, performed within a ſhell of their own ſkin.

The fly produced from this worm, is one of Reamur's firſt claſs of the two-winged flies; it has a trunk with lips, and has no teeth; it is of the claſs of thoſe with the ellipſoid bodies; but its body is remarkably long for one of thoſe, and is compoſed of ſix rings: its head is very round, and nearly of a ſpherical form, and is large in proportion to its body; it has antennæ of the lenticular or battledore form; its reticular eyes are of a deep cheſnut brown; and its three ſmall eyes are placed in the common manner. Its corcelet is of a fine gilded green; and its back is not eaſily to be deſcribed as to colour, for it is changeable, and ſeems compoſed of a violet colour, and of a deeper and a paler copper colour. The under part, or belly, is of a pale yellow, and the legs and balancers of a yet paler yellow. Reaumur's Hiſt. Inſect. v. iv. p. 350.

DUNGEON, DONJON, in *Fortification*, the higheſt part of a caſtle built after the ancient mode; ſerving as a watch-tower, or place of obſervation: and alſo for the retreat of a garriſon, in caſe of neceſſity, ſo that they may capitulate with greater advantage.

The word comes from the French, *donjon*, which ſignifies the ſame; and which Fauchet derives from *domicilium*, becauſe the dungeon, being the ſtrongeſt part of the caſtle, was uſually the lord's apartment. Menage derives it from *dominione*, or *dominionus*, which in ſome ancient writings we find uſed in the ſame ſenſe. Du-Cange derives the appellation from *duno aut colle ædificatum*, which the barbarous writers have altered into *dunjo*, *dungeo*, *dongio*, *dangio*, *domgio*, and *domnio*.

In ſome caſtles, as that of Vincennes, &c. the *donjon* ſerves as a priſon for perſons they would have the moſt ſecurely kept; whence the general uſe of our word *dungeon*, for a dark cloſe priſon under ground.

DUNKERS, in *Eccleſiaſtical Hiſtory*, a religious ſect at Ephrata or *Dunker*-town, near Lancaſter, in Penſylvania, which took their riſe about fifty years ago, and conſiſting moſtly of Germans. Their name is ſaid to be derived from their mode of baptizing new converts, which is by dipping, after the manner of the Anabaptiſts. Their habit is a kind of long coat or tunic, made of linen, for the ſummer, and woollen for the winter, reaching down to the heels, with a ſaſh or girdle round the waiſt; and a cap, or hood, hanging from the ſhoulders, reſembling the dreſs of the Dominican friars. The men ſhave neither the head nor beard. The men and women have diſtinct habitations and governments: they have for this purpoſe erected two wooden buildings; in each of which there is a banqueting-room, and an apartment for public worſhip; ſo that they never meet together even at their devotions. They live chiefly on roots and vegetables, and eat no fleſh, except on occaſion of their love-feaſts, when the brethren and ſiſters dine together. The *Dunkers* allow of no intercourſe between the brethren and ſiſters, not even by marriage; a regulation not very favourable to their ſubſiſtence and increaſe; and if any break through this reſtraint, and marry, they are removed from communion with the unmarried, to a place about a mile diſtant, called Mount Sion. Their principal tenet is ſaid to be, that future happineſs is only to be obtained by penance and mortification in this life; and that, as Jeſus Chriſt, by his meritorious ſufferings, became

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became the Redeemer of mankind in general, ſo each individual of the human race, by a life of abſtinence and reſtraint, may work out his own ſalvation.

DUNLIN, in *Ornithology*, an Engliſh name of a bird of the ſnipe-kind, or the TRINGA *alpina* of Linnæus. It is of the ſize of the ſmaller ſnipe; its beak is furrowed; its belly is white, variegated with large black ſpots; the head, back, and upper part of the neck, are ferruginous, marked with black ſpots; and the lower part of the neck is white, marked with ſhort duſky ſtreaks; the tail is aſh-coloured; the legs black; and the toes divided to their origin. It is common in watry places, and on the ſea-coaſts in the northern counties of England, and picks up its food out of the mud. They are eſteemed a great delicacy. Ray's Ornitholog. p. 226.

DUNNAGE, in *Sea-Language*, a quantity of faggots, boughs of trees, or other looſe wood, laid in the bottom of a ſhip, either to raiſe the heavy goods which might make her too ſtiff, or to keep the cargo ſufficiently above the bottom, that it may receive no damage from the water, if the ſhip ſhould prove leaky.

DUNTER-*Gooſe*, a ſpecies of the wild gooſe, found in Zeatland. Phil. Tranſ. N° 473. § 8. See *Cuthbert* DUCK.

DUO, in *Muſic*, a ſong, or compoſition, to be performed in two parts only; the one ſung, and the other played on an inſtrument; or by two voices alone.

DUO is alſo when two voices ſing different parts, accompanied with a third, which is a thorough baſe. Uniſons and octaves are rarely to be uſed in *duos*, except at the beginning and end.

DUOBUS, *Pilulæ ex*, in *Medicine*. See PILLS.

DUOBUS, *ſal de*, is *vitriolated* NITRE.

DUODENA *Arteria*, and *Vena*, a branch of an artery, which the duodenum receives from the cœliac; to which anſwers a vein of the ſame name, returning the blood to the porta.

DUODENUM, in *Anatomy*, the firſt of the *inteſtina tenuia*, or ſmall guts; being that which receives the food half chylified from the ſtomach. See *Tab. Anat.* (*Splanch.*) *fig.* 1. *lit. b and i. fig.* 2 *lit c.*

It has its name *duodenum*, as being above twelve fingers breadth long; on which account, ſome call it *dodecadactylum*.

The *duodenum* ariſes from the pylorus, or right orifice of the ſtomach; whence deſcending towards the Spine, from right to left, quite ſtrait, it terminates where the circumvolution of the reſt begins.

Its coats are thicker, and its cavity or canal is leſs than any of the other inteſtines. At its lower end are two canals, opening into its cavity, one from the liver, and gall-bladder, called the *ductus communis choledochus*; and the other from the pancreas, called *pancreaticus*.

The *duodenum* is quite ſtrait; but the inteſtinum jejunum makes diverſe windings and inflexions: the reaſon is, that the bile, and pancreatic juice, mixing at the beginning thereof, or at the end of the *duodenum*, would otherwiſe precipitate not only the groſs parts of the excrements, but alſo the chyle itſelf, too haſtily. Brunnerus diſcovered a number of ſmall glands in the *duodenum*, which diſcharge a menſtruous lymph; ſo that the digeſtion of the aliment begun in the ſtomach is completed in the *duodenum*.

The deſcription and draughts of the *duodenum*, as given by moſt anatomiſts, appearing faulty, Mr. Monro has endeavoured to rectify their omiſſions and miſtakes in the Med. Eſſ. Edinb. vol. iv. art. 11.

This inteſtine is ſometimes found ſo large, as to be called *ventriculus ſuccenturiatus*.

Authors ſeldom take notice of the *duodenum* as the ſeat or cauſe of any particular diſeaſe; but its diſtention and preſſure on the many veſſels to which it is contiguous, may diſturb the functions of the animal œconomy; and accordingly it is the ſource of many diſorders, which may be relieved by emetics and purgatives.

DUPLA, DUPLE *Ratio*, is where the antecedent term is double the conſequent; or, where the exponent of the *ratio* is 2: — thus 6 : 3 is in a *duple ratio*. See RATIO.

DUPLE, SUB, *Ratio*, is where the conſequent term is double the antecedent; or, the exponent of the *ratio* is $\frac{1}{2}$: Thus, 3 : 6 is in a *ſub-duple ratio*.

DUPLA *Seſquialtera* } *Ratio*. See RATIO.
DUPLA *Superbipartiens tertias* }

DUPLE *Time*. See TIME.

DUPLICATE, a ſecond inſtrument, or act in writing; or a tranſcript, or copy of another.

The word is formed from the Latin *duploma*, or *duplum*, double.

It is uſual to ſend a *duplicate*, when it is apprehended the firſt diſpatch, &c. is loſt.

DUPLICATE, in *Chancery*, is particularly uſed for a ſecond letter patent granted by the lord chancellor, in a caſe where he had formerly done the ſame. See PATENT.

DUPLICATE *Ratio*, the *ratio* between the ſquares of two quantities. Thus the duplicate *ratio* of *a* to *b* is the *ratio* of *aa* to *bb*, or of the ſquare of *a* to the ſquare of *b*.

In a ſeries of geometrical proportions, the firſt term to the third is ſaid to be in a *duplicate ratio* of the firſt to the ſecond; or as its ſquare is to the ſquare of the ſecond: thus in 2, 4, 8, 16, the *ratio* of 2 to 8, is *duplicate* of that of 2 to 4; or as the ſquare of 2 to the ſquare of 4: wherefore, *duplicate ratio* is the proportion of ſquares; as triplicate is of cubes, &c. and the ratio of 2 to 8, is ſaid to be compounded of that of 2 to 4, and of 4 to 8.

DUPLICATE *Root*, among *Botaniſts*, one compoſed of two coats. See ROOT.

DUPLICATION, DOUBLING, in *Arithmetic*, and *Geometry*, the multiplying a quantity, either diſcrete or continued, by two.

DUPLICATION *of a cube*, is the finding of the ſide of a cube that ſhall be double in ſolidity to a given cube; which is a famous problem cultivated by the geometricians two thouſand years ago.

It was firſt propoſed by the oracle of Apollo at Delphos; which, being conſulted about the manner of ſtopping a plague then raging at Athens, returned for anſwer, that the plague ſhould ceaſe when Apollo's altar, which was cubical, ſhould be doubled. Upon this, they applied themſelves in good earneſt, to ſeek the *duplicature* of the cube, which henceforward was called the *Delian problem*. The problem is only to be ſolved by finding two mean proportionals between the ſide of the cube, and double that ſide; the firſt whereof will be the ſide of the cube doubled, as was firſt obſerved by Hippocrates Chius.

Thus let x and z be two mean proportionals between a and $2a$; then $a : x :: x : z = \frac{x^2}{a}$; and $x : \frac{x^2}{a} :: \frac{x^2}{a} : 2a$; therefore $x^3 = 2a^3$. Suppoſing the ſide of the given altar a to be 10, then the cube root of $2a^3$, or 2000, found by approximation, will be the ſide of the altar required, nearly.

Eutochius, in his comments on Archimedes, gives ſeveral ways of performing this by the meſolabe. Pappus Alexandrinus, and his commentator Commandine, give three ways: the firſt, according to Archimedes; the ſecond, according to Hero; and the third, by an inſtrument invented by Pappus, which gives all the proportions required.

The ſieur de Comiers has likewiſe publiſhed an elegant demonſtration of the ſame problem, by means of a compaſs with three legs; but theſe methods are all only mechanical.

Re-DUPLICATION. See REDUPLICATION.

DUPLICATUM *Arcanum*. See ARCANUM.

DUPLICATURE, in *Anatomy*, a doubling or folding of membranes, or other like parts.

Such are the *duplicatures* of the peritonæum, of the omentum, of the pleura, &c.

In the hiſtory of the French academy for the year 1714, an account is given of a young man, who died at the age of twenty-ſeven years, in the *duplicature* of whoſe meninges there were found little bones, that ſeemed to proceed out of the inner ſurface of the dura mater, and with their acute points ſtimulated the pia mater.

That *duplicature* of the peritonæum, wherein the ancients placed the bladder, is not found by the modern anatomiſts. Dionis.

Fabricius ab Aquapendente firſt diſcovered the *duplicature* of the cuticula.

DUPLODES. See GAMBEZON.

DUPONDIUS, in *Antiquity*, a weight of two pounds; of a money of the value of two aſſes. See AS.

As the as, at firſt, weighed a juſt pondo, or libra; the *dupondius* then weighed two. And hence the name.

And though the weight of the as was afterwards diminiſhed, and of conſequence that of the *dupondius* alſo; yet they ſtill retained the denomination. See POUND, and LIBRA.

DURA *Mater*, or *Meninx*, a ſtrong, thick membrane, which lines or covers all the inner cavity of the cranium, and includes the whole brain; being itſelf lined on its inner, or concave ſide, by the pia mater, or meninx tenuis. See *Tab. Anat. (Oſteol.) fig.* 4. *lit. ee. fig.* 6. *lit. cc.*

The *dura mater* ſticks very cloſe to the baſis of the ſkull, and its ſutures, by the fibres and veſſels it ſends to the pericranium.

It is faſtened to the pia mater, and the brain, by the veſſels which paſs from one to the other. It gives a coat, or covering, to all the nerves which riſe from the brain; and to the medulla ſpinalis, and all the nerves, which riſe from it.

Its ſurface is rough towards the ſkull, and ſmooth towards the brain. It is a double membrane, woven of ſtrong

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ſtrong fibres, which may be plainly ſeen on its inſide, but very little on its outſide next the ſkull; it has three proceſſes made by the doubling of its inner membrane. The firſt reſembles a ſickle, and is therefore called *falx*. The ſecond ſeparates the cerebrum from the cerebellum, down to the medulla oblongata, that the weight of the cerebrum may not offend the cerebellum, which lies under it. This proceſs is very ſtrong and thick, and in ravenous beaſts for the moſt part it is bony, becauſe of the violent motion of the brain. The third is the ſmalleſt, and ſeparates the external ſubſtance of the hind parts of the cerebellum into two protuberances.

In the *dura mater* are ſeveral ſinuſes, or channels, which run between its internal and external membranes; the four principal ones are the ſinus longitudinalis; the ſecond and third ſinuſes are called *laterales*; and the fourth, *torcular*. Beſides theſe, there are more of inferior note, mentioned by anatomiſts, as Du Verney, Dr. Ridley, &c. Their uſe is to receive the blood of the adjacent parts from the veins, to which they ſerve as ſo many trunks, and to diſcharge it into the internal jugulars.

The veſſels of the *dura mater* are, firſt, a branch from the carotid, while it is in its long canal, which is diſperſed in the fore and lower part of the *dura mater*; ſecondly, an artery, which enters the hole of the ſkull, called *foramen arteriæ duræ matris*: it is diſperſed on the ſides of this membrane, and runs as high as the ſinus longitudinalis; the vein which accompanies the branches of this artery, goes out of the ſkull, by the foramen lacerum. Thirdly, a branch of the vertebral artery, and vein, which laſt paſſes through the hole behind the occipital apophyſis, where they are diſperſed in the hind part of the *dura mater*. It has alſo nerves from the branches of the fifth pair, which give it an exquiſite ſenſe. It has a motion of ſyſtole, and diaſtole, which is cauſed by the arteries which enter the ſkull. No doubt, the great number of arteries in the brain contribute more to it, than thoſe few peculiar to itſelf; theſe may aſſiſt a little, though not very ſenſibly, becauſe of their ſmallneſs and paucity.

The uſe of the *dura mater* is to cover the brain, the ſpinal marrow, and all the nerves; to divide the cerebrum into two, and to hinder it from preſſing the cerebellum.

DURA *Portio*. See PORTIO.

DURABLE *Fortification*. See FORTIFICATION.

DURALE, or DURO, in the *Italian Muſic*, ſignifies hard, harſh, or, more properly, ſharp. This name is given to B natural, becauſe its ſound is ſharp, when compared with B mol, or flat.

DURANTA, in *Botany*, a genus of the *didynamia angioſpermia* claſs. Its characters are theſe: the flower is of the ringent kind, with one petal, which is erect and concave, and hath an empalement divided into five equal ſegments. It hath four ſhort ſtamina, the two middle ones ſhorter than the others. The germen, which is ſituated under the flower, afterward becomes a globular berry, with one cell, incloſing four angular ſeeds. There are two ſpecies, which being natives of warm countries, require a ſtove to preſerve them in winter.

DURATION, an idea we get by attending to the fleeting, and perpetual periſhing parts of ſucceſſion.

The idea of ſucceſſion we get by reflecting on that train of ideas, which continually follow one another in our minds, while awake. The diſtance between any parts of this ſucceſſion is what we call *duration*; and the continuation of the exiſtence of ourſelves, or any thing elſe commenſurate to the ſucceſſion of ideas in the mind, is called our *own duration*, or that of the thing co-exiſting with our thinking. So that we have no perception of *duration*, when that ſucceſſion of ideas ceaſes.

Duration, in Mr. Locke's philoſophy, is a mode, or modification of ſpace.

The ſimple modes of *duration* are any lengths, or parts thereof, of which we have diſtant ideas; as hours, days, weeks, months, years, time, eternity, &c.

Duration, as marked by certain periods and meaſures, is what we properly call *time*.

1. By obſerving certain appearances at regular, and ſeemingly equidiſtant periods, we get the ideas of certain lengths and meaſures of *duration*, as minutes, hours, &c. 2. By being able to repeat thoſe meaſures of time, as often as we will, we come to imagine *duration* where nothing really endures, or exiſts: thus we imagine, tomorrow, next year, yeſterday, &c. 3. By being able to repeat ſuch idea of any length of time, as of a minute, year, &c. as often as we will, and add them to one another, without ever coming to an end, we get the idea of eternity.

Time is to *duration*, as place is to ſpace, or expanſion. They are ſo much of thoſe boundleſs oceans of eternity, and immenſity, as is ſet out, and diſtinguiſhed, from the reſt; and thus they ſerve to denote the poſition of finite, real beings, in reſpect of each other, in thoſe infinite oceans of *duration* and ſpace.

DURATION *of action*. See ACTION.

DURATION *of an eclipſe*. See ECLIPSE.

DURATION, *ſcruples of half*. See SCRUPLE.

DURATION *of a ſolar eclipſe*. See ECLIPSE.

DURATION *of ſound*, in *Muſic*. See SOUND.

DURE, DOOR. See SUTH-*Dure*.

DURESSE, *Hardſhip*, in *Law*, is where a perſon is kept in priſon, or reſtrained of his liberty, contrary to order of law; or is threatened to be killed, maimed, or beaten. In which caſe, if a perſon ſo in priſon, or in fear of ſuch threats, make any ſpecialty, or obligation, by reaſon of ſuch impriſonment, or threats, ſuch deed is void in law; and in an action brought on ſuch ſpecialty, the party may plead, that it was brought by *dureſſe*.

DURION, in *Natural Hiſtory*, the name of a fruit common in China and the Eaſt Indies, and eſteemed by the Indians the fineſt of all fruits; but the Europeans do not eſteem it ſo highly, becauſe of its diſagreeable ſmell. The tree which bears it is large and much branched, and its wood is like that of the hazel. The leaves are of a very ſingular figure, being about ſix inches long, and ſixteen or eighteen inches broad; they terminate in a long and ſlender point. The upper ſide of the leaves is of a duſky green, the under ſide is whitiſh, with ſome yellow ſpecks. The leaves grow on ſhort pedicles, which are joined to the ſtalks by a protuberance or oblong knot. The fruit grows to the large branches, adhering to their middles by a ſtrong wood ſtalk. It is of the ſize of an ordinary melon, and of a conic ſhape, pointed at the extremity, and is all over beſet with prickles reſembling thoſe of a hedge-hog; they are green, and very large and thick. When thoroughly ripe, the fruit opens at the extremity into five parts, and the cracks or openings running by degrees up to the top, the inner ſubſtance or pulp is diſcovered. This is of a whitiſh colour, and of a very agreeable flavour, which may not unaptly be compared to that of cream and ſugar; but it is of a more firm conſiſtence. This fruit contains in every compartment five large ſeeds perfectly reſembling the common cheſnut, but that they have no other covering than their own ſkin.

The fruit itſelf, were the ſmell as agreeable as its taſte, would vie with any fruit in the world; but its very diſagreeable ſcent requires time and cuſtom to enable any one to bear it; but uſe makes the natives wholly diſregard it. The ſmell is very like that of onions, that have lain in heaps till they are very rotten. The fruit is not only agreeable to the taſte, but of a very cordial virtue; but it will intoxicate if eaten in a large quantity, eſpecially ſuch of the fruits as are of a yellowiſh colour. The natives make debauches with it, as our poorer people do with ſpirituous liquors. But it is not ſo eaſily come at as thoſe, and therefore is very fatal to many families among them, who will ſell their liberties for a time to purchaſe enough of it for a debauch. Mem. Ac. Sc. Par. 1699.

DURSIANS, or DURURIANS, in *Eccleſiaſtical Hiſtory*. See DRUSES.

DURUNEGI, in the *Materia Medica*, a name given by the Arabian writers to the root of the doronicum, which is ſo well deſcribed by Avicenna, that we are very well informed of its nature, and find it to be the root of the ſame plant, which we at this time know by that name. He ſays it came to them in pieces, looking like the ſhort joints of a woody root; and that it was either yellow or white on the inſide, and of a greyiſh colour on the ſurface, and that it was conſiderably hard and ponderous. The doronicum we know at this time has a root that very well anſwers theſe characters; and though yellow, when freſh, is very apt to become whitiſh in decaying.

The name *durunegi* is a very plain copy of the Greek name of the ſame plant, which is not doronicon, as might be ſuppoſed from the Latin doronicum, but *durunizi*, or δρυνιζι. The change of the ζ into a *g*, or the *g* into a ζ, is very common in the turning Greek into Arabic, or Arabic into Greek names. Thus the zedoar of the Greeks is the geduar of the Arabians, and ſo in a thouſand other inſtances.

The word *durunegi*, or, as it is ſometimes written, *duronegi*, is however ſometimes made to expreſs another plant, whoſe ſhape, as well as virtues, are very different from that above mentioned.

We have at this time two plants of the doronicum kind, the one called thora, and the other antithora; the one allowed to be a poiſon, the other by many eſteemed an alexipharmic. The thora, or poiſonous kind, is yellow within, and the antithora is white. Theſe may probably be the two kinds of *durunegi* mentioned by the Arabians; and if ſo, the poiſonous qualities of the one, and the virtues of the other, ſtand on a higher record than many have ſuppoſed. Theſe two roots were lately ſent over into

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into England among our parcels of gentian, and did much miſchief, many people ſuffering greatly by the bitter infuſions in which they made a part. This was probably owing wholly to the thora, or yellow root, which has a poiſonous ſmell; not to the other, which has all the appearances of being innocent.

DUST, minute and almoſt inſenſible particles broken off from any hard body.

Thoſe broken from ſtones, or formed of extremely ſmall ſtones, are more properly called *ſand*. See SAND.

The ſubtile matter of Des Cartes is a ſort of *duſt* produced by the colliſion of the matter of the ſecond element. See SUBTILE.

DUST, *Gold*, and *Lead*. See the reſpective articles.

DUST, *moſs*. See BYSSUS.

DUTCH *Coins*, *Fortification*, *Monies*, *Pens*, *Pink*, *Teleſcope*, *Tyles*, *Trading Companies*, *Meaſures*. See the ſubſtantives.

DUTCHY, in *Geography*, an appellation given to the dominions of a duke. See DUKE.

DUTCHY-*Court*. See COURT.

DUTY, in a moral ſenſe. See OFFICE.

DUTY *of marriage*. See MARRIAGE.

DUTY, in *Policy*, and *Commerce*, an impoſt laid by authority of a prince, &c. on merchandizes and commodities, either of his own country, or brought from abroad; towards ſupporting the expences of the government. See CUSTOMS, FUND, and TAXES.

The general principles on which all *duties* and cuſtoms ſhould be laid on foreign merchandizes, which are imported into theſe kingdoms, are ſuch as tend to cement a mutual friendſhip and traffic between one nation and another; and therefore due care ſhould be taken in laying them, that they may anſwer this end, and be reciprocal in both countries; and they ſhould be laid in ſuch a manner, that the exports of this nation may, at leaſt, be equal to our imports from thoſe nations with which we trade; ſo that a balance in money ſhould not be iſſued out of Great Britain to pay for the goods and merchandizes of other countries; to the end that no greater number of our land-holders and manufacturers ſhould be deprived of their revenues ariſing from the product of the lands, and the labour of the people, by foreign importations, than by exportations to ſuch countries. Dict. of Commerce, art. DUTIES.

The *duties* on various kinds of commodities are infinite. The principal are, the

DUTIES *of exportation*, and *importation*, paid upon the bringing in, or carrying out, of the diverſe kinds of goods, animals, and even perſons; agreeable to the tarifs ſettled between the ſeveral nations. See EXPORTATION, &c.

There is no ſtate in Europe, or perhaps in the world, where the *duties* of exportation and importation are ſo many, and ſo conſiderable, as in England. The two principal are the *duties* of tonnage and poundage. The firſt charged on liquors, in proportion to their meaſure, and content. See TONNAGE. The ſecond on the other commodities, and paid according to their value, ſettled in a tarif. See POUNDAGE.

Theſe two *duties*, which have a long time been on foot in England, were re-eſtabliſhed at the reſtoration of king Charles II. in 1660, upon the parliament's annulling all the laws made under Cromwell, and decreeing the execution of the ancient ordinances.

To theſe there have been ſeveral new *duties* added ſince that time; ſome of them for liquids, and the others on other kinds of commodities.

The DUTIES *on liquids*, are the ancient *duty* of tonnage, or old ſubſidy; the additional *duty*; *duty* of exciſe, *duty* of coinage, the old impoſition, the additional impoſition, the orphans money, the *duty* on French wines, the new ſubſidy, the *duty* on Hungary wines, and the one third, and two thirds ſubſidies, &c. See COINAGE, EXCISE, ORPHAN'S *Money*, SUBSIDY, &c.

The DUTIES on other commodities are the ancient *duty* of poundage; the additional *duty* of 1660, on linens and ſilks; the new impoſition of poundage, called the *impoſt of* 1690; another impoſition of four fifths in 1693; the *duty* of 25 *per cent.* on French goods, impoſed in 1695; the new ſubſidy of poundage in 1697; another additional ſubſidy of a third of poundage in 1703; another third in 1704; a *duty* on fiſh, oils, and whale-fins, in 1709; another on leather, vellum, and parchment, in 1711; a ſecond on the ſame goods, in 1712; and laſtly, in the ſame year, a *duty* on paper, paſte-board, and ſoap. See IMPOST, POUNDAGE, &c. and the principal articles of commerce.

The Engliſh merchants, it is to be obſerved, are not obliged to pay theſe ſeveral *duties* before twelve months; nor foreigners before nine; giving ſecurity for the ſame. Or, if they pay ready money, there is a deduction made them of 5 *per cent.* on the old new third, and two third ſubſidy, and on the other *duties* ſix, and one-fourth *per cent.* Add, that if theſe merchandizes be again exported into other countries, after they have been entered in England, the *duties* are returned; though this only within the compaſs of a year to natives, and of nine months to foreigners. See ALIEN *Duty*.

In Spain, the *duties* of export and import, are called *duties of alcavala*, and amount to about 5 *per cent.* of the value of the goods: for inſtance, the piece of velvet of forty Spaniſh vares, or yards, pays twenty rials; hats of Vigonia, five rials a-piece; linens, 224 rials *per* 100 vares; gold and ſilver laces, 2 rials 3 quarters the mark weight. The *duties* of exportation are nearly on the ſame footing.

In Portugal, the *duties* of importation were anciently the ſame on all kinds of goods; viz. 18 *per cent.* of the value. But ſince the year 1667, ſilks have been excepted out of the general tarif, and reduced to 13 *per cent.* For exportation the *duties* are only 6 *per cent.*

In Holland, the *duties* of *exportation*, and *importation*, are nearly alike; both of them being about the rate of 5 *per cent.* on the value of the goods. At Hamburgh, and Bremen, the *duties* are but 1 *per cent.* At Lubeck, three 4ths *per cent.* In Muſcovy, they are 5 *per cent.*

At Venice, theſe *duties* are $6\frac{1}{4}$ *per cent.* for what the natives import; and $10\frac{1}{2}$ to ſtrangers; the duties of exportation are 9 *per cent.* At Leghorn, the *duties* of exportation and importation are very inconſiderable; but, with the addition of a number of petty dues, they become as great as at Venice.

In the ports of the Levant, Conſtantinople, Smyrna, Aleppo, &c. the *duties* of *exportation* and *importation* are nearly on an equal footing, viz. 3 *per cent.* except to the Venetians, and Jews, who pay 5 *per cent.* The conſuls *duties* are likewiſe to be added for Smyrna, &c. which are about 2 *per cent.*

At Cairo, Alexandria, and ſome other cities of Egypt, the *duties* are of two kinds: one for goods brought in ſhips from Europe; the other for thoſe brought by the caravans from Aſia. The firſt are fixed at 20 *per cent.* the ſecond are arbitrary, but they are always very high. Beſide the ordinary *duty*, they here pay the golden *duty*, which is the tenth part of what is paid for the firſt *duty*. As to *duties* of exportation, they may be ſaid to pay none, the $1\frac{1}{2}$ *per cent.* being rather the cuſtom-houſe fee, than any *duty* paid the ſovereign.

DUTY, in the *Military Art*, is the exerciſe of thoſe functions that belong to a ſoldier; with this diſtinction, that mounting guard, and the like, where there is no enemy directly to be engaged, is called *duty*; but marching to meet and fight an enemy is called going on ſervice.

DUUMVIR, a general appellation among the ancient Romans, given to magiſtrates, commiſſioners, and officers, where *two* were joined together in the ſame function. So that they had almoſt as many *duumviri*, as they had officers joined two by two in commiſſion.

There were *duumviri* to direct the building, repairing, and conſecrating, of temples and altars; *capital duumviri*, who took cognizance of crimes, and condemned to death; *duumviri* of the marine, or navy, &c. But the moſt conſiderable of the *duumviri*, and thoſe uſually thus called by way of eminence, were the

DUUMVIRI *Sacrorum*, created by Tarquin, for the performance of ſacrifices, and keeping of the ſibyls books. Theſe were choſen from among the nobility, or patricians; and held their office for life: they were exempted from ſerving in war, and from the offices impoſed on the other citizens; and without them the oracles of the ſibyls could not be conſulted.

The commiſſion laſted till the year of Rome 388, when, at the requeſt of C. Licinius, and L. Sextius, tribunes of the people, they were changed into *decemviri*; that is, in lieu of *two* perſons, the truſt was committed to *ten*, who were half patricians, half plebeians.

Sylla added five more to their number, upon which they became denominated *quindecemviri*; their body was afterwards much increaſed, and at length amounted to ſixty; yet ſtill it retained the denomination of *quindecemviri*.

They were entirely aboliſhed under the emperor Theodoſius, along with the reſt of the heathen ſuperſtitions.

DUUMVIRI, *the capital*, *Duumviri Perduellionis*, were not ordinary magiſtrates; but created only on certain occurrences. The firſt commiſſioners of this kind were thoſe appointed to judge the ſurviving Horatius, for killing his ſiſter, after vanquiſhing the Curiatii.

There were alſo *duumviri* in the Roman colonies; who held the ſame rank and authority in their reſpective colonies, that the conſuls held at Rome. They were choſen out of the body of decuriones, and wore the prætexta, or robe bordered with purple.

We alſo read of *municipal duumviri*, whom Vigenere com-

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pares to our ſheriffs, or rather mayors of towns, whoſe authority laſted only five years.

DUUMVIRATE, DUUMVIRATUS, the magiſtrature, office, or dignity, of the *duumviri*. See DUUMVIR.

DUYT, in *Commerce*, a Dutch copper COIN.

DWALE, or DWAL, in *Heraldry*, the herb night-ſhade; uſed by ſuch as blazon with flowers and herbs, inſtead of colours and metals, for ſable, or black.

DWARF. See PYGMY, and STATURE.

Dwarfs were called *nani* and *nanæ* amongſt the Romans; and were held in ſuch requeſt, that artificial methods were uſed in order to prevent the growth of boys deſigned for *dwarfs*, by incloſing them in a box, or binding them with bandages. Auguſtus's niece Julia was very fond of one of theſe *dwarfs* called Sonopas, who was only two feet and a hand-breadth high.

In the Philoſophical Tranſactions we have well authenticated accounts of two *dwarfs*; one born in Norfolk, who, at the age of twenty-two, weighed no more than thirty-four pounds with all his clothes on, and whoſe height, including hat, wig, and ſhoes, was only thirty-eight inches; and another in Wales, who, at the age of fifteen, meaſured no more than two feet ſeven inches, and weighed only thirteen pounds; and who at that early period of life laboured under all the infirmities and calamities of very old age. Phil. Tranſ. vol. xlvi. p. 67. and vol. xlvii. p. 279.

DWARF-*trees*, a ſort of diminutive fruit-trees, frequently planted in the borders of gardens; thus called from the lowneſs of their ſtature.

Dwarf-trees were formerly very much in requeſt in gardens, but ſince the introducing of eſpaliers, they are much neglected. The manner however of propagating *dwarf* pears, which have been found to ſucceed the beſt of any *dwarfs*, is this: they are to be grafted on a quince ſtock, and that at about ſix inches above the ground; and when the bud has ſhot ſo far as to have four eyes, it is to be ſtopped, to give riſe to lateral branches. Two years after the budding, the trees will be fit to tranſplant to the ſpot where they muſt remain. They ſhould be ſet at five and twenty, or thirty feet ſquare diſtance, and the ground between may be ſown or planted for kitchen uſe while the trees are young, only obſerving not to plant too near their roots. There ſhould be ſtakes driven down all round the tree, to which the branches muſt be nailed with liſt, while they are young, training them into an horizontal direction, and no branches are to be ſuffered afterwards to croſs one another, and in ſhortening the ſhoots, the uppermoſt eye muſt always be left outwards. The ſummer and autumn pears are thoſe which do beſt in *dwarfs*, for the winter ones never ſucceed well on them.

Apples are alſo ſometimes planted as *dwarfs*, and are for this purpoſe moſt commonly grafted on paradiſe ſtocks. Theſe ſpread much leſs than the pears, and therefore need only be ſet at about eight feet diſtance. Some alſo plant apricots and plums for *dwarfs*; but theſe being of a more tender conſtitution ſeldom ſucceed well. Miller. See ESPALIER.

DWARF-*fern*. See *Dwarf*-FERN.

DYADIC *Arithmetic*. See ARITHMETIC.

DYE, in *Architecture*, the trunk of the PEDESTAL; or that part between the baſe and the cornice; being ſo named, becauſe it is frequently made in the form of a cube, or *dye*. See *Tab. Archit. fig.* 24, 25, 26, 27, 28.

It is alſo called *dado*, by the Italians; and by Vitruvius, *truncus*.

DYE is alſo uſed for a cube of ſtone, placed under the feet of a ſtatue, and over its pedeſtal; to raiſe it, and ſhew it the more.

DYER'S *Black*. See BLACK.

DYER's *Blue*. See BLUE.

DYER's *Broom*, the name of a ſpecies of geniſta. See BROOM.

DYER's *Green*. See GREEN.

DYER's *Weed*, in *Botany*, the *luteola* of Tournefort, and a ſpecies of the *reſida* in the Linnæan ſyſtem. For the generic characters, ſee *Baſe* ROCKET.

It grows in moſt parts of the world. The Greeks, of old, uſed it in dying yellow, as we do at this time, and called it *cymene*, and ſometimes *thapſia*, that word ſignifying, with them, ſeveral different things which had the property of dying yellow. It was called alſo by ſome *robia*, or *rubia*; but thoſe who gave it this name have always diſtinguiſhed it by ſome peculiar epithet from the common *rubia*, or madder. Paulus Ægineta mentions it as an herb uſed in dying cloths; and Neophytus, and ſeveral others, give it a place among the things uſed to tinge the hair. See WELD.

DYER's *Yellow*. See YELLOW.

DYING, the art, or act, of tinging cloth, ſtuff, or other matter, with a permanent colour, which penetrates the ſubſtance thereof.

Dying differs from bleaching, or whitening, which is not the giving a new colour, but the brightening of an old one. It alſo differs from painting, gilding, marbling, and printing, or ſtamping; becauſe the colours in theſe only reach the ſurface.

Dying may be defined, the art of colouring wool, linen, cotton, ſilk, hair, feathers, horn, leather, and the threads and webs thereof; with woods, roots, herbs, ſeeds, and leaves; by means of ſalts, limes, lixiviums, waters, heats, fermentations, macerations, and other proceſſes.

Dying, with regard to the manner of applying the colours, is divided into *hot*, and *cold*.

DYING *hot*, Θερμοβαφη, is that wherein the liquors and ingredients are boiled, before the cloth be dipped therein; or even where the cloths themſelves are boiled in the *dye*.

DYING *cold*. Ψυχροβαφη, is where the ingredients are diſſolved cold; or at leaſt ſuffered to grow cold, before the ſtuffs be put in them. Vid. Savar. D. Comm. tom. ii. p. 1697, voc. *Teinture*. Salmaſ. Exerc. ad Solin. tom. ii. p. 1167.

DYING, *origin and progreſs of*. The *dying* art is of great antiquity; as appears from the traces of it in the oldeſt ſacred as well as profane writers. The honour of the invention is attributed to the Tyrians; though whatleſſens the merit of it is, that it is ſaid to have owed its riſe to chance. The juices of certain fruits, leaves, &c. accidentally cruſhed, are ſuppoſed to have furniſhed the firſt hint. Pliny aſſures us, that, even in his time, the Gauls made uſe of no other *dyes*. It is added, that coloured earths, and minerals waſhed and ſoaked with rain, gave the next *dying* materials. But the purple, an animal juice, found in a ſhell-fiſh called *murex*, *conchylium*, and *purpura*, ſeems from hiſtory to have been prior to any of them. This, indeed, was reſerved for the uſe of kings and princes; private perſons were forbidden, by law, to wear the leaſt ſcrap of it. The diſcovery of its tinging quality is ſaid to have been taken from a dog; which, having caught one of the purple fiſhes among the rocks, and eaten it up, ſtained his mouth and beard with the precious liquor; which ſtruck the fancy of a Tyrian nymph ſo ſtrongly, that ſhe refuſed her lover Hercules any favours, till he had brought her a mantle of the ſame colour.

Pliny ſeems to aſcribe the invention of the art of *dying* wools to the Lydians of Sardis: *Inficere lanas Sardibus Lydi*; where the word *incepere* muſt be underſtood. But a modern critic ſuſpects a falſe reading here; and not without reaſon, for *Lvdi*, ſubſtitutes *Lydda*, the name of a city on the coaſt of Phœnicia, where the chief mart of the *purple-dye* was. Plin. Hiſt. Nat. lib. vii. cap. 56. Hardou. not. ad loc. Nurra, in Bibl. Choiſ. tom. xx. p. 193, ſeq.

After the Phœnicians, the Sardinians ſeem to have arrived at the greateſt perfection in the *dying* art; inſomuch that βαμμα Σαρδινιακον, *Sardinian dye*, paſſed into a proverb among the Greeks. Ariſtophanes in two places, to expreſs a thing red as ſcarlet, compares it to the βαμμα Σαρδινιακον. Salmaſius, Palmerius, and Spanheim, indeed, for Σαρδινιακον ſubſtitute Σαρδιανικον; which they ſuppoſe a poſſeſſive of Sardis, and to denote *Sardian dye*; but Nurra, in a diſſertation expreſly on the ſubject, has ſtrenuouſly ſupported the pretenſions of his country againſt this innovation. Ariſtoph. in Acharnan. v. 112. item Pax. v. 11. 74. I. Paul. Nurra Diſſ. de Varia Lectione Adagii BAMMA ΣΑΡΔΙΝΙΑΚΟΝ, tinctura Sardiniaca, Flor. 1709. 4to. Le Clerc. Bibl. Choiſ. tom. xx. p. 187, ſeq.

Till the time of Alexander we find no other ſort of *dye* in uſe but purple, and ſcarlet. It was under the ſucceſſors of that monarch, that the Greeks applied themſelves to the other colours; and invented, or at leaſt perfected, blue, yellow, green, &c. As to the ancient purple, it has been long loſt; but the perfection to which the moderns have carried the other colours, abundantly indemnifies them for the loſs. In this, particularly in the ſcarlet and black colours, the French, under the auſpices of that excellent miniſter M. Colbert, ſeem to have out-ſtripped moſt of their neighbours. See GOBELINS.

Among the Romans, the *dye-houſes*, *baphia*, were all under the direction of the *comes ſacrarum largitionum*; though they had each their peculiar præpoſitus, as at Alexandria, Tyre, &c. The method of *dying* and dreſſing woollen cloths was very imperfectly underſtood in England, in the year 1608; before which period they were ſent white into Holland, where they were *dyed* and dreſſed, and from thence brought back for ſale. In this year, Sir William Cockayne, an alderman of London, obtained a patent for *dying* and dreſſing of colours at home; but great confuſion ariſing from this grant, it was revoked in 1615. But in 1667, workmen were introduced into this country from the Netherlands, under whoſe

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whose direction the art was brought to a considerable degree of perfection.

The *dyers* of London make the thirteenth company of the city, incorporated under Henry VI. consisting of a master, warden, and livery. At Paris, and in most of the great cities in France, the *dyers* are divided into three companies; viz. those *of the great dye, du grand & bon teint*, who are only to use the best ingredients, and such as strike the surest and most lasting colours. *Dyers of the lesser dye, du petit teint*, who are allowed to use the inferior sorts of drugs, which only yield false and fading colours. And silk, wool, and thread *dyers*. All the higher-priced cloths and stuffs are reserved to the *dyers* of the first sort: those of less value, particularly such as are not rated at above forty sols the ell in white, are committed to the masters of the *petit teint*. Blue, red, and yellow, are reserved more peculiarly to those of the *grand teint*; browns, fallows, and blacks, are common to both sorts. As to black, it is begun by the *dyers* of the *grand teint*, and finished by those of the *lesser*. It seems there is a tradition among *dyers*, that Jesus Christ was of their profession; which we also find delivered in the *Gospel of the infancy of Jesus*, though on what grounded we know not; but it is hence that the Persian *dyers*, notwithstanding all their Mahometanism, have chosen Jesus for the patron of their art; insomuch that, among them, a *dye-house* is called *Christ's shop*. V. Notit. Imper. Hoffm. L. tom. i. p. 469. Pitisc. L. Ant. tom. i. p. 249. New View of Lond. tom. ii. p. 601. seq. Savar. Dict. Comm. tom. ii. p. 1668. voc. *Teint*. Sike Not. ad Evang. Infant. p. 55. Hilscher De Stud. Christ. in Misc. Lipsi. Obs. 96. § 10. tom. v. p 34.

DYING, *requisites in.* There are three things demanded by the Greek chemists to a good *dye*; viz. Ἀραιωσις, opening, or rarefying, of the body to be *dyed*, to dispose it to imbibe the colour. Βαφη, the tincture, or *dye*, itself. Κατοχη, or Στυψις, by the Romans called *alligatio*, the binding or fixing the colour, to prevent its fading, or being discharged. Some add a fourth condition, viz. Στιλψις, by the Latins called *lumen*, by us *lustre*, or *brightness*.

Among some, these three were done severally at three different operations, in different liquors, or decoctions: by the first, the stuff was prepared to receive the *dye*; this was called προβαφιον, and ὑποσυφη; by the second, the desired colour was given it; and by the third, the colour was fixed on it. But others did all three at once, with one decoction, and at one dip. Vid. Salmas. Exerc. ad Solin. tom. ii. p. 1146, seq.

DYING, *theory of*, is still far from being thoroughly known, or established; though many facts and observations, and particular processes, have been offered for this purpose. We shall collect the principal of them in the sequel of this article.

The basis of a just history of *dying*, must be a theory of light and colours. Two things, it may be observed, are chiefly aimed at in the inquiry of colours: the first, to increase the *materia tinctoria*; the second, to fix those colours we have.

In order to these, it may be remembered, that some colours are *apparent*; as those of flowers, the juices of fruits, and those of animals. Others are *latent*, and only discovered by the effects which the several species of salts, and other things, have on them.

Concerniug the *apparent* colours of vegetables and animals, and the effects of different salts in changing them from one colour to another, we have many instances in Mr. Boyle, collected and ranged in a new order by Dr. Lister: as, 1. That acid salts advance the colours of flowers and berries; thus they make the infusions of balaustia, or pomgranate-flowers, red roses, clove-july-flowers, mezerion, peas-bloom, violets, and cyanus-flowers, of a very fine red; and the juices of the berries of ligustrum, of black-cherries, and buckthorn-berries, of a much fairer red. To the same purpose it is observed, that acid salts make no great alterations upon the white flowers of jasmin and snow-drops.

2. Urinous salts and alcalies, on the contrary, quite alter the colours of the flowers last named, as well as the juices of the berries above mentioned, from red to green.

3. Urinous salts and alcalies advance, at least they do not hurt, the colours of the juices of vegetable leaves, woods, and roots. Thus urinous spirits and alcalies make the yellow infusions of madder-roots, red; of Brasil wood, purplish; of lignum nephriticum, blue; the red infusion of log-wood, purple; and that of the leaves of sena, red.

4. Acid salts quite alter the said infusions from red, or blue, to yellow.

5. Cochineal, which of itself is red, upon the affusion of oil of vitriol, an acid salt, strikes the most vivid crimson that can be imagined; and with urinous salts, and alcalies, it will be again changed into an obscure colour betwixt a violet and a purple.

6. All red, blue, and white flowers, are immediately, upon the affusion of an alcali, changed to a green colour; and thence, in no long process of time, they turn yellow.

7. All the parts of vegetables which are green, will, in like manner, strike a yellow with an alcali.

8. What flowers are already yellow, are not much changed, if at all, by an alcali, or urinous spirit.

9. The blue seed-husks of glastum sylvestre, old gathered, and dry, diluted with water, stain a blue, which, upon the affusion of lye, strikes a green; which said green, or blue, being touched with oil of vitriol, *dyes* a purple; and all these three colours stand.

10. On the tops of the fungus tubulosus are certain red knots, which, upon the affusion of lye, will strike a purple, and stand.

As for the *latent* colours in animals and vegetables, discovered to us by the affusion of salts, they likewise are very numerous. We will only mention a few. 1. The milky juice of the lactuca sylvestris costa spinosa, & sonchus asper & lævis, upon the affusion of lye, will strike a vivid flame-colour, or crimson; and, after some time, quite degenerate into a dirty yellow.

2. The milk of the cataputia major, upon the affusion of lye, especially if it be drawn with a knife, and have any time stood upon the blade thereof, will strike a purple or blood-red colour, and soon after will change into a dull yellow.

3. The common hawthorn-caterpillar will strike a purple, or carnation, with lye, and stand.

4. The heads of beetles, pismires, &c. will, with lye, strike the same carnation colour, and stand.

5. The amber-coloured scolopendra will give, with lye, a most beautiful and pleasant azure, or amethystine, and stand.

It remains to be observed, 1. That in all the instances above mentioned, whether vegetable or animal, there is not one colour truly fixed; though there may be some use made of them as they are. By *not truly fixed*, we mean, not proof against salt and fire; for what seem to stand, and be lye-proof, are either wholly destroyed by a different salt, or changed into a much different colour; which must needs prove a stain and blemish, when it shall happen in the use of any of them.

2. That both the apparent and latent colours of vegetables are fixable; an instance whereof we may observe in the seed-husks of glastum, and the use *dyers* make of the leaves of that plant, after due preparation.

3. It is probable, from the same instance, that we may learn from the colour of some part of the fruit, or seed, what colour the leaves of any vegetable, and the whole plant, might be made to yield for our use.

4. That the latent colours of vegetables are pre-existent, and not produced; from the same instance of woad, and likewise from this, that the milky juice of lactuca sylvestris affords of itself a red serum.

5. That the change of colours in flowers is gradual and constant.

6. That the colours of flowers, which will not stand with lye, seem to be wholly destroyed by it, and irrecoverable. Thus one part of a violet leaf, upon the affusion of lye, is changed very soon into yellow, and will never be revived into a red by an acid salt; but if another part of the same leaf be still green, it will be revived.

7. The dryness seems to be a means, if not of fixing, yet of bringing the vegetable colour into a condition of not wholly and suddenly perishing by the otherwise destroying alcali.

8. That those plants, or animals, which will strike different, yet vivid colours, upon the affusion of different salts, and stand, as the cochineal, and glastum, are of all others to be reckoned the best. Vid. List. in Phil. Transf. N° 70. p. 2132. See also Boerh. Elem. Chem. part iii. tom. ii. p. 467. edit. Leipsi.

Many more valuable colours may be drawn from the vegetable kingdom, if the world would be at the pains of enquiring more minutely into the properties of plants. Mr. Jussieu observed in the drying plants between sheets of paper, in order to the making a hortus siccus in the common way, that some plants tinged the paper with colours the same with those they naturally possess, and others with different ones; and that many plants in drying assumed a colour which was not natural to them. Alkanet, woad, the several sorts of gallium, and some of the species of anonis, tinge the papers between which they are dried to a yellowish or reddish colour, because their stalks, or some other part of them, are of that colour. The common ros solis, or sun-dew, whose leaves are red, tinges the paper red also; and the ros solis of Portugal diffuses this tinge through three or four sheets

of

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of paper. The alpine veronica, though green in itſelf, leaves its mark in red upon the paper; and many of the common leguminous plants always become black in the drying. The common mercury, which is green while growing, becomes blue in the drying; and turneſol has the ſame change, though it is white in its natural ſtate.

One great reaſon of theſe changes of colour is, that all paper is impregnated with alum; and this ſalt may very eaſily extract, or even alter the colours of plants, whoſe juices it receives; and in ſuch caſes, where the alum is not in ſufficient quantity to do this, it is no wonder that it ſhould however ſo far affect the leaves as to turn them black.

On this principle Mr. Juſſieu attempted, by means of alum, to ſeparate colours from ſeveral plants, not known or uſed at preſent among the dyers, which might prove ſerviceable to them. The firſt experiments made on this occaſion proved, that there were many plants not uſed at preſent, which afford colours not at all inferior to thoſe in common uſe. The experiments the ſame gentleman tried on the drugs uſed for *dying* in the Indies, proved very plainly that they were no way ſuperior in many caſes to vegetables of our own growth; and that in order to have the moſt lively colours from ſuch ſubſtances, it is always neceſſary to have recourſe to ſome ſalt.

Among the other drugs uſed abroad in *dying*, there were ſent over to France, on this occaſion, certain yellow flowers of the radiated kind, which afforded on trial a very beautiful yellow *dye*; and Mr. Juſſieu found, on trying parallel experiments, that there were alſo yellow flowers in Europe of a like radiated kind, which were capable of affording a like beautiful yellow *dye*.

The flower which Mr. Juſſieu tried theſe experiments upon, was the common yellow corn marygold, the chryſanthemum ſegetum of Lobel. This plant flowers in the middle of July; and Mr. Juſſieu drying its flowers between papers at that time of the year, found that they did not loſe their colour, as moſt others do in the operation, but became of a deeper yellow than before. Hence it was eaſy to judge, that this flower contained a matter proper for colouring; and decoctions being made of it of different ſtrengths, cloths of different kinds dipped into them became tinged to a light pale yellow, and kept this colour after being boiled in fair water. A little alum was after this added to the decoctions, and cloths dipped in theſe became much more finely *dyed*, the colour being much ſtronger and more lively. They alſo imbibed the colour much more ſpeedily from theſe decoctions; and on boiling afterwards in water, they loſt no part of it, but remained as ſtrongly and as lively tinged as before. This experiment was afterwards tried by a *dyer*, under whoſe hands it ſucceeded much better than before with Juſſieu, who was unacquainted with the regular methods of the trade. The decoction of the flowers gave a ſort of ſulphur colour; but linen, woollen, and ſilken things, which had been the day before ſteeped in alum water, received from this decoction a very beautiful and ſufficiently ſtrong yellow. Another decoction of the flowers made ſtronger than the firſt, tinged a woollen cloth to a greeniſh lemon colour; and the ſame decoction gave a bright gold yellow to ſilk; and a piece of woollen cloth, before *dyed* blue with indigo, on dipping it in this decoction became of a beautiful deep green. A ſmall quantity of chimney-ſoot added to the decoction made it tinge cloth to a yellowiſh brown; and a ſmall quantity of roucou added to the ſimple decoction produced an olive yellow.

The mixture of ſeveral other drugs uſed to be added to the decoction of the common luteola, or dyer's weed, to vary its tinge, produced the ſame changes with the decoction of this flower, and abundantly teſtified its value and uſe in the *dying* trade. Mem. Acad. Par. 1724.

With reſpect to the theory of *dying*, it is farther to be obſerved, 1. That all the materials, which of themſelves give colour, are either red, yellow, or blue; ſo that out of them, and the primitive fundamental colour, white, all that great variety, which we ſee in dyed ſtuffs, ariſes. 2. That few of the colouring materials (as cochineal, ſoot, wood-wax, or woad) are in their outward and firſt appearance, of the ſame colour, which by the ſlighteſt ſolutions in the weakeſt menſtrua, they dye upon cloth, ſilk, &c. 3. That many of the colouring materials will not yield their colours without much grinding, ſteeping, boiling, fermenting, or corroſion by powerful menſtrua; as red-wood, weld, woad, arnotto, &c. 4. That many of the ſaid colouring materials will of themſelves give no colouring at all, as copperas, or galls, or with much diſadvantage, unleſs the cloth, or other ſtuff to be dyed, be firſt covered or incruſtated as it were, with ſome other matter, though colourleſs, aforehand; as madder, weld, and brazil, with alum. 5. That ſome of the colouring materials, by the help of other colourleſs ones, do ſtrike different colours from what they would alone, and of themſelves; as cochineal, and brazil. 6. That ſome colours, as madder, indigo, and woad, by reiterated tinctures, will at laſt become black. 7. That though green be the moſt frequent and common of natural colours, yet there is no ſimple ingredient, which is now uſed alone, to dye green with upon any material; ſap-green, the condenſed juice of the rhamnus or buckthorn-berry, being the neareſt; and this only uſed by country people. 8. There is no black thing in uſe which dyes black; though both the coal and ſoot of moſt things burnt, or ſcorched, be of that colour; and the blacker, by how much the matter, before it was burnt, was whiter, as in the famous inſtance of ivory black. 9. The tincture of ſome *dying* ſtuffs will fade even with lying, or with the air, or will ſtain even with water; but very much with wine, vinegar, urine, &c. 10. Some of the dyers materials are uſed to bind and ſtrengthen a colour; ſome to brighten it; ſome to give luſtre to the ſtuff; ſome to diſcharge and take off the colour, either in whole or in part; and ſome out of fraud, to make the material dyed, if coſtly, to be heavier. 11. Some *dying* ingredients, or drugs by the coarſeneſs of their bodies, make the thread of the dyed ſtuff ſeem coarſer; and ſome by ſhrinking them, ſmaller; and ſome by levigating their aſperities, finer. 12. Many of the ſame colours are dyed upon different ſtuffs with different materials; as red-wood is uſed in cloth, not in ſilks; arnotto in ſilks, not in cloth; ſo that they may be died at ſeveral prices. 13. Scowering, and waſhing of ſtuffs to be dyed, is to be done with appropriate materials; as ſometimes with ox-galls, ſometimes with fullers earth, ſometimes with ſoap: this latter, however, is pernicious in ſome caſes, where pot-aſhes will ſtain or alter the colour. 14. Where great quantities of ſtuff are to be dyed together, or where they are to be done with great ſpeed, and where the pieces are very long, broad, thick, &c. they are to be differently handled, both in reſpect to the veſſels and ingredients. 15. In ſome colours and ſtuffs the tingent liquor muſt be boiling; in other caſes only blood-warm, in ſome it may be cold. 16. Some tingent liquors are fitted for uſe by long keeping; and in ſome the virtue wears away by the ſame. 17. Some colours, or ſtuffs, are beſt dyed by reiterated dippings ever into the ſame liquor at ſeveral intervals of time; and ſome by continuing longer, and others for a ſhorter time therein. 18. In ſome caſes, the matter of the veſſels wherein the liquors are heated, and the tinctures prepared, muſt be regarded; as that the kettles be pewter for bow-dye. 19. Little regard is had how much liquor is uſed in proportion to the dying drugs; the liquor being rather adjuſted to the bulk of the ſtuff, as the veſſels are to the breadth of the ſame; the quantity of *dying* drugs being proportioned to the colour higher or lower, and alſo to the ſtuffs; as likewiſe the ſalts are to the *dying* drugs.

Concerning the weight which colours give to ſilks, for in them it is moſt taken notice of, as being ſold by weight, and being a commodity of great price; it is obſerved, that one pound of raw ſilk loſes four ounces by waſhing out the gums, and natural ſordes. That the ſame ſcowered ſilk may be raiſed to above thirty ounces from the remaining twelve, if it be dyed black, with certain materials. That the reaſon why black colour may be dyed the heavieſt is, that all ponderous drugs may be dyed black, being all of colours lighter than it; whereas, perhaps, there ſeem to be few or no materials wherewith to encreaſe the weight of ſilk, which will conſiſt with fair light colours; ſuch as will having been uſed, as white arſenic to carnations.

Of things uſed in dying, eſpecially black, nothing encreaſes weight ſo much as galls; by means whereof black ſilks recover the weight which they loſt by waſhing out their gum. Nor is it counted extraordinary, that blacks ſhould gain about four or ſix ounces in the dying upon each pound. Next to galls, old fuſtic increaſes the weight about 1 ½ in 12. Madder about an ounce in the pound. Weld half an ounce. The blue fat, in deep blues of the fifth ſtall, adds no conſiderable weight. Neither do logwood, cochineal, or arnotto; nor even copperas of itſelf, where galls are not uſed. Slipp adds much to the weight, and gives a deeper black than copperas, which affords a good excuſe for the dyers that uſe it. Petty's Appar. to Hiſt. of Dying, ap. Sprat. Hiſt. R. S. p. 302.

There is great reaſon to believe, that the art of *dying* might be carried to much greater perfection than it is at preſent, if the attempts to improve it were in proper hands, and the perſons employed in it could be enabled to ſet out with all the knowlege there is at preſent in regard to its ſeveral materials, and their manner of uſe, as a fund of real facts on which to ground future diſcoveries. This however ſeems difficult to be brought about; for

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for the people who exerciſe the art generally are acquainted only with a certain ſet of rules, which though they know not why they follow, yet they will not depart from them, and eſteem every thing a loſs of time that can be propoſed to them as improvements. They keep their knowlege alſo a cloſe ſecret from thoſe who might be expected to improve upon it; and uſually one man trades only in ſome one part of it, without any knowlege of the reſt. Hence the difficulties attending the acquiring a knowlege of the firſt principles of the art are very diſcouraging, but they are not inſurmountable. The idea which preſents itſelf moſt naturally to us, as to the manner in which ſtuffs are dyed, is, that the colouring particles which ſwim in the liquor, immediately attach themſelves to the ſurface of the body that is plunged into it, and there adhere in ſo firm a manner, that there is no removing many of them without wholly taking off the ſurface of the body. The barely plunging a white ſubſtance into a coloured liquor is not however ſufficient for the *dying* it in many caſes. Indeed there are only a few colours which will ſtrike with this eaſe and facility; and the others require that the matter to be dyed ſhould have firſt received the particles of another fluid, which is in moſt caſes a ſolution of alum and tartar in common water. And, according to the nature of the colour that is to be given the ſtuff afterwards, the alum is put in in large quantities, or the ſtuff boiled in the liquor a longer or a ſhorter time. After boiling in this liquor, a ſtuff is in the proper condition to receive the greater part of the common colours; but for blue, ſtuffs require no preparation at all; and for ſcarlet, the liquor in which they are firſt boiled is made without alum.

The matter of the ſtuff to be dyed makes it neceſſary alſo to change the liquor in which it is to be boiled, or to vary the ingredients; and the greateſt naturaliſt, without a mechanical knowlege of *dying*, would be amazed to ſee, that if a ſkain of white wool, and another of white cotton, be plunged together into the ſcarlet dye, and this even after they have both received the ſame previous boiling and preparation, the ſkain of cotton would come out of the liquor as white as it was put in, while the wool comes out tinged to a beautiful fire colour. The dyer, however, ſees this every day, without any admiration of the cauſe, and never troubling his thoughts about the manner in which it is done. He uſes it daily to dye any thing woollen to a ſcarlet colour, leaving a part white; in order to which, he knows there requires no more than that the part to be left white ſhould be of cotton.

Mr. Dufay ſuppoſing this to be owing to the cotton's imbibing much more ſlowly than the wool, the liquor in which they are both previouſly boiled to make them receive the colour, as the cotton is well known not to take wet ſo ſoon as wool, ordered a ſort of cloth to be wove, the warp of which was wool, and the woof cotton; and ſending this to the fuller's, the two ſubſtances were ſo well blended together, that it became impoſſible for the one to receive the impregnation of any liquor without the other. With all theſe precautions, however, the whole came out of the ſcarlet dye in the ſame condition as if nothing had been done, the cotton remaining wholly white, and the wool being marked with fire colour and white; ſo that it may be eſteemed a certain fact, that the colour of cochineal cannot be given to cotton by the means of acids; the ſame alſo holds good of kermes and gum lac, both which are uſed inſtead of cochineal to dye in ſcarlet; but neither of theſe, any more than the cochineal, will dye cotton. It is not to be concluded from hence, however, that cotton cannot be dyed ſcarlet by theſe ſubſtances; the whole is, that it requires a different treatment; and as wool, to take the ſcarlet dye, requires only to be firſt impregnated with tartar, cotton requires to be firſt impregnated with alum, as wool does, for the generality of the other colours. The acid of ſea-ſalt, of vitriol, vinegar, and verjuice, all ſerve to dye wool to a ſcarlet with cochineal, but none of theſe will make it give any tinge to cotton, to which alum alone can ſerve.

The ſame dye will give very different colours to the different parts of a cloth, which have been differently prepared. And this gentleman ſhewed before the academy a piece of cloth, which he had carefully prepared in a different manner in the different parts, which being all plunged together in the dye, when taken out and dried was found to be of a dirty red in that part where it had not been impregnated with any thing; and in the other parts, where it had been differently impregnated, was found of all the degrees of red, from a pale damaſk roſe colour to the deepeſt ſcarlet, and this while it had in every part been dipt an equal time in the ſame dye. This equally holds good of the other colours. And in theſe experiments the dirty colours given to ſuch parts of the cloth as have received no previous impregnation, will be waſhed away, and quite carried off, while the others remain in all their perfection.

Another circumſtance very worthy attention in the *dying* of ſcarlet is this, that the dye is evidently compoſed of a clear or common water, in which the colouring particles are ſuſpended, and from which it is eaſy to ſuppoſe that they are ſeparated and applied to the ſtuff in *dying*. As this is naturally ſuppoſed to be the caſe in regard to all colours, ſo it appears very evidently to be a fact in this, ſince the colouring particles adhere in ſuch quantities to the matter, and ſeparate themſelves ſo readily and perfectly from the water, that after an hour and half's boiling of the dye with a proper quantity of the ſtuff in it, the whole coloured matter ſhall be attached to the ſtuff, and the remaining liquor be only clear water; and what might appear wonderful is, that all the boiling in the world will never diſlodge any of the colour from the ſtuff, or occaſion its being received into the water again. It might be ſuppoſed that this was wholly owing to the particles of ſalts, which had been imbibed into the ſtuff in its prior preparation; that theſe attracting the particles of the colour to the ſtuff, while the water of the dye had none of them to cauſe ſuch an attraction in it, they did not remain in it. But this appears not to be the caſe, but that the ſtuff will attract the colour, whether it be previouſly prepared, or the preparation and the *dying* be all one act; ſince the dyers ſometimes dye ſcarlet at once in this manner, only plunging the ſtuff into a dye made of cochineal, a ſolution of tin mixed in a large quantity of water, with a ſmall quantity of ſal ammoniac, and cream of tartar. All theſe ingredients are mixed together before the ſtuff is put in; yet after it has boiled about an hour and a half, all the colour is in the ſtuff, and the liquor is become colourleſs as water. The event is the ſame in the dyes made of woad and indigo for the *dying* blue, and indeed in the greater part of other colours; but as the ingredients of theſe are not ſo pure as the cochineal, and there are uſually many heterogene particles among them, the liquor does not become ſo wholly colourleſs in theſe, as in the caſe of the ſcarlet. But the dyers, who well know that ſo long as there is any colour left in the liquor, ſo long the ſtuff will be profited by remaining in it, always take ſmall quantities out of it, and examining it by pouring it gently down againſt the light, they know when it is that the ſtuff has received all the tincture it can, by there being no more colouring matter ſuſpended in the dye.

Experience ſhews, that all colours do not attach themſelves with equal readineſs to the ſtuff, or remain equally firmly united to it. Woad, indigo, cochineal, kermes, and many other colours, never reach farther than the ſurface of the ſtuff. The liquor of the dye penetrates indeed perfectly through the body of it, but the colouring particles ſtopping at the ſurface become entangled there, and never penetrate, at leaſt not in any great quantity, to the central part, which remains either quite white, or only very ſlightly tinged. This however only happens to ſuch ſtuffs as are thick, and of a very cloſe texture; others are coloured throughout. And this is only the caſe in regard to ſome dyes, not to all ſorts, ſince the moſt of the wood colours penetrate wholly through the ſtuff be it ever ſo thick, and colour it equally every where. Whence it ſeems probable, that the colouring particles of the woods are either more minute and fine, or much more intimately blended with the water, than thoſe of cochineal, indigo, and ſuch others as do not penetrate beyond the ſurface.

It might ſeem ſtrange, that the ſtuffs which are thus readily coloured on the ſurface, ſhould not afterwards, by the continual boiling of the water, have the colouring particles carried farther down into the body, as the water continually penetrates the whole from each ſurface to the center, and might naturally be expected to carry a part of the colouring particles in along with it. But if we conſider the whole proceſs from the beginning, we find that the colouring particles are ſtrongly attracted by the ſtuff, and ſcarce at all by the water. Whence they almoſt immediately leave the water, and attach themſelves to the firſt part of the ſtuff they come in contact with, which is its ſurface; and when once fixed there, it is no wonder that the particles of water, ever ſo long paſſing by them, do not attract or take them away from this ſurface, as they muſt do in order to carry them in; ſince we have before had proof, that their attraction to the water is greatly weaker than that to the ſtuff. And the difference between the wool and the cotton, the one receiving, and the other not receiving at all the coloured particles in its natural ſtate, or with the ſame impregnation, by means of which the other does, ſeems reſolvable into the ſame principle, that though the attraction in wool be much greater in regard to the coloured

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particles than that of the water, and therefore it robs the water of them; yet the attraction in cotton being leſs than in water, the colouring particles remain in the water without any tendency to attach themſelves to the cotton. Mem. Acad. Sc. Paris. 1737.

M. Hellot's theory of *dying* is, that the colouring particles are fixed into the pores of ſtuffs chiefly by means of a vitriolated tartar, which he believes to exiſt in each proceſs, to be produced by the acid of alum and alkaline baſis of tartar in the proceſs for red and yellow dyes, to exiſt originally in the pot-aſh employed in the blue dye, and in the nuts and roots employed in the root-coloured dye. He ſuppoſes that the pores of the ſtuff are cleanſed and enlarged by the preparatory ſalts, and by the boiling water, ſo as to receive the colouring particles, which particles are afterwards detained by the contraction of the pores occaſioned by cold; and farther, that theſe pores are lined with a ſaline cruſt of vitriolated tartar, or of tartar; which ſalts being difficultly ſoluble in water, retain firmly the colouring particles. But this theory, ſays the ingenious tranſlator of the Dictionary of Chemiſtry, cannot be admitted, when we conſider that vitriolated tartar does not exiſt in any of the materials uſed in ſome of the proceſſes for *dying*, as in the root-coloured materials, from which no vitriolated tartar can be obtained, unleſs by accident, till they have been by burning reduced to aſhes, and even then the quantity is exceedingly ſmall; that although common pot-aſh generally contains ſome vitriolated tartar, yet M. Hellot has not ſhewn, that pure fixed alkali is incapable of producing the ſame effect; and laſtly, that vitriolated tartar, and tartar, although they require much water to be diſſolved, are yet ſoluble by water; and therefore if the colouring particles were fixed chiefly by means of theſe ſalts, they might be waſhed out by a large quantity of water, which is contrary to experience. The above mentioned writer ſuggeſts the following conjectural obſervations on this ſubject: that the colorific particles of moſt ſubſtances uſed in *dying* ſeem to be unſoluble in water, in ſpirit of wine, and even in alkaline lixiviums; that their diffuſion through theſe liquids is cauſed merely by their adheſion to certain gummy and reſinous particles; and that they may be diſengaged from theſe gummy and reſinous matters, by applying a piece of ſtuff, to which they have a greater adheſive power; and this ſeems to be the caſe of the root-coloured and blue dyes; or by applying another ſubſtance, to which theſe particles have a greater power of adheſion; ſuch as the earth of alum, in thoſe dyes where that ſalt is uſed, together with ſome other ſubſtance, as fixed or volatile alkali, capable of decompoſing alum; or as the ferruginous earth of the green vitriol in black dyes, to which the colorific particles of the galls adhere; which earths are capable of applying themſelves, and of adhering to the ſtuffs. The ſeparation of the colouring particles from the gummy and reſinous matters is probably facilitated by the addition of acids and neutral ſalts, which may coagulate in ſome meaſure the vegetable matters, and leave the colorific particles diſengaged; ſo that they may apply themſelves to the ſtuff, or to the above mentioned earths. Theſe ſalts are alſo uſeful by heightening certain colours; all acid ſalts and alum having the property of heightening the red colours of vegetables. The metallic ſalt uſed in the ſcarlet dye, conſiſting of a decoction of cochineal, to which a ſolution of tin in aqua regia, and ſome tartar, are added, has the effect of changing the crimſon colour of cochineal into a vivid ſcarlet; and probably has alſo the other effects of alum, of affording an earth, namely that of tin, to which the colouring particles may adhere, and of coagulating the vegetable matters, ſo that they ſhall leave the colouring particles detached and ſuſpended in the water. The chief difference then betwixt the falſe and true dyes is, that the colouring particles in the former dyes are applied to ſtuffs, together with ſome gummy or reſinous matter to which they adhere, and are therefore liable to be waſhed out along with thoſe matters by any liquid capable of diſſolving gums or reſins; while the colouring particles of the true dyes are applied to ſtuffs, either alone, or adhering to ſome fine earth, as that of alum, or of tin; and as both the colouring and the earthy particles are unſoluble in any liquids, to which they are moſt apt to be expoſed, as water, ſoap-ſuds, &c. they are capable of reſiſting the action of theſe liquids, and are therefore durable. The above conjectures are confirmed by obſerving, that when the colouring particles of vegetables and animals are diffuſed in an alkaline lixivium, by means of gummy, reſinous, or oily matters, to which they adhere, they may be ſeparated from theſe adheſive matters by adding alum, the acid of which unites with the alkali of the lixivium; while the colouring particles apply themſelves to the baſis or earth of the alum, now diſengaged, with which they form what are called by painters LAKES, the colouring matter of which is not now ſoluble in water or ſpirit of wine; although theſe liquids are capable of extracting that colouring matter from the animal and vegetable ſubſtances which contain it, by the intervention, as above ſuppoſed, of ſome gummy or reſinous matters. Dict. Chem. Eng. ed. 8vo. art. DYING, note.

DYING *Ingredients*, or the *Materia Tinctoria*, are beſt reduced under two heads. *Colorata*, or thoſe which properly give the colour. And *Non-colorata*, uſed to prepare the ſtuffs for better taking the dye, and to heighten the luſtre of the colours.

As to the *colouring ingredients*, *colorantia colorata*, we have, 1. Iron and ſteel, or what is made from them, which are uſed in *dying* blacks; though how they contribute thereto is not ſo obvious: we know that green oaken boards become black by the affriction of a ſaw; a green ſour apple, cut with a knife, turns of the ſame colour; the white greaſe wherewith the wheels of coaches are anointed, becomes likewiſe black, by means of the iron boxes wherewith the nave is lined, and the friction between the nave and the axle-tree; and that an oaken ſtick becomes black by a violent friction againſt other wood in a turning-lath; and the black colour on earthenware is given with ſcalings of iron, vitrified. From all which it ſeems to follow, that the buſineſs of blacking lies in the iron, and particularly in its uſtulation or affriction Be this as it will, copperas, the moſt uſual ingredient for *dying* black, is the ſalt of the pyrites, wherewith old iron is incorporated. And, where-ever this is uſed, ſome of the aſtringents are to accompany it. 2. Redwood chopped, and ground in a mill, is uſed for *dying* cloth, rugs, &c. of the coarſer ſort. Its tincture, which is a ſort of brick-colour, is got out by long-boiling it with galls, and the cloth with it. It ſtands better than brazil. 3. Brazil chopped alſo, and ground, dyes a pink-colour, or carnation, neareſt approaching cochineal: it is uſed with alum; with pot-aſhes it alſo ſerves for purples. It eaſily ſtains. 4. Madder gives a colour nearly approaching the *bow-dye*, or new ſcarlet: thoſe called baſtard-ſcarlets are dyed with it. It endures much boiling, and is uſed both with alum and argol, and holds well. The brighteſt dyes with madder are made by over-*dying* the ſtuff, and then diſcharging part of it, by back-boiling in argol. It is uſed with bran-water inſtead of white liquor. 5. Cochineal, uſed with bran-liquor, in a pewter veſſel, with aqua-fortis, gives the dye called among us, though improperly, *ſcarlet in grain*. Too much acid takes off the intenſe redneſs of the colour, and turns it towards an orange, or flame-colour. With this colour, the Spaniſh leather and wool, uſed by ladies, are dyed. 6. Arnotto gives an orange-colour, eſpecially to ſilk, linens, and cottons; for it does not penetrate cloth: it is uſed with pot-aſhes. 7. Weld, by the help of pot-aſhes, yields a deep lemon-colour; though it is uſed to give all ſorts of yellow. 8. Wood-wax, or green-wood, called alſo *geniſta tinctoria*, and the *dyer's weed*, has the like effect as weld, though its uſe is chiefly confined to coarſe cloths. It is ſet with pot-aſhes, or urine. 9. Fuſtic is of two ſorts, young and old: the former, chopped and ground, yields a kind of rediſh orange-colour: the latter, a hair-colour, diſtant ſeveral degrees of yellow from the former. It ſpends with or without ſalts, works either hot or cold, and holds firm. 10. Wood-ſoot, containing not only a colour, but a ſalt, needs nothing to extract its dye, or make it ſtrike on the ſtuff. The natural colour it yields is that of honey; but it is the foundation of many other colours, on wool and cloth only. 11. Woad, ground, or chopped with a mill for the purpoſe, is made up into balls; which being broken, and ſtrewed on lime or urine, is uſed with pot-aſhes, or ſea-weed, and gives a laſting blue. The lime or chalk accelerates the fermentation of the woad, which in three or four days will work like a guile of beer, and be covered with a greeniſh froth or flower. An intenſe woad-colour is almoſt black; that is, of a damaſcene-colour. It is the foundation of ſo many colours, in different degrees or ſhades, that the dyers have a ſcale whereby to compute the lightneſs and depth of this colour. See WOAD. 12. Indigo is of the like nature, and uſed for the ſame purpoſe as woad, only that it is ſtronger. 13. Logwood, chopped and ground, yields a purpliſh blue: it may be uſed with alum. Formerly it was of ill repute, as a moſt falſe and fading colour; but, ſince it has been uſed with galls, it is leſs complained of. V. Petty's Apparat. to Hiſt. of Dying, in Sprat's Hiſt. Roy. Societ. p. ii. p. 288. Mer. Not. on Neri, c. cx. p. 335.

The *dying* materials are generally applied in decoctions made in water, more or leſs ſtrong, according to the occaſion; ſometimes by only dipping the ſtuff in the vat of dye; ſometimes by boiling it therein; and ſometimes

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by leaving it a day or more to ſteep. As to the alum, in *dying* ſilks, it is always applied cold, in which ſtate alone it contributes to the brightneſs of the dye.

The *non-colouring ingredients* are, certain *reſtringent*, or *binding materials*, as galls, ſumac, alder-bark, pomegranate-peel, walnut-rinds and roots, ſapling-bark, and crab-tree-bark. Certain *ſalts*, as alum, argol, ſalt-petre, ſal armoniac, pot-aſhes, lime, and urine. *Liquors*, as well water, river water, aqua vitæ, vinegar, lemon-juice, aqua fortis, honey, and molaſſes. *Gums*, as tragacanth, arabic, maſtic, and ſanguis draconis. *Smectics*, or *abſterſives*, as ſoap, fullers earth, linſeed-oil, ox-gall, &c. *Metals*, and *Minerals*, as ſteel filings, ſlippe, and pewter; to which add copperas, verdigris, antimony, litharge, and arſenic. Laſtly, bran, wheat-flour, yolks of eggs, leaven, cummin-ſeed, fenugreek ſeed, agaric and ſena.

Of the moſt of theſe ingredients, ſome account may be found under their reſpective articles, in the courſe of this book; but with regard to their uſe and effect in *dying*, it will be neceſſary to conſider them more particularly, and to bring them together in one view.

Among the *non-colouring drugs*, then, from the mineral kingdom come: 1. Copperas, ſteel-filings, and ſlippe, (the ſtuff found in the troughs of old grind-ſtones, whereon edge-tools have been ground) theſe are uſed for all true or Spaniſh blacks, though not for the Flanders blacks. 2. Pewter, diſſolved in aqua fortis, uſed for the new ſcarlet or BOW-*dye*. 3. Litharge, though not owned or allowed, is uſed to add weight to dyed ſilks. 4. Antimony, uſed chiefly for the ſame purpoſe, though it alſo contains a tingent ſulphur; which, by precipitation, &c. affords a great variety of colours. 5. Arſenic, uſed in dying crimſon, on pretence of giving a luſtre. 6. Verdigris, uſed by linen-dyers, in their yellow and green colours. 7. Alum, much uſed, though with what intent is not agreed on; whether to fix the dye, to render water a proper menſtruum to extract the tingent particles of certain hard drugs; or to ſcower the ſordes, which may interpoſe between the ſtuff and the dye, and hinder their due adheſion; or to intenerate the hairs of wool, and hair ſtuffs, that they may better imbibe their colours; or to contribute to the colour itſelf, as copperas does to galls, in making black, or juice of lemons to cochineal, in carnations, or aqua fortis impregnated with pewter in the bow-dye; or, which ſeems moſt probable, to ſerve as a vinculum between the cloth and the colour, as clammy oils and gum waters do in painting; alum being a ſubſtance whoſe aculeated particles, diſſolved with hot liquors, will enter the pores of ſtuffs, and on which the particles of dying drugs will catch; though it may alſo ſerve another uſe, viz. to dry up certain particles which diſagree with the colour to be ſuperinduced: to which add, that it may alſo ſerve to brighten a colour, by incruſtating the ſtuff to be dyed with its cryſtals, on which the dye coming to be applied, has a finer effect, than if it were applied on a ſcabrous matter, ſuch as an unalumed cloth is. 8. Bran, and bran-water, whoſe flour entering the pores of the ſtuff, levigates its ſurface, and thus renders the colour laid on it more beautiful; much as woods to be gilded, are firſt ſmoothened over with the white colours. 9. Salt-petre, uſed chiefly in aqua fortis, in the bow-dye, to brighten colours by back-boiling. For which purpoſe, 10. Argol is more commonly uſed. 11. Lime, or chalk, uſed in the working of blue vats.

Non-colouring ingredients of the animal kind are, 1. Honey. 2. Yolks of eggs. 3. Ox-gall: though this, and the two laſt, are only uſed by a few particular dyers, to ſcower, promote fermentation, and increaſe weight. 4. Stale urine, uſed as a lixivium to ſcower, alſo to help the fermenting and heating of woad; though it is alſo uſed in the blue fats inſtead of lime. In reality, as it diſcharges the yellow wherewith blue and moſt greens are compounded, it is uſed to ſpend weld withal: yet it is known, that the urine, or cold mud of piſſing-places, will dye a well-ſcowered piece of ſilver of a golden colour; it being with this (not Bath-water, as imagined) that the Bath ſix-pences, &c. are prepared.

To the claſs of non-colouring ingredients, may alſo be added water, by dyers called *white liquor*, which is of two ſorts: 1. Well-water, uſed in reds, and in other colours wanting reſtringency, as well as in dying ſtuffs of a looſe contexture, as callico, fuſtian, and the ſeveral ſpecies of cottons; but naught for blues, and making yellows and greens look ruſty. 2. River-water, ſofter and ſweeter than the former, and diſſolving ſoap better, uſed in moſt caſes by the dyers, for waſhing, rinſing, &c. their clothes after dying. 3. Liquor abſolutely ſo called, which is bran liquor made of one part bran, and five of river-water, boiled an hour, and put in a leaden ciſtern to ſettle: four or five days in ſummer turn it too ſour, and render it unfit for uſe. Its office is to contribute to the holding of the colour. It is known, that ſtarch, which is only the flour of bran, makes a clinging paſte, which will conglutinate paper, though not wood or metals. Accordingly bran liquors are uſed to mealy dying ſtuffs, as to madder, which is rendered clammy and glutinous by being boiled in bran-water, and thus made to ſtick the better to the dyed ſtuff. 4. Gums tragacanth, arabic, maſtich, and ſanguis draconis, are uſed in dying ſilk, chiefly to give it a gloſſineſs, which may make it ſeem finer, ſtiffer, and to increaſe its weight. Petty, ubi ſupra.

DYING, *the Art of*, may be divided into as many branches as there are different colours to be communicated, and ſorts of different ſtuffs to be the ſubjects of it.

DYING *of Cloths, Serges, Druggets, and other woollen Manufactures.* With reſpect to *black*, in cloths and ſtuffs of price, it is begun with a ſtrong decoction of woad and indigo, which gives a deep blue. The uſe aſſigned for this blue ground is that the cloth, having already a conſiderable body of colour, may require leſs of the blackening materials, and conſequently be leſs weakened, than if it was dyed directly from white to black: beſides, blue is eſſential to the production of the black dye; for without either a blue ground, or a blue ſuperadded to the vitriol and galls, no other than brown dyes are obtained. Stuffs, whoſe price will not admit of blue dyes, are ſaid, by the French and German writers, to be grounded with a deep brown, by boiling them with walnut peels, or walnut-tree roots: but this practice is never followed by our dyers. However it ſhould ſeem, that any deep colour, which does not hurt the cloth, is preferable to white. After bluing, the ſtuffs being boiled with alum and tartar, or pot-aſhes, are to be maddered with common madder. This practice of maddering is one of the regulations for the French dyes, publiſhed by the order of M. Colbert. It has not been found, however, on fair trials, to be abſolutely neceſſary, or to contribute any thing either to the beauty or duration of the black. M. Hellot obſerves, that having dyed a piece of cloth of deep blue, he maddered one half, and dyed both the maddered and unmaddered halves black in one copper; and that the unmaddered half was the beſt black, without that ruſty hue which the other had. The moſt plauſible reaſon in ſupport of this practice is this, that it prevents the black cloth from ſtaining the ſkin or linen; but, according to M. Hellot, all that the madder can do in this reſpect is to diſcharge the ſuperfluous blue, which is owing not to the madder itſelf, but to the boiling with alum and tartar preparatory to the madder dye: an advantage which may be obtained by ſufficiently ſcowering the cloth in the fulling-mill after the dye. Dr. Lewis adds, that this is evident from the ſuperfine cloths dyed by our dyers, among whom the injudicious and unfrugal practice of maddering is unknown. They have indeed a colour called madder black, dyed on baize, for exportation to Spain and Portugal, which is a kind of black dye, very durable, without any vitriol or other preparation of iron, from a combination of blue dye, with the madder red. Cloth is then dyed black with Aleppo galls, copperas, and ſumach, and finiſhed by back-boiling in weld or logwood. Logwood is the material which adds blackneſs to the various ſhades of brown produced by vitriol and gall; and this black dye, though not of the moſt durable kind, is the moſt common. On blue cloth, a good black may be died by vitriol and galls alone; but even here, an addition of logwood contributes much to improve the colour. A hundred pounds of woollen cloth, dyed firſt to a deep blue, require for the black dye about five pounds of vitriol, five of galls, and thirty of logwood. The galls, beaten into moderately fine powder, and tied up in a bag, are boiled for a little time in a copper of water ſufficiently for working the cloth in. The blued cloth, after being ſteeped in river water, and drained, is in this ſtate put into the boiling decoction of the galls, and kept turning therein for two hours or more; the bag of galls being now and then ſqueezed, in order to extract their virtues. The logwood, being raſped or ſhaved into ſmall chips, or pulverized, is boiled in another copper for ſeveral hours; and this liquor is uſually prepared a conſiderable time before it is uſed, as its colour improves by keeping. When this liquor is made of a ſcalding heat, the vitriol is thrown into it; and as ſoon as it is diſſolved, the galled cloth is put in. A boiling heat ſhould never be uſed after the vitriol is added to the liquor, becauſe it would augment the corroſive power of the ſalt, and impair the beauty of the colour, by haſtily extricating part of the ferruginous matter of the vitriol in an ochery form, before it can come ſufficiently in contact with the aſtringent ſubſtance with which the cloth is impregnated. The cloth is continually turned about in the liquor, and occaſionally taken out and aired, which operation contributes

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tributes to ſecure the colour. After two hours continuance in the dye, the cloth, having received a good black, is taken out, waſhed with cold water, and paſſed through the fulling-mill. Superfine cloth is fulled three times with warm ſolutiou of ſoap, by which the ſuperfluous colour is diſcharged, and the cloth ſoftened. The cloth is improved neither in beauty nor durableneſs of colour, by being repeatedly paſſed through the *dying* liquor, or by increaſing the quantity of ingredients firſt uſed, after it has once acquired a full black colour. Our dyers uſe a ſmall quantity of verdigreaſe for ſome of the ſuperfine black cloths; but this is more frequently uſed by the French. M. Hellot gives the following proceſs, as the beſt, and as that, which, producing the fineſt velvet black on cloth, is followed in the beſt dye-houſes in France. For a hundred pounds of blue cloth, ten pounds of logwood chips, and the ſame quantity of Aleppo galls, in powder, are tied up together in a bag, and boiled in a middling copper, with a ſuitable quantity of water, for twelve hours. One-third of this decoction is taken out into another copper, and two pounds of powdered verdigreaſe added to it. In this mixture, kept gently boiling, or rather ſcalding hot, the cloth is dipped, and conſtantly turned for two hours; after which it is taken out and aired. Another third of the decoction is laded out into the ſame copper, eight pounds of green vitriol added, and the fire ſlackened about half an hour. The vitriol being diſſolved, the cloth is put in and worked for an hour, and then taken out and aired again. The remaining third of the decoction is then put to the other two, the bag of galls and logwood being well preſſed out, fifteen or twenty pounds of ſumac are now added; and as ſoon as the copper begins to boil, two pounds more of vitriol are thrown in, with ſome cold water, to ſlacken the heat. The cloth is kept in for an hour, then taken out and aired, dipped a ſecond time, and kept turning for an hour longer. The cloth, now completely dyed, is waſhed in a river, and ſcowered in the fulling-mill till the water comes from it colourleſs. It is then paſſed through a copper of weld, which is ſuppoſed to ſoften the cloth and confirm the colour; but it is obſerved in this proceſs, that the quantities of vitriol and galls may be diminiſhed, and the time of boiling much ſhortened; and that the weld liquor only ſupplies the place of ſoap, and is altogether unneceſſary, after ſcowering with ſoap; the liquor remaining after both theſe proceſſes retains, and will communicate a dilute black, or a grey colour, to as much cloth as can be conveniently worked in it.

As galls are an expenſive article in the operation of *dying*, other cheaper aſtringents have been recurred to as a ſubſtitute; ſo that they have been uſed in leſs quantity than in the proportion already ſtated, and weaker aſtringents have been taken in larger quantity. In the Swediſh Tranſactions for the year 1753, a fine black is ſaid to be *dyed*, without galls or logwood, by means of a plant called in Sweden, *mjælon* or *mjælon-ris*, which Linnæus has ſhewn, is no other than the *uva urſi*. This plant is gathered in autumn, while the leaves are green, and carefully dried, that they may retain their green colour. A hundred pounds of woollen cloth are directed to be boiled with ſixteen pounds of green vitriol, and eight pounds of white tartar, for two hours; and the cloth is next day to be rinſed out: then one hundred and fifty pounds of the dried plant, cut a little, are boiled in water for two hours; and when the plant is taken out, a ſmall quantity of madder is added to the liquor. The cloth is put in along with it, and boiled for an hour and a half, or an hour and three quarters, and afterwards rinſed in water. This dye is ſaid to be chiefly uſed for fine cloth, and to give leſs harſhneſs than the common black. Dr. Lewis purſued theſe directions with the German *uva urſi* both on white and blue cloth; the colour in the former was only a dark brown, as with other aſtringents, and in the latter a tolerably good black. From ſome other experiments on oak-duſt, Dr. Lewis concludes, that it deſerves the attention of dyers, and that this duſt, or the heart of the oak reduced to powder in mills, will be found an aſtringent of ſufficient efficacy, and ſupply with advantage the place of galls.

It has been generally obſerved, that cloth is weakened by the black dye, on account of the corroſive quality of the vitriol more than by any other; and the finer the black the more it has been thought to injure the cloth; and therefore the beauty and durability of the cloth have been thought incompatible with one another. But a German writer on *dying*, diſtinguiſhed by the approbation of the celebrated Stahl, alleges, that the vitriol is corroſive only ſo far as it is not ſaturated with galls; and he propoſes, in order to determine the quantity of galls ſufficient for complete ſaturation, to mix a decoction of galls and ſolution of vitriol in different proportions, and to drop theſe liquors much diluted on white paper; and the proportions which give the deepeſt black colour, are thoſe which ſhould be followed by the dyer, and in which the vitriol is made harmleſs. This proportion Dr. Lewis ſhews, is about equal parts of the one and the other; and as the dyers generally uſe theſe proportions, he concludes, that the common black dye cannot hurt the cloth; and this concluſion is farther confirmed by the teſtimony of a judicious dyer, who deſcribes the rottenneſs or periſhableneſs, often complained of in black cloths, to the damage it has received before *dying*. It is well known, that all colours receive a black dye, though black will not receive any other, whence it happens, that black is the laſt reſource for cloths that have been damaged, or that have had their colour ſtained, or impaired by different accidents: beſides, vitriol is uſed in greater quantities for ſome coffee colours than the black; and the aqua fortis employed in ſcarlets, oranges, &c. is certainly more corroſive. Wool is dyed black in the ſame manner with cloth, after having been ſcowered by a mixture of ſtale urine, with twice or thrice its quantity of water made ſcalding hot; in which operation it is ſaid to loſe between one-fifth and one-fourth of its weight. Dict. of Commerce. Hellot's Art of Dying, and Lewis's Comm. Phil. Techn. p. 401, &c.

It appears by ſome experiments lately made, that lime-water, though it tends to deepen the colour produced by ſome aſtringents and martial vitriol, by no means adds to the duration of thoſe colours; and that either by trituration or coction, it entirely deſtroys the property in logwood of ſtriking black with martial vitriol, and therefore can be of no ſervice in the black dye, where logwood is a material ingredient. It is alſo inferred from the ſame experiments, that ſlight boiling is preferable to trituration, for the purpoſes of *dying*, when a durable colour is wanted. Phil. Tranſ. vol. lxiv. p. i. art. 4.

Simple *greys*, which are no other than ſhades of black, are dyed nearly in the ſame manner as the full blacks; only by uſing a leſs proportion of the *dying* ingredients, or continuing the cloth in the liquor for a ſhorter time. Theſe ſimple *greys* are dyed from white cloth without any previous ground of blue on other colours. There are alſo a multitude of compound greys and browns, produced from cloth dyed blue, red, yellow, brown, or of colours compounded of theſe, by darkening them with the black dye. *Scarlet* is dyed with kermes and cochineal, with which may alſo be uſed agaric and arſenic. *Crimſon ſcarlet* is given with cochineal, maſtich, aqua fortis, ſal armoniac, ſublimate, and ſpirit of wine. *Violet-ſcarlet*, *purple*, *amaranth*, and *panſy-ſcarlets*, are given with woad, cochineal, indigo, braziletto, brazil, and archil. See ARCHIL, COCHINEAL, CRIMSON, &c. &c. For common *reds*, pure madder is uſed, without any other ingredients. *Crimſon-reds*, *carnations*, *flame*, *and peach colours*, are dyed according to their ſeveral hues, with cochineal, maſtich, without madder or the like. *Crimſon-red* is prepared with Roman alum, and finiſhed with cochineal. *Peach-colour* muſt be back-boiled a little with galls and copperas or the like. *Orange-aurora*, or *golden-yellow*, *brick-colour*, and *onion-peel colour*, are given with woad and madder, tempered according to their reſpective ſhades. For *blues*, the *dark* are given with a ſtrong tincture of woad: the *brighter*, with the ſame liquor, as it weakens in working. *Dark-browns*, *minims*, and *tan-colours*, are given with woad, weaker in decoction than for black, with alum and pot-aſhes; after which, they are maddered higher than black: for tan-colours, a little cochineal is added. *Pearl-colours* are given with galls and copperas; ſome are begun with walnut-tree roots, and finiſhed with the former; though, to make them more ſerviceable, they uſually dip them in a weak tincture of cochineal. *Greens* are begun with woad, and finiſhed with weld. *Pale-yellows*, *lemon-colour*, and *ſulphur-colour*, are given with weld only. *Olive-colours* of all degrees are firſt put in green, and taken down again with ſoot, more or leſs, according to the ſhade required. *Feulemort*, *hair-colour*, *muſk*, and *cinnamon-colour*, are given with weld and madder. *Nacarat*, or *bright orange-red*, is given with weld, and goats-hair, boiled with pot-aſhes. Fuſtic here is forbid, as a falſe colour. V. Savar. Dict. de Com. tom. ii. p. 1690. See alſo le Teinturier Parfait, Leid. 1708, 12°. Salm. Polygraph. lib. iii. cap. 37. See the ſeveral colours with the ſubſtances above enumerated in the courſe of this Dictionary.

DYING *of wools for tapeſtry*, is performed after the ſame manner as cloths, excepting blacks, which are only to be woaded, and then put in black, as above.

Black wools for cloths and ſerges, may be begun with walnut-tree root, and walnut-rinds, and finiſhed by dipping in a vat of black.

DYING *of ſilks* is begun by boiling them with ſoap, &c. in which proceſs it loſes about one-fourth part of its weight;

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weight; then ſcouring and waſhing them out in ſoft water, and ſteeping them in alum-water cold. For *crimſon* they ſcour them a ſecond time before they put them in the cochineal vat.

Red crimſon is dyed with pure cochineal maſtich, adding galls, turmeric, arſenic, and tartar, all put together in a copper of fair water almoſt boiling: with theſe the ſilk is to be boiled an hour and a half; after which, it is ſuffered to ſtand in the liquor till next day. *Violet crimſon* is alſo given with pure cochineal, arſenic, tartar, and galls; but the galls in leſs proportion than the former. When taken out, it is to be well waſhed, and put in a vat of indigo. *Cinnamon crimſon* is begun like the violet, but finiſhed by back-boiling, if too bright, with copperas; if dark, with a dip in indigo. *Light blues* are given in a back of indigo. *Sky blues* are begun with archil, and finiſhed with indigo. For *citron colours*, the ſilk is firſt alumed, then welded with a little indigo. *Pale yellows*, after aluming, are dyed in weld alone. *Pale* and *brown auroras*, after aluming, are welded ſtrongly, then taken down with rocou diſſolved with pot-aſhes. *Flame-colour* is begun with rocou, then alumed, and dipped in a vat or two of brazil. *Carnation*, and *roſe-colours*, are firſt alumed, then dipped in brazil. *Cinnamon-colour*, after aluming, is dipped in brazil and braziletto. *Lead-colour*, is given with fuſtic, or with weld, braziletto, galls, and copperas: but the galls, on theſe and other occaſions, are not to be overdoſed, which increaſes the weight to the damage of the purchaſer; for which reaſon, it is puniſhed in France as a fraud; and in reality few but black ſilks need galls.

Black ſilks of the *coarſer* ſort, are begun by ſcouring them with ſoap, as for other colours; which done, they are waſhed out, wrung, and boiled an hour in old galls, where they are left to ſtand an hour or two; after which, they are waſhed again with fair water, wrung, and put in another vat of new and fine galls; then waſhed and wrung again, and finiſhed in a vat of black. *Fine black* ſilks are only put once into galls, viz. the new and fine ſort, which has only boiled an hour; then they are waſhed, and wrung out, and dipped thrice in black, to be afterwards brought down by back-boiling with ſoap. Savar. lib. cit. p. 1693, ſeqq.

M. Macquer, in his Diſſertation on the Art of *Dying* Silk, has given the following proceſs for *dying* of black, which is followed in the manufactories of Tours and Gênes: the ſilk, waſhed with ſoap, is ſteeped in a decoction of one-third its weight of Aleppo or blue galls, or half its weight of the weaker white galls of Sicily and Romania, and afterwards waſhed with water: every twelve ounces are reduced by the cleanſing to nine, which ought to be increaſed by the galling to eleven, and no more. The *dying* liquor, for one hundred pounds of ſilk, is prepared by boiling twenty pounds of galls in about one hundred and twenty-ſix gallons of water, and adding to this decoction, after being ſettled and drawn off from the ſediment, two and a half pounds of Engliſh vitriol, twelve of iron-filings, and twenty of the gum of the cherry or plum-tree; that the gum may diſſolve the more readily, it is put into a large copper cullender, immerſed in the hot liquor, and ſtirred from time to time with a wooden rod till it is all paſſed through. This mixture is kept for ſix or ſeven days or more, a circumſtance ſuppoſed to be neceſſary to its perfection; and being then made as hot as the hand can bear, freſh parcels of the galled ſilk are dipped in it ſucceſſively, and kept in about ten minutes each; and all of them, after being aired, are dipped over again, ſeveral times, with the addition of more vitriol and iron-filings till they have acquired the requiſite blackneſs, after which they are well waſhed in water. Dr. Lewis obſerves on this proceſs, that while five or ſix pounds of galls are ſufficient for one hundred pounds of wool, upwards of fifty pounds of galls are here allowed to the ſame quantity of ſilk; and that logwood, an eſſential ingredient in the black dye on white woollen, is not at all required for ſilk. He alſo found, in repeating this proceſs with a leſs quantity of the ſeveral ingredients but in the ſame proportion, that by adding more and more of the vitriol, ſo that the whole amounted to one-fifth of the weight of the ſilk, and repeating the dippings thirty times or more, he obtained at laſt a good black: nor did he obſerve any difference in two blacks produced by repeating the operation with and without any iron filings: he apprehends likewiſe, that the gum is rather of diſſervice than advantage. Dr. Lewis concludes upon the whole, that a good black may be dyed on ſilk, with the ſame materials, in the ſame method, and with the ſame diſpatch, as on wool and woollen cloth. Com. Phil. Tech. p. 425, &c.

DYING *of thread* is begun by ſcouring it in a lye of good aſhes; after which, it is wrung, rinſed out in river water, and wrung again. For a *bright blue*, it is given with braziletto and indigo. *Bright green* is firſt dyed blue, then back-boiled with braziletto, and verditer, and laſtly woaded. For a *dark green*, it is given like the former, only darkening more before woading. *Lemon*, or *pale yellow*, is given with weld, mixt with rocou. *Orange* and *Iſabella*, with fuſtic, weld, and rocou. *Red*, both *bright* and *dark*, with *flame-colour*, &c. are given with brazil, either alone, or with a mixture of rocou. *Violet*, *dry roſe*, and *amaranth*, are given with brazil, taken down with indigo. *Feulemort* and *olive-colour* are given with galls and copperas, taken down with weld, rocou, or fuſtic. *Black* is given with galls and copperas, taken down and finiſhed with braziletto wood.

It is obſervable, that the black vitriolic dye, which is very durable on the ſubſtances already mentioned, is periſhable on linen and cotton. Pieces of both ſorts of cloth and ſkains of thread boiled firſt with galls, and afterwards infuſed and dipped repeatedly in a decoction of logwood with vitriol, received a good black colour, which was in ſome meaſure diſcharged by waſhing with ſoap; and the black dye proved equally periſhable, though the linen was ſteeped for a month previous to the dye, with galls and with oak-bark. The dyers of thread obtain a colour ſomewhat more laſting, by ſteeping it firſt in alum-water for ſeveral days; and then dipping it repeatedly in the dying liquor, cold, or only lukewarm. This liquor conſiſts of the irony and aſtringent matters mixed together; and in the room of, or along with vitriol, they uſe either filings of iron or ſlippe. Dr. Lewis made ſeveral unſucceſsful trials to fix the black dye in linen and cotton. He has given us, from the diſſertation of M. l'Abbé Mazeas, on the red printed cottons of the Eaſt Indies, an account of a method practiſed by the Indians, of impregnating their cotton with animal matter, in order to its receiving a red ſtain. A ley is made from the aſhes of a certain kind of wood, and with this is mixed ſome ſheep's dung, and a quantity of the oil of ſeſamum, in want of which oil they uſe hog's lard: theſe ingredients ſtirred together are ſaid ro unite into a milky liquid. The cotton is ſteeped in this liquor during the night, and expoſed to the hotteſt ſun during the day for a fortnight. He applied a ſimilar preparation to the black dye; but the reſult was not ſuch a degree of ſucceſs as to render the proceſs intereſting to the workman. He obſerves, on the credit of a ſkilful artiſt, that ſome printed linens and cottons have a durable black ſtain, which is made with madder and a ſolution of iron. For this purpoſe a quantity of iron is put into ſour ſtrong beer; and to promote the diſſolution of the metal, the whole is occaſionally well ſtirred, the liquor at times drawn off, the ruſt beaten from the iron, and the liquor poured on again; the ſolution is not fit for uſe in leſs than a twelvemonth. This ſolution ſtains linen yellow, and of different ſhades of buff colour, and is the only known material by which theſe colours can be fixed on linen. The cloth, ſtained deep with the iron liquor, being afterwards boiled with madder, without any other addition, becomes of the dark colour which is ſeen on printed linens and cottons; which, though not a perfect black, bears a very near reſemblance to it. He apprehends, that a better black might thus be dyed on thread, than that which the printer on linen produces; becauſe in this laſt buſineſs, while ſome parts of the linen are ſtained deep with the iron liquor, in order to their being made black; others are ſtained paler, with the ſame liquor diluted with water, for making purple; and others, deſigned to be red, are prepared with a ſolution of alum and ſugar of lead; all theſe colours are dyed in the ſame copper of madder, with a heat a little below boiling; but a boiling heat, which would injure the red colour, would deepen the black, and might be advantageouſly applied, if thread, or whole pieces of linen or cotton, were to be dyed of this colour. Com. Phil. Techn. p. 429, &c.

DYING *of hats*, is done by boiling a hundred pounds of logwood, twelve pounds of gum, and ſix pounds of galls, in a proper quantity of water for ſome hours; after which about ſix pounds of verdigris, and ten pounds of green vitriol are added, and the liquor kept ſimmering, or of a heat a little below boiling. Ten or twelve dozen of hats are immediately put in, each on its block, and kept down by croſs bars for about an hour and a half; they are then taken out and aired, and the ſame number of others put in their room; the two ſets of hats are then dipped and aired alternately, eight times each; the liquor being refreſhed each time with more of the ingredients, but in leſs quantity than at firſt. This proceſs affords a very good black on woollen and ſilk ſtuffs as well as on hats. Com. Phil. Techn. p. 428. See HAT.

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DYES, *Proof of.* There are divers ways of proving the truth of *dyes*, or examining the juſtneſs and legitimacy of their compoſition. To diſcover whether a cloth have been duly treated by the dyer, and the proper foundation laid, a white ſpot, by the French called *roſette*, of the bigneſs of a ſhilling, ought to be left; beſides a white ſtripe between the cloth and the liſt.

Farther proof is had by boiling the dyed ſtuff in water with other ingredients different according to the quality of the *dye* to be proved. If the colour ſuſtain the teſt, i. e. do not diſcharge at all, or very little, ſo that the water is not tinctured by it, the dye is pronounced good: otherwiſe it is falſe.

Some colours will for a long time reſiſt the injuries of the air; and theſe are therefore called the good or ſtanding colours; and there are others which the bare expoſure to the air will deſtroy or deface in a very little time; theſe are therefore called the falſe or fading colours. In what manner is the action of the air upon theſe laſt to be explained? Does it take away, or carry off from the ſtuff the particles of the colours; or does it only break and deſtroy that beautiful and regular texture of each particle on which the colour depends? The dyers very often have recourſe to ſeveral ingredients, in order to produce one colour; and reaſon ſeems to urge, that one of theſe falſe or fading colours might be rendered laſting by mixing it with a permanent one: the dyers are alſo of this opinion. But it is nevertheleſs an erroneous one; for repeated experiments have proved, that one of theſe falſe colours fades as ſoon, when it is mixed with a ſtanding or laſting colour, as when it is uſed alone. There are but few colours on which this experiment can be tried, ſo as to come to a regular deciſion. One of the principal is the mixing a blue and a yellow, for producing a green. In this experiment, if the blue and the yellow be both ſtanding or permanent colours, the ſtuff will perfectly hold its colours, and ſucceed alike, whether it be *dyed* firſt blue, and afterwards yellow; or firſt yellow, and afterwards blue. But if one of the two colours be a falſe or fading colour, it is found that the green produced by the mixture will not ſtand, though the other be ever ſo good or permanent a colour.

There is a ſhorter way of trying the permanence of many colours of this kind than that of expoſing them to the air, ſince in boiling only five minutes in a pint of water, in which there has been diſſolved half an ounce of alum, they will loſe as much colour as they would have done by being expoſed two days to the air in ſummer. Some colours require different methods of trial, but this ſerves for almoſt all. The ſhades of blue, yellow, red and green, purple and green, are the fineſt colours to experiment theſe things upon, as the ſame previous preparation or impregnation of the ſtuff ſerves for both, and both depend upon blue for their baſis, the purple being made of blue and red, and the green of blue and yellow.

It ſhould not ſeem ſurpriſing, if the ſtuff be firſt dipped into a *dye* of a ſtanding blue, and afterwards into a fading red or yellow, to turn it green or purple, that the action of the air, or boiling in alum water, ſhould carry off thoſe falſe colours, which had only been applied to the ſtuff after it was before ſaturated with a ſtanding colour. But it might be expected, that when the ſtuff was firſt impregnated with them, and afterwards had the blue added upon them, that either the blue muſt be the colour that went off, or that they muſt all remain. But, in effect, nothing of this difference is found, but the blue remains, while the fading colours go off, however or in whatever manner or order they are applied. Mem. Acad. Scienc. Par. 1737.

DYES *of Silk, Proofs of the.* For red crimſon, the proof is made by boiling the ſilk with an equal weight of alum. For ſcarlet crimſon, it is boiled with ſoap almoſt of the weight of the ſilk. For violet crimſon, with alum of equal weight with the ſilk, or with citron juice, about a pint to a pound of ſilk. Theſe ingredients are to be mixed, and put in fair water when it begins to boil; after which, the ſilks are alſo to be put in; and after boiling the whole for half a quarter of an hour, if the dye be falſe, the liquor of the red crimſon will be violet, in caſe it has been dyed with archil; or very red, if with brazil. That of crimſon ſcarlet, if rocou hath been uſed, will become of an aurora colour; or, if brazil hath been uſed, red. On the contrary, if the three ſorts of crimſon be truly dyed, their liquors will diſcover very little alteration.

A ſtill ſurer way to diſcover whether crimſon ſilks have been rightly dyed, is by boiling a piece of ſtandard dyed ſilk, kept for that purpoſe at Dyers-hall, after the ſame manner, and then comparing the tinctures of the two liquors.

To diſcover whether other colours have been dyed with galls, the ſilk is to be put in fair boiling water, with pot-aſhes, or ſoap, nearly of the weight of the ſilk; after ſome time, it is taken out; upon which, if it hath been dyed with galls, the colour will be all vaniſhed, and nothing but that of the galls left, which is a ſort of feuille-mort, or wood colour.

The *dying* of ſilk with galls may alſo be detected by putting it in boiling water, with a gallon of citron juice; being taken out, and waſhed in cold water, and then dipped in a black *dye*, if galls have been uſed, it will turn black; if not, it will be of a brown-bread colour.

To diſcover whether black ſilk has been over-doſed with galls, ſteel-filings, or ſlippe, it is boiled in fair water, with twice its weight of ſoap: if it be loaden with galls, it will turn reddiſh, otherwiſe it will keep its colour.

DYES *of Cloths, Proofs of the.* To diſcover whether black cloth has been firſt woaded, and maddered; a ſample of it, and, at the ſame time, a ſample of ſtandard black, kept for that purpoſe by the Dyers company, is to be taken; and then as much Roman alum as is equal in weight to both, together with a like weight of pot-aſhes, is to be put over the fire in a pan of bran-water: when it begins to boil, the two ſamples are to be put in; and after half an hour to be taken out and compared. The piece which has only been woaded will be found bluiſh, with ſomewhat of a dull green; if it hath been both woaded and maddered, it will be of a tan, or minim colour; and, if it has been neither woaded nor maddered, its colour will be dunniſh, between yellow and fallow.

The ſame diſcovery may be made by ſteeping a ſmall bit of the black cloth for a day or two in water acidulated with oil of vitriol; or by boiling it about a quarter of an hour in a ſolution of alum and tartar, made by the proportion of one ounce of each to a pint of water: if the cloth has had a previous blue ground, it will remain of a bluiſh black colour; but if it has been dyed directly from white, it will look of a muddy reddiſh brown. The dyers commonly leave ſome blue marks at the end of pieces of black cloth, by fixing pieces of lead on them, in order to ſhew that the piece has been regularly dyed in a blue ground, and that the colour is durable.

For cloths dyed of a minim colour, the proof is to be made after the ſame manner as that of blacks.

To know whether ſcarlet or crimſon cloth hath been dyed with pure cochineal, they are to be boiled with an ounce of alum to a pound of cloth.

For cloths of other colours, the proof is to be made in the ſame manner as that of blacks and minims. Savar. lib. cit. p. 1665, ſeqq. voc. Debouilli.

DYING, *the Laws relating to*, are as follow. Dyers ſhall dye both the cloth and the liſt, or forfeit it. 1 R. III. cap. 4. No dyer may dye any cloth with archil, or with brazil, to make a falſe colour in cloth or wool, &c. on pain of twenty ſhillings. Stat. 3 & 4 Edw. VI. cap. 2. Dyers are to fix a ſeal of lead to cloths, with the letter *M*, to ſhew that they are well maddered, &c. or forfeit three ſhillings and four pence; and not to uſe logwood in *dying* on pain of forfeiting twenty pounds. Stat. 23 Eliz. cap. 9. and penalties are inflicted on dyers, who dye any cloths deceitfully, and not being dyed throughout with woad, indigo, and madder; alſo marks ſhall be put to the cloth dyed, &c. Dyers in London are ſubject to the inſpection of the Dyers company, who may appoint ſearchers; and out of their limits, juſtices of peace in ſeſſions to appoint them: oppoſing the ſearchers incurs ten pounds penalty, by Stat. 13 Geo. I. c. 24.

DYING, in a more extenſive ſenſe, is applied to all kinds of colourings given to bodies of any ſort.

In which ſenſe, *dying* amounts to the ſame with *coloration*; and includes ſtaining, painting, gilding, marbling, printing, &c. The Chineſe are ſaid to practiſe the *dying* of tea with catechu, which gives the worſe ſorts of green tea-leaf the colour, and its infuſion the tincture of bohea. Short. Diſſ. on Tea, pref. p. 15. See TEA and CATECHU.

The ſorts of *dying* now commonly uſed in vulgar trades, are, 1. Whitening of wax, and ſeveral ſorts of linen, and cotton cloths, by the ſun, air, and reciprocal effuſions of water. See BLEACHING. 2. Staining of wood and leather by lime, ſalt, and liquors, as in ſtaves, canes, marble, leathers, marquetry, &c. 3. Marbling of paper, by tempering the colours with ox-gall, and applying them upon a ſtiff gummed liquor. See PAPER. 4. Colouring, or rather diſcolouring ſilks, tiſſanies, &c. by brimſtone. 5. Colouring ſeveral iron and copper-works into black with oil. 6. Giving leather a gold colour, or rather *dying* ſilver-leaves like gold, by varniſhes; and in other caſes by urine and ſulphur. 7. Staining of marble and

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and alabaſter, with heat, and coloured oils. 8. Tinging ſilver into braſs with brimſtone or urine. 9. Colouring the barrels and locks of guns blue and purple with the temper of ſmall-coal heat. 10. Colouring glaſs cryſtals, and earthen-ware, with the ruſts and ſolutions of metals. See POTTERY, &c. 11. Colouring live hair, as in Poland, both horſe and man's hair; and alſo of furs. 12. Enamelling and annealing. See ENAMELLING. 13. Application of colours, as in the printing of books and pictures; and the making of playing-cards, japanning, &c. See PRINTING, CARDS, and JAPANNING. 14. Gilding, and tinning with mercury, block-tin, and ſal armoniac. See GILDING and TINNING. 15. Colouring metals, as copper with calamine into braſs, and with zink or ſaltpetre into falſe gold, or into falſe ſilver with arſenic. See CALAMINE, BRASS, ZINK, ARSENIC, &c. 16. Making painters colours, by preparing of earth, chalk, and ſlates, as in umber, oker, Cologn earth, &c. out of the calces of lead, as ceruſs and minium; by ſublimates of mercury and brimſtone, as in vermillion; by tinging of white earths variouſly, as in verditer, and ſome of the lakes; by concrete juices or fæculæ, as in indigo, pinks, ſap-green, and lakes; and by ruſts, as in verdegris, &c. See CERUSS, MINIUM, VERMILLION, INDIGO, &c. 17. The applying of theſe colours by the adheſion of ox-gall, as in the marbled paper aforeſaid; or by gum-water, as in limning; or clammy drying oils, as the oils of linſeed, nuts, ſpike, turpentine, &c. See PAINTING, LIMNING, &c. 18. Watering of tabbies. See WATERING, CALENDER, TABBY, &c. Petty Appar. Hiſt. of Dying, ap. Sprat.

Glaſs *dyed* is the common matter of artificial jewels: the tinctures are given with zaffer, manganeſe, feretto, crocus martis, &c. The proceſſes are deſcribed at length in Antonio Neri, de Re Vitraria, lib. i. cap. 12, 13, 14, ſeqq. See GLASS, GEM, &c.

The Peruvian women, when grown old, *dye* their grey hairs black by a very untoward operation, viz. holding the head ſome hours with the hair ſopped in a boiling tincture of the root of a tree called *cuchau*, by the Spaniards *maquey*.

DYING *of leather, ſkins*, &c. A *black* colour is eaſily given to tanned leather, by rubbing it over three or four times with a ſolution of vitriol, or with a ſolution of iron in the vegetable acids. For leathers that have not been tanned, ſome galls or other aſtringents are added to the ſolution of iron; and in many caſes, particularly for the finer parts of leather, and for renewing the blackneſs, ivory or lamp-black are uſed. See CURRYING. A *blue* colour is given by ſteeping the ſubject a day in urine and indigo, then boiling it with alum: or it may be given by tempering the indigo with red wine, and waſhing the ſkins therewith. *Red* is given by waſhing the ſkins, and laying them two hours in galls; then wringing them out; dipping them in a liquor made with liguſtrum, alum, and verdigris in water; and laſtly; in a *dye* made of brazil wood boiled with lye. *Purple* is given by wetting the ſkins with a ſolution of roch alum in warm water, and when dry again, rubbing them with the hand with a decoction of logwood in cold water. *Green* is given by ſmearing the ſkin with ſap-green and alum-water boiled; to darken the colour, a little more indigo may be added. *Dark green* is alſo given with ſteel-filings, and ſal armoniac ſteeped in urine till ſoft, then ſmeared over the ſkin; which is to be dried in the ſhade. *Sky-colour*, is given with indigo ſteeped in boiling water, and the next morning warmed and ſmeared over the ſkin. *Yellow*, by ſmearing the ſkin over with aloes and linſeed oil diſſolved and ſtrained; or by infuſing it in weld. *Orange-colour*, is given by ſmearing with fuſtic berries boiled in alum-water; or for a deep orange, with turmeric. Salm. Polygr. lib. iii. cap. 34. p. 272.

The following proceſſes for *dying* leather red and yellow, as practiſed in the Eaſt, for that kind called Turky-leather, were lately communicated by Mr. Philips, a native of Armenia, to the Society of Arts, &c. The ſkins are prepared for both dyes, by dreſſing them in lime. For this purpoſe, after having been dried with the hair on, they are firſt laid to ſoak in clean water for three days; they are then broken over the fleſh ſide, put into freſh water for two days longer, and afterwards hung up to drain half an hour. They are then broken again on the fleſh ſide, limed with cold lime on the ſame ſide, and doubled together with the grain ſide outward. In this ſtate, they are hung up within doors for five or ſix days, till the hair be looſe, which is then taken off; and the ſkins are returned into the lime pit for about three weeks. They are then taken out and well worked, fleſh and grain, every ſixth or ſeventh day during that time; after which they are waſhed ten times in clean water, and the water is changed at each waſhing. The next operation is drenching: in order to which, a liquor is prepared, by mixing bran and water, and new milk, warm, allowing about three pounds of bran for five ſkins, and about a gallon of water to each pound of bran: the ſkins are left to lie in this drench three days, when they muſt be well worked, and returned into it for two days longer. They are then taken out and rubbed between the hands; the water is ſqueezed from them, and the bran ſcraped off clean from both ſides; after which they are waſhed ten times in clean water, and the water ſqueezed out of them. The ſkins that are to be dyed red are then prepared by honey and bran in the following manner: a pound of honey is diſſolved in three pints of lukewarm water; to which are added, two double handfuls of bran; and then four ſkins are well worked in this quantity of mixture, one after another They are then folded ſeparately in a round form, with the fleſh ſide outward, and laid in an earthen pan, or other proper veſſel, by the ſide of each other in ſummer, and upon each other in winter; and the veſſel is placed ſloping, ſo that the liquor may drain from them. In this operation the liquor will ferment, and the ſkins ſwell; in which ſtate they remain about ſeven or eight days, the liquor that drains from them being poured off as occaſion requires. On the eighth or ninth day, they are taken out of this mixture, and rubbed with dry common ſea-ſalt, in the proportion of about half a pound to each ſkin; by which they are contracted, and the remaining moiſture is to be ſqueezed out, by drawing each ſkin ſeparately through the hands. They are then ſcraped clean on both ſides from the bran and ſuperfluous ſalt and moiſture; and freſh ſalt is ſtrewed over the grain ſide, and well rubbed in with the hands. They are now doubled, with the fleſh ſide outward, lengthwiſe, from tail to tail, and more ſalt is thinly ſtrewed over the fleſh ſide and rubbed in. About one pound and a half of ſalt for each ſkin will ſuffice for both theſe operations. In this ſtate they are folded on each other, and laid between two clean boards, under a heavy weight, and continued in this draining ſtate for two days or more, when they will be fit for *dying*. The red dye is prepared by boiling ſeven ounces of ſhenan, tied up in a linen bag, in eight gallons of water for about an hour; and by putting into the boiling mixture two drams of pomegranate bark, three-fourths of an ounce of turmeric, three ounces of cochineal, and two ounces of loaf ſugar, and letting the mixture afterwards boil for ſix minutes: this is the proportion for four ſkins. N. B. The ſhenan is eaſily to be obtained from any of the ports in the Levant: it is the eaſtern jointed kali, called by botaniſts *ſalicornia*, but different from the ſmall ſpecies met with on the Engliſh ſea-coaſt. Two pints of the above liquor are to be meaſured out in a flat earthen pan; and when it is as cool as new milk, one ſkin folded lengthwiſe, with the grain ſide outwards, is to be dipped in it, and rubbed gently with the hand; then it is hung up to drain; and the ſuperfluous dye is thrown away. The ſame proceſs muſt be obſerved with reſpect to the other three ſkins; and the ſame operation muſt be repeated on each ſkin ſeparately eight times, before each freſh dipping: then let the ſkins be ſqueezed and laid in a ſloping-pan to drain for about two hours, or till they are cold. They are next to be tanned, by working them well for half an hour or more in a mixture, made by powdering four pounds of the beſt white galls in a marble mortar, ſifting and mixing them with about three quarts of water: the ſkins are folded in four folds, and left to lie in the ſun twenty-four hours; after which they are again to be worked, ſcraped clean from the firſt galls, and put into the like quantity of freſh galls and water: they muſt be well worked in this for three quarters of an hour, folded up as before, and left in it three days. On the fourth day they muſt be waſhed clean from the galls in ſeven or eight freſh quantities of water, and hung up to dry. When they are almoſt dry, they are to be ſcraped on the fleſh ſide with the ſcraper, in order to reduce them to a proper thickneſs; they are then to be laid on a ſmooth board, and glazed, by rubbing them with a ſmooth glaſs. Afterwards they muſt be oiled, by rubbing them with olive oil, in the proportion of one ounce and a half of oil to four ſkins, and then grained on a graining board lengthwiſe, breadthwiſe, and croſſwiſe, from corner to corner.

The ſkins that are deſigned for the yellow dye, after having been drenched, muſt be well worked for half an hour or more, in a mixture of one pound and a half of the beſt white galls, powdered with two quarts of clean water: this is the proportion for four ſkins. They muſt then be ſeparately doubled lengthwiſe, rolled up with the fleſh-ſide outwards, laid in the mixture, and cloſe preſſed on each other; in which ſtate they are to remain

two

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two whole days. On the third day they muſt be again well worked in the tan, and afterwards ſcraped clean from the galls with an ivory or braſs inſtrument; and then put into a freſh tan made of two pounds of galls, with about three quarts of water, and well worked in it fifteen times. After this they muſt be doubled, rolled up as before, and remain in the ſecond tan for two days. On the third day, a quarter of a pound of white ſea-ſalt muſt be worked into each ſkin, and the ſkins be doubled and rolled, and laid in the tan till the following day, when they are to be waſhed ſix times in cold water, and four times in lukewarm water. The ſkins muſt then be well preſſed between two boards, and drained.

The yellow dye, for which they are now ready, muſt be prepared by mixing ſix ounces of caſſiari gehira, or the berries of an eaſtern rhamnus, or buck thorn-tree, with the ſame quantity of alum; theſe are to be pounded together in a marble or braſs mortar, with a braſs peſtle: this is the proper quantity for four ſkins. The berries may be obtained at Aleppo, or other parts of the Levant; or the Avignon berries, though they yield a weaker dye, may be ſubſtituted in their room. The powdered materials are to be divided into three equal parts; and one of theſe parts is to be ſtirred in about a pint and a half of hot water, in a china or earthen veſſel. When the liquor has been boiled and ſtood to cool, ſo as not to ſcald the hand; a fourth part of it is poured on the grain ſide of one of the ſkins laid flat on a table in a warm room, with this ſide uppermoſt, and well rubbed over the ſkin. The ſame proceſs is to be purſued with the other three ſkins. The ſame operation muſt be repeated twice more, ſeparately on each ſkin, with the remaining eight ounces of the pulveriſed berries and alum, mixed with the ſame proportion of hot water. When the ſkins are dyed, they are to be hung up looſely, with the grain ſide outwards, for about three quarters of an hour to drain, and then well waſhed ſix times or more in running water. They muſt then be preſſed for about an hour, till the water is well ſqueezed out, and hung to dry in a warm room. And laſtly, they muſt be dreſſed and grained, in the manner already preſcribed for thoſe dyed red, except that they muſt not be oiled. Doſſie's Mem. of Agriculture, vol. i. p. 400, &c.

DYING *or ſtaining of wood, for inlaying, veneering*, &c. *Red*, is done by boiling the wood in water and alum; then taking it out, adding brazil to the liquor; and giving the wood another boil in it. *Black*, by bruſhing it over with logwood boiled in vinegar, hot; then waſhing it over with a decoction of galls and copperas till it be of the hue required. *Any other colour* may be given by ſqueezing out the moiſture of horſe-dung through a ſieve, mixing it with diſſolved roch alum and gum arabic; and to the whole adding green, blue, or any other colour deſigned. After ſtanding two or three days, pear-tree, or other wood, cut to the thickneſs of half a crown, is put into the liquor boiling hot, and ſuffered to remain till it be ſufficiently coloured. Park. Treat. of Japann. cap. xxvii. p. 82.

DYING *of bone, horn, or ivory. Black* is performed by ſteeping braſs in aqua fortis till it be turned green: with this the bone, &c. is to be waſhed once or twice; and then put in a decoction of logwood and water, warm. *Green*, is begun by boiling the bone, &c. in alum-water; then with verdigris, ſal armoniac, and white-wine vinegar; keeping it hot therein till ſufficiently green. *Red*, is begun with boiling it in alum-water, and finiſhed by decoction in a liquor compounded of quicklime ſteeped in rain-water, ſtrained, and to every pint an ounce of brazil wood added: the bone, &c. to be boiled herein till ſufficiently red. Other methods are given by Salmon. And from him by Houghton. Park. lib. cit. p. 83. Salm. Polygraph. lib. iii. cap. 35. p. 275. Hought. Collect. N° 138. tom. i. p. 361. See BONES, HORN, IVORY, &c.

The refuſe of the bow-dye given to hogs to feed on, is ſaid to tinge their very bones red.

DYING *of marble and ſtones.* See STAINING.

DYKE-*Reeve*, a bailiff, or officer, that has the care and over-ſight of the *dykes* and drains in deepening fens, &c. We find mention made of this officer anno 16 & 17 Car. II. cap. 11. See DIKE.

DYNA, in *Commerce*, a kind of Eaſt-Indian coin, worth about thirty ſhillings of Engliſh money.

DYNAMICS, from δυναμις, *power*, is the ſcience of moving powers; more particularly of the motion of bodies which mutually act on one another. See MECHANICS, MOTION, COMMUNICATION *of Motion*, OSCILLATION, PERCUSSION, &c.

DYNASTY, a term in *Hiſtory*, ſignifying a race or ſucceſſion of kings of the ſame line, or family. The word is formed from the Greek, δυναστεια, of δυναστευω, *to be powerful, to be king.*

We find frequent mention in ancient hiſtory of *dynaſties* of Perſians, Aſſyrians, Medes, &c. The ancient Chronicon of Egypt mentioned by Syncellus, gives us an account of three different *dynaſties*; that of the gods, that of the demi-gods or heroes, and that of men or kings. The two former are repreſented as continuing thirty-four thouſand two hundred and thirty-one years, in order to favour the high antiquity of the Egyptians: the laſt as commencing with the reign of Menes the firſt king of Egypt, and terminating with Nectanebus II. under whom the kingdom was conquered by Artaxerxes Ochus; and this is ſaid to have laſted two thouſand three hundred and twenty-four years. Manetho has left us an hiſtorical chronology of Egypt, divided into thirty *dynaſties*, comprehending a ſpace of more than five thouſand three hundred years to the reign of Alexander: but it is certain, that theſe were collateral and not ſucceſſive.

DYOTA, in *Chemiſtry*, from δις, *double*, and ους, *ear*, a pelican, or circulating veſſel with two ears, in ſhape reſembling a man ſtanding with his arms bent outwards, and with his hands on his ſides.

DYPTYCHA, or rather DIPTYCHA. See DIPTYCHA.

DYSÆ, in *Mythology*, inferior goddeſſes among the Saxons, being the meſſengers of the great Woden, whoſe province it was to convey the ſouls of ſuch as died in battle to his abode, called *Valhall*, i. e. the hall of ſlaughter; where they were to drink with him and their other gods, *cereviſia*, or a kind of malt liquor, in the ſculls of their enemies. The *Dyſæ* conveyed, thoſe who died a natural death, to *Hela*, the goddeſs of hell, where they were tormented with hunger, thirſt, and every kind of evil.

DYSCRASY, from δυς and κρασις, an ill temperament or habit of the blood and humours, as in a jaundice or the like.

DYSENTERY, δυσεντερια, in *Medicine*, a bloody diarrhœa; or a flux of blood by ſtool, attended with pains and griping. Dr. Akenſide calls this diſeaſe a rheumatiſm of the bowels.

The word *dyſentery* is formed from the Greek, δυς, *difficulty*, and εντερον, *inteſtine*; and properly ſignifies that kind of flux of the belly, characterized by the frequency of ſtools, or ejections, mixed with blood, and accompanied with gripes. The fever, ulcers, &c. which attend it, are not eſſential to the diſeaſe; though many, both of the ancients and moderns, think the latter are.

The *dyſentry*, Sydenham obſerves, begins with a chilneſs and ſhivering; which is followed by a heat: then gripings of the belly enſue, with mucous, or ſanious ſtools, which in progreſs of time are found interſperſed with ſtreaks of blood, and attended with vehement pain.

The ſtools are ſometimes void of blood; and yet, if they be frequent, and attended with gripes, and a mucous colluvies, the ſame author ſays, it is a proper *dyſentery*.

Along with the excrements, beſides a whitiſh mucoſity, frequently there come ſcrapings of the guts, in form of little ſkins. If pure blood be evacuated, the patient's life is in great danger. Vomiting and hiccupping are alſo bad ſigns, becauſe they indicate an inflammation of the ſtomach. A feeble pulſe, coldneſs of the extremities, with difficulty of ſwallowing, and convulſions, are ſigns of approaching death.

Etmuller makes three kinds of *dyſenteries*. 1. When a laudable blood is evacuated, from a mere plethora, or plenitude, without any diſorder of the inteſtines; as in the hæmorrhoidal flux.

2. When a thin, watery blood is evacuated, called the *hepatic flux*, though really ariſing from the hæmorrhoidal veſſels.

The third kind, which is that we more peculiarly call *dyſentery*, is, when blood is caſt out mixed with a purulent matter in the excrements. See FLUX.

This is either *benign*, i. e. without a fever, and not contagious; or *malignant*, which is attended with a peſtilential fever, and frequently ravages whole cities and provinces; happening moſt commonly in armies. In the laſt ſtage, a ſort of caruncles are frequently ejected along with the purulent matter, which are difficult to be accounted for, unleſs from an excoriation and ulceration of the inteſtines. Sometimes the inteſtines in this caſe are even gangrened.

The cauſe of the *dyſentery*, as aſſigned by ſome phyſicians, is a ſerous, or other morbid humour, mixed with the maſs of blood; the conſequence of which is a too great fermentation in the blood, and a diſſolution of its parts, which are rendered too liquid. The ſecond cauſe is a vellication and irritation of the nervous fibres of the inteſtines, occaſioned by ſharp acid humours ſeparated from

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from the blood, which occaſion the ſpiral fibres that produce the periſtaltic motion of the guts to move too faſt, and thus to expel the matters too haſtily out of the inteſtines. The mediate cauſe, in the phyſicians language, is ſome foreign body adhering ſtrongly to the inteſtines; and, by its ſharp points, vellicating the nervous fibres of the inteſtines, and at length ulcerating them. The remote cauſes are any thing that corrupts the maſs of blood, as viſcid and crude, ſharp juices; ill foods, autumnal fruits, grapes, new wine drank in exceſs, poiſons, violent medicines, waters that have corroded leaden pipes; rainy weather in the ſpring, with a dry winter, and a hot ſummer and autumn.

The *dyſentery* is owing to cauſes little different from thoſe which produce the bilious or putrid fever. Accordingly it is agreed on all hands, that it chiefly proceeds from two cauſes, different in appearance, but in effect the ſame; one from acrimony, generated within the body; and the other from foul ſteams, which being received into it, act as a ferment, and ſuddenly produce the ſame diſorder that ariſes more ſlowly from an internal cauſe.

As to the acrimony, it appears to be of the putrid kind, the *dyſentery* being moſt frequent in hot, cloſe, and moiſt ſeaſons, when bodies are moſt ſubject to putrefaction; and beſides, it prevails chiefly among thoſe of a ſcorbutic habit, or the meaneſt and pooreſt people, who, from foul air, bad diet, and naſtineſs, are moſt liable to putrid diſeaſes.

There is likewiſe an old obſervation, that ſuch ſeaſons as produce moſt flies, caterpillars, and other inſects (the increaſe whereof depends ſo much upon heat, moiſture, and conſequently upon corruption) have likewiſe been the moſt productive of *dyſenteries*.

Laſtly, it is beyond diſpute, that the infection is communicated by putrid effluvia from the bodies; but more eſpecially the fæces of thoſe who are ill of the diſtemper. See Pringle, Obſervations on the Diſeaſes of the Army, p. 224, ſeq.

This diſeaſe is the ſame in camps as in other places; its greater fatality in the former, ariſing from want of neceſſaries, than from any extraordinary virulence in the *dyſentery* itſelf.

The ſeat of the diſeaſe is in the inteſtines, either the large or the ſmall, or both. When the diſeaſe is in the ſmall ones, the gripes begin long before the ſtools, and are felt about the navel; and the blood and excrements are more blended, as being longer together. When the large inteſtines are ſeized, the pain is leſs vehement, and is felt lower, &c.

Phyſicians diſtinguiſh three ſtates of the *dyſentery*: the firſt, when recent; the ſecond, when it has continued ſome time, and has much impaired the ſtrength, weakened the tone of the inteſtines, and abraded their villous coat; and the third, when, either from the putrid fumes within, or the foul air of an hoſpital, a malignant fever is joined, and a mortification threatened.

In the firſt ſtage bleeding is proper, though not in the ſubſequent ones: alſo vomiting with *ipecacuhana*, in ſmall quantities, and repeated ſeveral times. *Vitrum ceratum antimonii* is alſo recommended as the moſt efficacious emetic for relieving the ſtomach and bowels, provided it be given in the beginning of the diſtemper. After vomiting, a purge of rhubarb, to which are added a few grains of ſalt of wormwood, may be given. In winter, indeed, and vernal fluxes, bleeding and rhubarb have been found ſufficient, without vomits. In regard to diet, the common practice is to confine the patient in the beginning to rice-gruel, panado, mutton-broth, and the like; and for drink, rice or barley-water, or the white-decoction, are recommended. In the convaleſcent ſtate, they may be allowed meat, but no ſmall beer; and never any milk unleſs diluted with lime-water. Pringle, Obſervations on the Diſeaſes of the Army, p. 230, ſeq.

In the ſecond ſtage, the ſame diet, with ſmall doſes of the bark; to which has been added the extract of logwood, or the *tinctura Japonica*, is recommended. The following electary, prepared with the *Japonic* CONFECTION, two ounces; Lucatelli's balſum, one ounce; powdered rhubarb, half an ounce; and ſyrup of marſhmallows, may be given in the quantity of a nutmeg, twice or thrice a day, as the ſymptoms may require.

In a putrid *dyſentery*, the patient may be allowed to eat freely of moſt kinds of good ripe fruit, as apples, grapes, currants, ſtrawberries, &c. theſe being excellently calculated to counteract putrefaction; and with the ſame intention fixed air, adminiſtered both by way of drink and clyſter, may be highly uſeful. Whey alſo may be taken both ways; and camomile tea is alſo an exceeding proper drink, both for ſtrengthening the ſtomach, and by its antiſeptic qualities preventing a mortification of the bowels.

The *dyſentery*, after a ſeeming cure, is apt to recur upon any cold, or error in diet; however, it is to be obſerved, that for the moſt part, relapſes are not attended with ſuch acrimony as at firſt. When relapſes are apprehended, or the cure imperfect, the patient muſt ſtill uſe a ſoft mucilaginous diet, and continue to take ſome mild aſtringent; which laſt intention may be anſwered by lime-water, given to a pint a day, and ſoftened with half that quantity of boiled milk. Sometimes ſmall doſes of the bark have been no leſs effectual. Id. ibid.

Gripes always attend the *dyſentery*, and are relieved by opiates, by fomenting the belly, and drinking chamomile-tea; for carminatives, in this caſe, inſtead of mitigating, increaſe the pains. The tea produces this effect not only by its antiſpaſmodic but antiſeptic virtue. The fomentations, which are made of herbs, adding ſome ſpirits, muſt be frequently repeated; and when theſe are found ineffectual, the pains may be relieved with a bliſter, or only a warm plaſter, with a fourth or fifth part of the *emplaſtrum epiſpaſticum* added to it.

As to the third ſtage of this diſtemper, it coincides with the malignant or hoſpital-fever. See HOSPITAL-*fever*.

Purgatives have rarely any good effect in *dyſenteries*; as increaſing the fermentation of the blood, and irritating the fibres of the inteſtines more and more. Nor are emetics in general much better, as tending to draw the peccant humours into the ſtomach; or at leaſt into the higher inteſtines, and thus cauſe more frequent ſtools.

Ipecacuanha, however, is excellent on this occaſion: not ſo much as a vomitory, Dr. Freind obſerves, as a ſudorific; having this faculty beyond all other emetics, that it corrects the *dyſentery* ferment in proportion as it evacuates it. In the Philoſophical Tranſactions, we have an expreſs diſcourſe on the ſubject; where it is aſſerted to be infallible in all *dyſenteries* and looſeneſſes, how dangerous and inveterate ſoever; except in pulmonic and hydropic patients, whoſe fluxes are indications of approaching death.

Sydenham commends phlebotomy; but Willis ſays, no evacuation is good, and preſcribes hot cardiacs, as ſpirit of wine a little burnt, &c. Balſamic and ſtyptic medicines are alſo to be uſed, according to the diverſe cauſes and ſymptoms of the diſeaſe.

Borri, in a letter to Bartholine, affirms there is no better medicament in *dyſenteries* than roſe-water wherein gold has been extinguiſhed.

Dolæus relates, that he cured above an hundred perſons with oil of ſweet almonds, mixed with orange-juice.

In this diſorder, ſome, after bleeding and vomiting, give their patients ſmall doſes of calomel once a day, till their breath begins to be tainted; the purging being moderated by opiates, glutinous food, drink, and anodyne glyſters, which is the more neceſſary, as the guts in this caſe are eaſily irritated. Medic. Eſſ. Edinb. abridg. vol. i. p. 72.

The vitrum antimonii ceratum has been found a moſt efficacious remedy in this diſtemper. See VITRUM *Antimonium ceratum*.

Repeated doſes of ipecacuanha, and of rhubarb with calomel, with opiates in the evening, have alſo been found ſucceſsful. Medic. Eſſ. Edinb. abridg. vol. i. p. 65. where it is obſerved, that aſtringent medicines, without gentle revulſions and evacuations, generally retard the cure.

Ipecacuanha, and the ſimarouba, have often had great effects in this diſtemper. See Juſſieu in Mem. Acad. Scienc. ann. 1729. This gentleman ſays, that the ſimarouba may be compared to, and ſubſtituted for the *macer* of the ancients, which is by ſome ſuppoſed to have been a ſpecific in this diſtemper. See SIMAROUBA.

DYCESTHESIA, from δυς, *difficult*, and αισθησις, *ſenſation*, in *Medicine*, is uſed for a difficulty of, or fault in ſenſation.

DYSEPULOTICA, from δυς, επι, and ουλη, *cicatrix*, of ουλος, *ſound*, in *Medicine*, great ulcers beyond cure. See ULCER.

DYSOREXIA, from δυς and ορεξις, *appetite*, in *Medicine*, a want of appetite, proceeding from an ill diſpoſition, or diminiſhed action of the ſtomach. See APPETITE.

DYSPEPSY, Δυσπεψια, from δυς and πεπτειν, *coquere, to concoct*, in *Medicine*, a difficulty or weakneſs of digeſtion. See DIGESTION.

The *dyſpepſy* may ariſe from the too great weakneſs of the ferment of the ſtomach, or its being too ſparing in quantity; from a relaxation of the fibres of the ſtomach; the want of a proper heat in the ſtomach, &c. Bitters and ſubaſtringents are its proper-remedy.

DYSPHONIA, from δυς and φωνη, *voice*, in *Medicine*, a difficulty of ſpeech from an ill diſpoſition of the organs.

DYSPNOEA, Δυσπνοια, from δυς and πνεω, *I breathe*, in *Medicine*, a difficulty of breathing.

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The *dyſpnœa* admits of three degrees: a ſhort-breath, an aſthma, and an orthopnœa. The ſhort-breath is the firſt and lighteſt degree. The aſthma is more violent, and is accompanied with a wheezing.

The orthopnœa is the higheſt of all; the patient affected therewith not being able to lie down, but obliged to keep erect, without which he could not reſpire.

The moſt uſual cauſes of *dyſpnœas* are phlegm lodged in the bronchia, or the too ſtrong conſtriction of the bronchia themſelves, which prevents the eaſy ingreſs of the air into the lungs. See ASTHMA and ORTHOPNOEA.

DYSTHANATOS, from δυς and θανατος, *dying*, a word uſed by the ancient writers, ſometimes to ſignify any diſeaſe which occaſions a painful and ſlow death, and ſometimes for the perſon dying in ſuch a lingering manner.

DYSURIA, Δυσουρια, from δυς and ουρειν, *to make urine*, in *Medicine*, a difficulty of making urine, accompanied with pain, and a ſenſe of heat.

It is alſo called *ardor urinæ*, becauſe the urine ſeems to burn the urethra as it iſſues forth.

The *dyſuria* differs chiefly from the ſtrangury in this, that in the ſtrangury the urine only ouſes out, as it were drop by drop; whereas in the *dyſuria*, when it is made, it ſtreams out without any interruption, and frequently in the proper quantity: thus it alſo differs from the *iſchuria*, which is a total ſuppreſſion of urine.

The ordinary cauſes of the *dyſuria* are, the acrimony, or ſharpneſs of the urine, and the excoriation or exulceration of the neck of the bladder, or of the urinary paſſage.

The uſual remedies in this caſe are cooling laxatives and mucilaginous medicines, as gum arabic, diſſolved in barley-water; decoctions of marſhmallow-root, with or without nitre; camphor, and ſmall doſes of laudanum. See ISCHURIA and STRANGURY.

DYTISCUS, in *Zoology*. See *Water*-BEETLE.

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E.

E, The fifth letter of the alphabet, and the ſecond vowel.

E is a letter that admits of ſome variety in the pronunciation, in moſt languages; whence grammarians uſually diſtinguiſh ſeveral *E's*, or kinds of *E*. In Engliſh, *E* has two ſounds; long, as *ſcēne*, and ſhort, as *mĕn*. *E* final has the peculiar quality of lengthening the preceding vowel, as *căn*, *cāne*; yet there are ſome inſtances in which it has not this effect; as *gŏne*, &c. It ſerves alſo to modify the foregoing conſonants; as *ſince*, &c. It is alſo ſounded at the end of proper names, as *Penèlope*, and in monoſyllables that have no other vowel, as *the*; but in every other caſe it is mute. It was formerly uſed much more generally at the end of words than at preſent, and had probably a ſoft ſound like the French *E* feminine; and afterwards was made vocal or ſilent in poetry, as the verſe required, till at laſt it became univerſally ſilent. Camden calls it the ſilent *E*. Johnſon.

The Greeks, have their ſhort and long *E*, viz. ε and η, epſilon and ēta. The Greek η, or H, *eta*, or *ita*, was no original letter; but was added to the alphabet in after-times. Of this we have proofs ſtill extant in the ancient monuments; particularly, the Farneſe columns, brought to Rome from the Via Appia, where the *epſilon*, E, is uſed in lieu of the H: e. gr. DEMETPOΣ KOPEΣ, for DHMHTPOΣ KOPHΣ. This letter is ſaid to have been added by Simonides.

The pronunciation of the η ſeems to have been varied; it having been ſometimes the ſame with the Latin *E*, ſometimes with *I*. Terentianus aſſures us of the former; and the Greeks themſelves for many ages have only uſed the latter.

The Latins have an opener *E*, called *vaſtius*; ſuch was the ſecond *E*, in the word *here*, *maſter*; and another cloſer, as that in the adverb *here*, *yeſterday*. This latter *E* they frequently uſed promiſcuouſly with *I*. Thus for *here*, they wrote *heri*; and, in diverſe places, we meet with *ſibe*, *quaſe*, &c. for *ſibi*, *quaſi*, &c.

The Roman *E* was likewiſe ſometimes written, by corruption, æ; for which reaſon, F. Hardouin takes that medal of Gallienus, GALLIENÆ AUGUSTÆ, not to be any ſatirical medal, as others have imagined; nor to be a dative feminine, but a vocative maſculine, *Galliene Auguſte*, wrote with the æ.

It has been much diſputed how the Latins render the η in their language. The common opinion is, that they render it by an *E*; as in Δημητριος, Βητα, Ημερα, Θησευς, Θησαυρος, &c. which they rendered *Demetrius*, *Beta*, *Hemera*, *Theſeus*, *Theſaurus*, &c. Though there are perſons exceedingly well verſed in antiquity, who hold that they pronounced it like an *i*. Lud. de Dieu, one of the moſt learned grammarians of his age, obſerves as much in his animadverſions on Geneſis vi. 24. Adding, that it is for this reaſon, that the Hebrews, e. gr. the paraphraſt Jonathan, expreſſes it by a *Hhirek*; μησωρ, מסטור. J. Rod. Wetſtein proves the ſame in his learned oration on the true pronunciation of the Greek tongue, from an infinity of inſtances. To this purpoſe he cites a manuſcript Pſalter of the eighth century, where all the η's are expreſſed by *i's*. In effect, Wetſtein ſhews, not only that the Latins pronounced and wrote it as an *i*, which might happen from its being ſo eaſily confounded in writing with an *i*; but alſo that they rendered it by an æ, and *ai*; that it was often uſed for Υ and ΕΙ; and that in the time of Plato this letter had a kind of intermediate ſound between the ε and ι. See that author, and Voſſius de Idolol. lib. ii. cap. 16.

The French have, at leaſt, ſix kinds of *E*; the firſt pronounced like *a*; as in *emporter*, *orient*, &c. The ſecond, a final mute, in the laſt ſyllable of diverſe words not pronounced at all; as in *bonne*, *donne*, &c. The third, an imperfect mute, pronounced much like the diphthong *ea*, &c. as in *je*, *de*, *te*. The fourth, *e ferme*, or *e maſculine*, marked at the ends of words with an accent, *é*. The fifth, is *e ouvert*, or *long e*, having the ſame ſound with *ai*, as in *mere*, *feſte*, &c. In the middle of words it is ſometimes marked with a circumflex, and in the end, with an accent, *é*. The ſixth, is an intermediate *e*, between the *ouvert* and *ferme*; as in *cabaret*, *lettre*, &c. Some add a ſeventh kind of *e*, not reducible to any of the former, as that in *grammarien*, *hiſtorien*, &c. And others admit of only three kinds, viz. the mute, open, and ſhut; but they make variations therein, which amounts to the ſame thing.

As to the figure of the letter *E*, we borrow it from the Latins, who had it from the Greeks, and they from the Phœnicians, by Cadmus, who firſt brought it them. Now the Phœnicians had the ſame characters with the Hebrews. Accordingly, the form of the ancient Hebrew *He* was the ſame with that of our *E*, as may be ſeen in the Hebrew medals, and the Jeſuit Souciet's Diſſertation thereon, p. 143. All the difference between them conſiſts in this, that the Hebrews, reading from right to left, turn their letters that way; whereas the moderns, reading from left to right, write their letters accordingly.

The little *e* was formed of the great one, by writing it faſt, and making the croſs ſtrokes at top and bottom without taking pen off paper, and then adding the ſtroke in the middle.

E, on the keys of an organ, or harpſichord, denotes the tones, *E*, *mi*, *la*.

On the compaſs, in ſea-charts, &c. it marks the eaſt point, or wind. E. eaſt; E. S. E. eaſt-ſouth-eaſt; N. E. north-eaſt, &c.

In the calendar, *E* makes the fifth of the Dominical letters.

Among authors, *e. gr.* ſtands for *exempli gratia*, *for inſtance*. In ſeveral dictionaries we find it noted, that the letter *E*, among the ancients, was a numeral letter, ſignifying 250, according to the verſe,

E *quoque ducentos & quinquaginta tenebit.*

But it has already been obſerved, that this uſe of numeral letters was unknown among the earlieſt people. Iſidore Hiſpalenſis, an author of the ſeventh century, ſays as much in expreſs terms, in the firſt book of his Origines, cap. 3. In effect, it was firſt introduced in the times of barbariſm and ignorance.

EADISH. See EDDISH.

EAGER *Wine*. See WINE.

EAGLE, *Aquila*, Αετος, in *Ornithology*, the largeſt, ſtrongeſt, and ſwifteſt, of all the birds that live by prey.

In the Linnæan ſyſtem it is a ſpecies of the FALCON. See *Tab. of Birds*, N° 1.

It has a long beak, hooked almoſt from the root; yellow legs, which are feathered to the toes; and the toes are covered with large ſcales; thick, crooked talons, and a ſhort tail, of a deep brown, with waves of aſh-colour, and uſually white at the roots of the feathers. Its plumage is cheſnut-coloured, brown, ruddy, and white. Its beak black at the tip, and in the middle blue, though in ſome yellow. The *eagle* is diſtinguiſhed from the hawk by his bigneſs; and from the vultur, by the crookedneſs of his beak.

This is the *golden eagle* of ſome authors, the *falco chryſaetos* of Linnæus, and the *royal eagle* of others.

Its aery, or neſt, is uſually on the higheſt rocks, ſometimes on the tops of old trees. It feeds its young till ſuch time as they are able to fly, and then drives them out of the neſt.

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Its food is birds, hares, lambs, kids, and fawns; nay, Sir Robert Sibbald aſſures us, children too, when it can catch them; of which he gives an inſtance in the Orcades iſlands. Prod. Nat. Hiſt. Scot. lib. iii. p. 2. and 14.

Ray mentions an *eagle's* neſt, found near the river Derwent, in 1668. It conſiſted of large ſtrong ſticks, one end whereof was laid on the crag of a rock, and the other on two beech-trees; it was two yards ſquare; in it was found one *eaglet*, with the carcaſe of a lamb, one hare, and three grygalli. Synopſ. Method. Av. p. 6.

The *eagle* frequently watches the fiſhing-hawk, and as ſoon as it perceives it to have ſtruck a fiſh, takes wing, and purſues the bird till it lets fall its prey, and often catches it before it reaches the earth or water. Phil. Tranſ. N° 201.

Eagles are remarkable for their longevity, and for their faculty of ſuſtaining a long abſence from food. Keyſler relates, that an *eagle* died at Vienna after a confinement of a hundred and four years, which juſtifies the alluſion of the Pſalmiſt. Pſalm ciii. 5.

Its ſight is quick, ſtrong, and piercing, to a proverb. Job xxxix. 29. The reaſon why the *eagle*, the fibres of whoſe optic nerves are not ſtronger than thoſe of other animals, is able to face the ſun, and endure its brighteſt rays, the Jeſuit Angelus, in his Optics, aſſures us, is, that it has two ſets of eye-lids, the one thick and cloſe, and the other thinner and finer, which laſt it draws over the eye, when it looks at any luminous body, and thus breaks the force of its rays.

The falconers have trained up *eagles* to the game; but they only ſucceed in mountainous countries. On plains they cannot keep any time on the wing; and when they ſtoop, or light, are weak, ſo that the faker beats them.

Ariſtotle, and Pliny, reckon up ſix kinds of *eagles*, to which they give names correſponding to the difference of their plumage: as the *eagle-royal*, called by Ariſtotle γνησιος, and ασσιας, from the ruddy, golden colour of its feathers, which are likewiſe ſpotted as it were with ſtars. The *black eagle*, *valeria*, the ſmalleſt and moſt vigorous of all. The *white-tailed eagle*, or *pygargus*. The *middle-ſized eagle*, with a large tail, living in moraſſes, *morphnus*. The *ſea-eagle*, *haliætus*. And the *bearded-eagle*, a kind of *oſſifraga*.

EAGLE, *black*, a ſpecies, called alſo *aquila valeria* by ſome authors. It is a ſmall *eagle*, of twice the bigneſs of a crow. Its jaws and eye-brows are deſtitute of feathers, and look reddiſh; its head, neck, and breaſt, are black, and in the middle of its back he has a large triangular ſpot, of a pale browniſh red, with ſomething of whiteneſs intermixed. His rump is a reddiſh brown, and his wings variegated with black, white, and grey. His beak is not large, black at the end; the ſkin, covering the noſtrils, red; and the iris of his eyes hazel-coloured. His legs are feathered a little below the knee, and below that are red; and the claws very ſharp. Willughby's Ornithology, p. 30.

EAGLE, *creſted*, in *Ornithology*, a name under which Nieremberg has deſcribed an American ſpecies of bird, of the *eagle* kind, called by the Indians *yzuahtli*. It is, by much, the largeſt of all the *eagles*, yet it is eaſily tamed, and fitted for the diverſions of hawking. This is placed by Mr. Ray among the birds, the deſcriptions of which he is very ſuſpicious of. Ray's Ornithol. p. 299.

EAGLE, *ſea*, in *Ornithology*, a name uſed by ſome authors for the HALIÆTUS, or oſprey.

EAGLE, *ſea*, in *Ichthyology*, the name of a ſpecies of cartilaginous flat fiſh, of the paſtinacha marina kind. It is generally found ſmall, but ſometimes grows to a very large ſize. Its head is large for a fiſh of this genus, and ſomewhat reſembles a toad's in ſhape; its eyes are large and prominent; its mouth is placed in the under part of the head, and is large, and furniſhed with ſtrong teeth. Its ſides are broad and thin, and repreſent the expanded wings of an eagle, whence it had its name. See *Tab. of Fiſhes*, N° 1.

EAGLE, *white-tailed*, *Falco fulvus* of Linnæus, is a ſpecies common in the northern parts of Europe and America. This is called in Scotland the *black eagle*, from the dark colour of the plumage. It is about the ſame ſize with the golden *eagle*; the bill is of a blackiſh horn colour, the cere yellow, and the whole body is of a deep brown, ſlightly tinged with ruſt colour; but its diſtinguiſhing characteriſtic is a band of white on the upper part of the tail. The legs are feathered to the feet, the toes are yellow, and the claws black. The white-tailed *eagle* of Canada is a variety of this, differing only in ſome white ſpots on the breaſt. See PYGARGUS.

EAGLE, in *Heraldry*, is the ſymbol of royalty, as being, according to Philoſtratus, the king of birds; and for that reaſon dedicated, by the ancients, to Jupiter.

The *eagle* is the arms of the emperor, the king of Poland, &c. It is accounted one of the moſt noble bearings in heraldry, and, according to the learned in that art, ought never to be given, but in conſideration of ſingular bravery, generoſity, &c. On which occaſions, either a whole *eagle*, or an *eagle naiſſant*, or only the head, or other parts, agreeable to the exploit, may be granted.

The *eagle* is ſometimes repreſented with one head, and ſometimes with two, though never more than one body, two legs, and two wings opened, or ſtretched out, in which poſture it is ſaid to be *ſpread* or *diſplayed:* ſuch is that of the empire, which is blazoned a *ſpread eagle*, *ſable*, *diademed*, *langued*, *beaked* and *membered*, *gules*.

The reaſon why *eagles* are generally given in heraldry diſplayed, is partly, becauſe in that poſture they fill up the eſcutcheon better, and partly, becauſe it is imagined a poſture natural to the *eagle*, when it plumes its feathers, or faces the ſun. However, there are *eagles* borne in other poſtures; and ſome monſtrous ones, with human or wolves heads, &c. The late authors only ſay *diſplayed* to expreſs the two heads; and ſay *an eagle*, without any addition, when it has but one. The kingdom of Poland bears *gules*, *an eagle argent*, *crowned and membred*, *or*.

The *eagle* has been borne, by way of enſign, or ſtandard, by ſeveral nations. The firſt who ſeem to have aſſumed the *eagle*, were the Perſians, according to the teſtimony of Xenophon. Afterwards, it was taken by the Romans; who, after a great variety of ſtandards, at length fixed on the *eagle*, in the ſecond year of the conſulate of C. Marius: till that time, they uſed indifferently wolves, leopards, and *eagles*, according to the humour of the commander.

Several among the learned maintain, that the Romans borrowed this cuſtom from Jupiter, who had appropriated the *eagle* as his own badge, in commemoration of its ſupplying him with nectar, while he lay concealed in Crete, for fear of being devoured by his father Saturn. Others hold that they borrowed it from the Tuſcans, and others from the Epirots.

The Roman *eagles*, it muſt be obſerved, were not painted on a cloth, or flag; but were figures in relievo, of ſilver or gold, borne on the tops of pikes; the wings being diſplayed, and frequently a thunderbolt in their talons. Under the *eagle*, on the pike, were piled bucklers, and ſometimes crowns. Thus much we learn from the medals. See Feſchius in his Diſſert. de Inſignibus. And Lipſius, De Militia Romana, lib. iv. dial. 5.

Conſtantine is ſaid to have firſt introduced the *eagle* with two heads, to intimate, that though the empire ſeemed divided, it was yet only one body. Others ſay, that it was Charlemagne, who reſuming the *eagle*, as the Roman enſign, added to it a ſecond head; but that opinion is deſtroyed, by an *eagle* with two heads, noted by Lipſius, on the Antonine column; as alſo by the *eagle's* only having one head on the ſeal of the golden bull, of the emperor Charles IV. The conjecture, therefore, of F. Meneſtrier appears more probable, who maintains, that as the emperors of the Eaſt, when there were two on the throne at the ſame time, ſtruck their coins with the impreſſion of a croſs, with a double traverſe, which each of them held in one hand, as being the ſymbol of the Chriſtians; the like they did with the *eagle* in their enſigns; and inſtead of doubling their *eagles*, they joined them together, and repreſented them with two heads. In which they were followed by the emperors of the Weſt.

F. Papebroche wiſhes, that this conjecture of Meneſtrier were confirmed by ancient coins; without which, he rather inclines to think the uſe of the *eagle* with two heads, to be merely arbitrary; though he grants it probable, that it was firſt introduced on occaſion of two emperors in the ſame throne.

The *eagle* on medals, according to M. Spanheim, is a ſymbol of divinity, and providence; and, according to all other antiquaries, of empire. The princes on whoſe medals it is moſt uſually found, are the Ptolemies and the Seleucides of Syria. An *eagle* with the word CONSECRATIO, expreſſes the apotheoſis of an emperor.

EAGLES, a name found very frequently in the ancient hiſtories of Ireland, and uſed to expreſs a ſort of baſe money that was current in that kingdom in the firſt years of the reign of Edward the firſt, that is, about the year 1272. There were, beſides the *eagles*, lionines, roſades, and many other coins of the ſame ſort, named according to the figures they were impreſſed with. Simon's, Hiſt. Coins.

The current coin of the kingdom was at that time a compoſition of copper and ſilver, in a determined proportion, but theſe were ſo much worſe than the ſtandard proportion of that time, that they were not intrinſically worth quite half ſo much as the others. They were imported out of France, and other foreign countries. When this prince

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prince had been a few years eſtabliſhed on the throne, he ſet up mints in Ireland for the coining ſufficient quantities of good money, and then decried the uſe of theſe *eagles*, and other the like kinds of baſe coins, and made it death, with confiſcation of effects, to import any more of them into the kingdom.

EAGLE, *Aquila*, in *Aſtronomy*, is a conſtellation of the northern hemiſphere, having its right wing contiguous to the equinoctial.

For the ſtars in this conſtellation, their number, longitude, latitude, &c. ſee AQUILA.

There are alſo three ſeveral ſtars, particularly denominated among the Arab aſtronomers, *Naſr*, i. e. *eagle*. The firſt, *Naſr Sohail*, the *Eagle of Canopus*, called alſo *Sitareh Jemen*, the ſtar of Arabia Felix, over which it is ſuppoſed to preſide; the ſecond, *Naſr Althair*, the *Flying Eagle*; and the third, *Naſr Alvake*, the *Reſting Eagle*.

EAGLE, *White*, is a Poliſh order of knighthood, inſtituted in 1325, by Uladiſlaus V. on marrying his ſon Caſimire with a daughter of the great-duke of Lithuania.

The cavaliers of this order were diſtinguiſhed by a gold chain, which they wore on the ſtomach, whereon hung a ſilver *eagle* crowned.

EAGLE, *Black*, was a like order, inſtituted in 1701, by the elector of Brandenburgh, on his being crowned king of Pruſſia.

The knights of this order wear an orange-coloured ribbon, to which is ſuſpended a black *eagle*.

EAGLE, in *Architecture*, is a figure of that bird anciently uſed as an attribute, or cognizance of Jupiter, in the capital and friezes of the columns of temples conſecrated to that god.

EAGLE-*flower*. See BALSAMINE.

EAGLE-*ſtone*, in *Natural Hiſtory*, a ſtone, by the Greeks, called *ætites*, and by the Italians, *pietra d'aquila*, as being ſuppoſed to be ſometimes found in the *eagle's* neſt. It is of famous traditionary virtue, either for forwarding, or preventing, the delivery of women in labour, according as it is applied above, or below, the womb.

Matthiolus tells us, that birds of prey could never hatch their young without it, and that they go in ſearch for it as far as the Eaſt Indies. Bauſch has an expreſs Latin treatiſe on the ſubject. See ÆTITES.

EAGLET, or EAGLON, a diminutive of *eagle*, properly ſignifying a young *eagle*.

The *eagle* is ſaid to prove his *eaglets* in the brightneſs of the ſun; and if they ſhut their eye-lids, he diſowns them. In *Heraldry*, when there are ſeveral *eagles* on the ſame eſcutcheon, they are called *eaglets*.

EALDERMAN, or EALDORMAN, among the Saxons, was of like import with *earl* among the Danes. Camden's Britan. p. 107.

The word was alſo uſed for an elder, ſenator, or ſtateſman. Hence, at this day, we call thoſe *aldermen*, who are aſſociates to the chief officer in the common-council of a city or corporate town.

EAR, *Auris*, the organ of hearing; or that part whereby animals receive the impreſſion of ſounds.

The *ear* is generally divided into *internal* and *external*.

The *external*, or *outer ear*, in moſt animals, conſiſts of two principal parts, viz. that which appears prominent from the head, called the *auricle*; and an inner part, which enters the ſkull by a narrow paſſage, called the *meatus auditorius*; and leads to the *auris* or *ear*, properly ſo called.

The *auricle*, or outer part of the *external ear*, is ſemicircular, and contains divers ſinuoſities. Its upper part, which is the broadeſt, is called *pinna*, and ſometimes *ala*; and the lower, which is narrower, ſofter, and pendant, the *lobe*, or *fibra*, being that to which ladies hang their ear-rings, &c. The outer area, or extent of the *auricle*, is called the *helix*; and the inner, oblong prominence, ſurrounded by it, the *anthelix*; the little protuberance of the ſide next the face, is called the *tragus*, or *tircus*; and the ridge juſt above, and oppoſite to it, the *antitragus*; and the cavity, leading to the beginning of the *meatus*, the *concha*. See each part deſcribed under its proper article.

The *auricle* ſtands out from the head, and is furrowed with divers winding canals, which receive and collect the wandering circumambient impreſſions, and undulations of ſound, and modify and forward them to the inner *ear*. It is formed of a thin cartilage, covered with a ſkin. It has two muſcles, which in men are very ſmall, whence ſome anatomiſts deny there are any at all, though others increaſe their number to three, one attollent, and two retrahent; and others to four. But in brutes, which move and prick the *ears*, as horſes, aſſes, &c. they are very large and conſiderable. Thoſe who have loſt their *auricles*, M. Dionis obſerves, have but a confuſed way of hearing; and are obliged either to form a cavity round the *ear* with their hands, or to make uſe of a horn, applying the end of it to the *meatus auditorius*.

The inner part of the *external ear* is poſſeſſed by the *meatus auditorius*, or auditory paſſage, which commences from the bottom of the concha, called the *alveatium*, and is continued in a winding direction, turning ſometimes this way, and ſometimes that, to the *membrana tympani*. The *meatus* is dug out of the *os temporis*, and lined with a ſkin; or membrane, which is furniſhed with divers little glands, that ſeparate a thick, yellow, glutinous humour, called *cerumen*, or *ear-wax*, ſerving to defend the *ear* from the ingreſs of vermin, and other extraneous bodies, and cellular membrane. This *meatus* is all the *external ear*, in diverſe animals, as reptiles, birds, moles, divers fiſhes, &c. The farther end thereof is cloſed by a thin, dry, round, tranſparent membrane, called the *membrani tympani*, and improperly, *tympanum*, or drum, which ſeparates the *external ear* from the *internal*. The arteries of the external *ear* come anteriorly from the *arteria temporalis*, and poſteriorly from the *occipitalis*, which is a branch of the external carotid. The veins are rami of the *jugularis externa*.

Behind the *membrana tympani*, is a cavity called, by different authors, the *tympanum*, *cavitas tympani*, *concha interna*, and *meatus auditorius internus*. In this cavity are five conſiderable parts; viz. four little bones; two apertures, called *foramina*, or *feneſtræ*; as many meatuſes, or paſſages; four muſcles, and a branch of a nerve.

The firſt of the bones, or oſſelets, is the *malleolus*, *malleus*, or hammer; the ſecond, is called the *incus*, or anvil; the third, the *ſtapes*, or *ſtirrop*; and the fourth, the *orbiculare*. Theſe bones are nearly of the ſame bigneſs at the birth of the child, as when arrived at maturity, ſo that all that age does is to harden them.

To give motion to theſe bones, is the office of the four muſcles of this cavity; three of them belonging to the *malleus*; viz. the *externus*, *obliquus*, and *internus*; and the fourth to the *ſtapes*, called the *muſculus ſtapedis*.

The two meatuſes are ſituated at the ſides of the cavity; the one opening into the palate, called *aquæductus*, or Euſtachian tube; the other, ſhorter and bigger, opening into the ſinus, in the mamillary proceſs.

The two apertures, or *feneſtræ*, of the tympanum, are in the ſurface of the *os petroſum*, which is oppoſite to the membrane of the tympanum. The firſt, called *feneſtra ovalis*, becauſe of its figure, is ſituate a little higher than the other, and receives the baſis of the *ſtapes*. The other is called *rotunda*, notwithſtanding its figure is oval, like the former, and is cloſed by a thin, dry, tranſparent membrane, reſembling that of the tympanum.

The laſt thing conſidered in the cavity of the tympanum is a fine chord, which runs over the inner ſurface of the membrane, called *chorda tympani*. Anatomiſts have long diſputed, whether it was an artery, a vein, or nerve, or the tendon of one of the muſcles of the malleus; but it is now diſcovered to be a branch of the fifth pair of nerves, which meets the *portio dura* of the auditory nerve.

The two *feneſtræ* above mentioned open into a cavity dug out of the *os petroſum*, called the *labyrinth*, as being perplexed with divers windings and meanders: in this cavity is ſuppoſed to be contained the *innate* AIR. It is divided into three parts, which are lined by a fine perioſteum, in which, and alſo through the whole extent of the perioſteum of the inner *ear* may be diſcovered a great number of blood-veſſels; the firſt is called the *veſtible*, becauſe it leads into the other two; in it are obſerved nine apertures, or foramina. The ſecond, placed on one ſide of the veſtibulum, towards the back of the head, comprehends three round canals, diſpoſed in a ſemicircular form, and thence called *canales ſemicirculares*. The third is the *cochlea*, which conſiſts of two parts, viz. a ſpiral ſemi-oval canal; and a lamina, formed into a ſpiral flight. The canal makes two turns and an half round a newel, or axis, ſtill growing leſs as it aſcends; the ſpiral lamina divides this cavity into two, being faſtened by its baſe to this newel; and, by its other extremity, to the ſurface of the canal oppoſite to the newel, by means of a very fine membrane. The cavity of the cochlea, thus divided, forms, as it were, two winding ſtair-caſes, both formed on the ſame newel, one over the other, but without any communication between them. In the aqueduct is the auditory nerve; which conſiſts of two branches, or parts; the one ſoft, called *portio mollis*; and the other harder, *portio dura*; the ſoft part is ſpent on the organ of hearing, being divided into five branches, which form a delicate web, that lines the veſtibulum, cochlea, &c. The hard part paſſing through the whole bony duct called *aqueductus Fallopii*, out of the cranium, is diſtributed among the parts of the external *ear*, &c.

The other veſſels of the internal *ear* are arteries and veins from the carotids and jugulars. Particular deſcriptions

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of each part of the ear, see under FENESTRA, FORAMEN, MALLEUS, STAPES, ORBICULARE, LABYRINTH, VESTIBLE, COCHLEA, AUDITORY *Nerve*, &c. The immediate organ of hearing has been generally supposed to be the membrane of the tympanum; but later anatomists shew this to be a mistake, from divers instances, wherein that membrane has been absolutely destroyed, and broken, without the least diminution of the sense of hearing.

The parts that bid the fairest for this prerogative, are those which compose the labyrinth; viz. the cochlea, lamina spiralis, vestible, and semicircular canals; the portio mollis of the auditory nerve, ramified and diffused through these parts, receives the impressions of sounds, and propagates them to the brain.

The commissaries of the Royal Society of Physicians at Paris, appointed to examine the work of M. Geoffroy, entitled Dissertations sur l'Organe de l'Oüe de l'Homme, de Reptiles, des Poisons, published in 1778, infer, from the facts and observations which he has recited, that the impression made on the branch or part of the auditory nerve, called the *portio mollis*, is sufficient to produce the perception or sensation of sound; that the semicircular canals render this perception more lively and intense; that the cochlea adds little to the intensity of the impression, but the small bones, or ossicles, considerably; and that the human species, quadrupeds, and cetaceous fishes, form the first class of animals, whose organ of hearing is the most subtile, and of the most perfect construction; that birds are to be placed in the second; reptiles, who have the external marks of a tympanum, in the third; cartilaginous fishes in the fourth; spinous or prickly fishes in the fifth; fishes of the eel-kind, which seem to have only two semicircular canals completely formed, in the sixth; and serpents, who appear to have no semicircular canals, in the seventh.

Behind, and under the external *ear*, are a number of large glands, called *parotides*, wherein is separated a great deal of saliva; which is conveyed, by the excretory ducts, into the mouth.

Distempers incident to the ear, and adjacent parts, are noises, OTALGIA, DEAFNESS, &c.

EAR, *wounds of the*. Wounds of the external *ear* are easily united by sticking-plasters, unless the cartilage is entirely divided, and then it will require the help of the needle, and the application of vulnerary balsams, with the proper compresses and bandages. When the *ear* is wounded in the neighbourhood of the meatus auditorius, great care must be taken to prevent the discharge of blood and matter into that passage, which would do great mischief to the tympanum; but this may be done only by filling the internal *ear* with lint or cotton. Heister's Surgery, p. 81.

M. Le Cat, in his Treatise of the Organ of Sound, has new figures of several parts of the *ear*. Med. Ess. Edinb. abr. tom. ii. p. 481.

We have also some treatises on the *ear* by Dr. Cassebhom, containing very minute descriptions of the parts. Ibid.

EARS, *running of the*, in infants. See INFANT.

The comparative anatomy of the *ear* furnishes abundant instances of the Creator's wisdom. In birds, the outer *ear* is of a form proper for flight; not protuberant, as that would obstruct their progress, but close and covered.

In quadrupeds, its form is agreeable to the posture and motion of the body, but admirably varied, according to their various occasions: in some, as the hare, it is large, open, and erect; by which means that timorous, defenceless creature, is warned of the least approach of danger: in others, it is covered, to keep out noxious bodies. In the subterraneous quadrupeds, who are forced to mine and dig for their food and habitation, as a protuberant *ear* would obstruct them, and be liable to injuries, their *ears* are very short, and are lodged deep, and backwards in the head.

Thus moles have no auricle at all, but only a round hole, between the neck and shoulder. Some authors observe, that this meatus, or passage, is closed with a little skin, which opens and shuts like an eye-lid. The sea-calf, and the several species of lizards and serpents, are likewise without any external *ear*. And the tortoise, cameleon, and generality of fishes, have the passage of the *ear* quite stopped, or covered over. And there is a sort of whale, which has the aperture of the *ear* under the shoulder.

Among all the varieties in the structure of this organ, none, as Dr. Grew observes, are more remarkable than those in the passage into the os petrosum; for in an owl, which perches on a tree, or beam, and hearkens after the prey beneath her, it is produced farther out above, than below, for the better reception of the least sound: in a fox, which scouts underneath the prey at roost, it is, for the same reason, produced farther out below: in a pole-cat, which hearkens strait forwards, it is produced behind, for the taking of a forward sound; where-

as in a hare, which is very quick of hearing, and thinks of nothing but being pursued, it is supplied with a bony tube, directed backwards, so as to receive the smallest and most distant sound that comes behind her.

Schelhammer denies the existence of the innate air, so much talked of, in the labyrinth; and with good reason, as there is a passage out of the labyrinth into the throat, through which the innate air must escape. This is past doubt; since, by stopping the breath, and straining, we can force the external air into the *ear*, and even hear it rushing in. When the passage is any way stopped, as by a cold, &c. the hearing thereby becomes dull and obtuse; and when, by strong swallowing, or other motion of the throat, the passage is opened, we perceive it by a sudden crack, and immediately hear very clearly, the load of feculent air being then discharged from the inner *ear*.

Several naturalists and physicians have held, that cutting off the *ear* rendered persons barren, and unprolific; and this idle notion was what first occasioned the legislators to order the *ears* of thieves, &c. to be cut off, lest they should produce their like.

The *ear* has its beauties, which a good painter ought by no means to disregard; where it is well formed, it would be an injury to the head to be hidden. Suetonius insists, particularly, on the beauties of Augustus's *ears*; and Ælian, describing the beauties of Aspasia, observes she had short ears.

Martial also ranks large *ears* among the number of deformities. Felibien.

Among the Athenians, it was a mark of nobility to have the *ears* bored, or perforated. And among the Hebrews and Romans, this was a mark of servitude.

Loss of one *ear* is a punishment enacted by 5 & 6 Ed. VI. cap. 4. for fighting in a church-yard; and by 2 & 3 Ed. VI. cap. 15. for combinations to raise the price of provisions, labour, &c. if it be the third offence, beside pillory, and perpetual infamy, or a fine of 40*l*.

By a statute of Henry VIII. maliciously cutting off the *ear* of a person is made a trespass, for which treble damages shall be recovered; and the offender is to pay a fine of ten pounds to the king. 37 Hen. VIII. cap. 6. § 4. In the index to the Statutes at Large, it is said, that this offence may be punished as felony, by 22 & 23 Car. II. cap. 1. § 7. commonly called Coventry's act; but *ear* is not mentioned in that statute.

EAR, *tingling of the*. See TINNITUS.

EAR, in *Music*, denotes a kind of internal sense, whereby we judge of musical sounds and harmony; they who possess this sense are said to have a good *ear*. And the like distinction we should, probably, acknowlege in other affairs, had we got distinct names to denote those powers of perception by.

Thus, a greater capacity of perceiving the beauties of painting, architecture, &c. is called a *fine taste*. See TASTE.

EAR-*ach*. See OTALGIA.

EAR *of fishes*. All the cetaceous fishes have external meatus auditorii, or passages for hearing; but other fish have nothing of these external appearances, and seem neither to be intended by nature to make any sounds, or to hear any. Though sound being a tremulation in the air, it may be felt by them as motion, though not distinguished as sound. It may easily be proved, that they do not hear our voices in speaking, by walking near the side of a pond or river well stored with fish about the edges, if the body and its shadow be kept out of their sight, they will never start at the voice.

Yet how far fishes are deaf and dumb, seems a question not yet perfectly decided. See FISH.

EAR, in *Gardening*, a name given to the seminal leaves of plants, or those two green and succulent leaves which first appear from the seed, and are very different, in all respects, from those which follow. Thus in the melon plants, the two first leaves are called *ears*; and the leaves, with their stalks, which shoot out afterwards, are called knots, and denominated the first, second, and third knot, according to their place, and time of growing. The cutting off every third knot in this plant, is the great means of procuring the finest and largest fruit. Phil. Transf. N° 45.

EAR, in *Botany*, is also applied to a long cluster of flowers, or seeds, produced by certain plants; and usually called, by botanists, *spica*. The flowers and seeds of wheat, rye, barley, &c. grow in *ears*. The same holds of the flowers of lavender, &c.

We say, the stem of the *ear*, i. e. its tube, or straw; the knot of the *ear*; the lobes, or cells, wherein the grains are inclosed; the beard of the *ear*, &c. great numbers of *ears* of wheat have been known to arise from the same root.

EAR, *Jews*. See AURICULA *Judæ*.

EAR-*picks*, are instruments of ivory, silver, and other metal,

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tal, ſomewhat in form of a probe, for cleaning the *ear*. The Chineſe are particularly fond of entertaining themſelves with picking and tickling their *ears*; this they do either for themſelves, or interchangeably for one another, and have a great number of inſtruments of peculiar ſhapes and ſtructure, invented for this purpoſe. But Sir Hans Sloane very judiciouſly obſerves, that the uſe of them ſeems very prejudicial; for that, among many people in England who had applied to him on account of deafneſs, the far greater part were thrown into their complaints by too often picking their *ears*, and thereby bringing humours, or ulcerous diſpoſitions, on them. Phil. Tranſ. N° 246. p. 406.

EAR-*ring*. See PENDANT.

EAR-*wax*. See CERUMEN.

EAR-*wig*, *Forficula*, in *Zoology*, the name of a genus of inſects, of the order of *coleoptera*, the tail of which forms a kind of forceps, capable of pinching; the exterior wings are very ſhort, but dimidiated; and the antennæ are ſetaceous. It has ſix feet; its body is about the thickneſs of a ſmall worm, and very ſmooth.

It is a very troubleſome creature, frequently introducing itſelf into the ears, and cauſing a great deal of pain by its biting: it likewiſe burrows in other parts of the body, which it bites in the ſame manner.

They are likewiſe very pernicious in gardens, eſpecially where carnations are preſerved. In order to prevent the miſchief attending them, it is uſual to erect ſtands, ſupporting baſons of water, or to hang the hollow claws of crabs or lobſters on ſticks in different parts of the garden, in which they lodge.

The dried powder of *ear-wigs* is eſteemed good for deafneſs; and the oil prepared from them, in convulſions and ſpaſms. Vide Lemery, Dict. des Drog. in voc. *Forficula*.

EAR-*wig*, *Sea*. See FORFICULA *Marina*.

EAR-*ſhell*, *Auris Marina*, in *Natural Hiſtory*, the name of a genus of ſhell-fiſh, the characters of which are theſe: it conſiſts only of one ſhell, or valve, and is of a flatted ſhape, in ſome meaſure reſembling that of the human *ear*, and has an extremely wide mouth, or aperture, at its baſe, the wideſt of that of all ſhells, except only the patella or limpet, which is all mouth below. See *Tab. of Shells*, N° 3.

In the Linnæan diſtribution this is a ſpecies of the HALIOTIS.

Aldrovand and Rondeletius have given this genus the name of *patella fera*, the wild limpet; but in this they have been followed by no author, as it confounds the *auris marina* and *patella*, which are two abſolutely diſtinct genera. Theſe authors have alſo ranked both this and the limpet among the bivalve ſhells, but nothing can be more abſurd than this.

This genus of ſhells ſometimes yields ſmall pearls, the rudiments of which are very frequently ſeen in thoſe ſhells which have not perfect ones, and the whole inſide of the ſhell is of the colour of the fineſt mother of pearl. This alſo appears on the outſide, when the rough coat is ſo far eaten away by acids, as to leave this pearly ſurface bare; in this caſe it makes a very elegant appearance, being of the ſplendor of the moſt perfect mother of pearl both within and without, and it is frequently preſerved in cabinets in that ſtate.

The inſide and outſide of this ſhell are both rigid with very high ribs, which run from one ſide to the other; and there is in all theſe ſhells a row of holes near one edge, of which ſix are uſually open, and there are beyond theſe the marks of three or four others, which do not go through the ſhell. Theſe are formed in the growth of the fiſh, which, as it enlarges, enlarges alſo the ſhell; and when a new rim is formed, in which there is an open hole, one of the hinder ones is always cloſed up by the growth of freſh ſhelly matter over it. Aldrovand. de Aquat. Rondelet. de Aquat.

There is one very ſingular ſpecies of *auris marina*, which differs from all the others in its length; it is large, and brought from the Eaſt Indies, but is not found in the European ſeas. The general ſpecies of *aures marinæ* are four; thoſe with ſix holes; thoſe with ſeven, and which are more pearly than the reſt; thoſe of an oblong form; and thoſe which have no mark of aperture at all. Hiſt. Nat. Eclaire. part ii. p. 243, 244.

EAR *of corn*, in ſtone. See *Tab. of Foſſils*, *Claſs* 6.

EARINÆ *veſtes*, from *ἔαρ*, *ſpring*, among the ancient Greeks, a habit worn in the ſpring, which was made of wool, and dyed green. The cuſtom of wearing green veſtments in this ſeaſon, has not been unknown in modern times.

Dempſter ſays, it was cuſtomary, in his time, for the king, and nobility of England, to go a-hunting in the ſpring, dreſſed in green, that they might be of a ſimilar colour with the ſeaſon.

EARING, in a ſhip, that part of the bolt-rope, which, at the four corners of the ſail, is left open, in the ſhape of a ring. The two uppermoſt parts are put over the ends of the yard-arms, and ſo the ſail is made faſt to the yard; and into the lowermoſt *earings* the ſheets and tackles are ſeized, or bent at the clew.

EARING *Third*, in *Huſbandry*. See THIRD.

EARL, an Engliſh title of honour, or degree of nobility, next below a marquis, and above a viſcount.

Earls were anciently attendants or aſſociates of the king in his councils, and martial expeditions; much as comites, counts, were of the magiſtrates of Rome, in quality of deputies, to execute their offices for them.

Hence, alſo, *earls* are called, in Latin, *comites*; in French, *comtes*, counts, &c. The Germans call them *graves*, as landgrave, markgrave, palſgrave, &c. The Saxons, *ealdormen*; the Danes, *eorlas*; and the Engliſh, *earls*.

Earl was a conſiderable title among the Saxons: it is obſerved to be the moſt ancient of any of the peerage; and that there is no other title of honour in uſe among the preſent nobility, which was likewiſe uſed among the Saxons, beſide it. The original titles of honour among the Saxons, were *edeling*, *ealderman*, and *degen*, or *degn*. The firſt appropriated to thoſe of the royal family; the other two to the reſt of the nobility; only the thani were afterwards diſtinguiſhed into majores and minores.

Originally, the title *earl* always died with the man. William the Conqueror firſt made it hereditary; giving it in fee to his nobles, and annexing it to ſhires or counties; for the ſupport of the ſtate thereof, he allotted the third penny out of the ſheriff's court, iſſuing out of all pleas of the ſhire from which the *earl* took his title. But, of later days, the matter is much altered.

Earls are now created by patent, without any authority over, or particular relation to, their counties; and without any profit ariſing thence, except ſome annual ſtipend out of the exchequer, for honour-ſake. The number of *earls* being of late much increaſed, and no more counties being left for them, ſeveral of them have made choice of ſome eminent part of a county, as Lindſey, Holland, Craven, &c. Others of ſome town, as Marlborough, Exeter, Briſtol, &c. And others, of ſome village, or their own ſeat, park, &c. as Godolphin, Bolton, Danby, &c.

Some *earls* we have who are not local, i. e. not dignified from any places, but from noble families, viz. *earl* Rivers, and *earl* Paulet. A third is denominated from his office, viz. the *earl* Marſhal.

Earls are created by cincture of ſword, mantle, a cap, and a coronet put on his head, and a charter in his hand. Their title is, *moſt potent and noble lord*. Their coronet has the pearls raiſed on points, with leaves between.

Their place is next to a marquis, and before a viſcount; and as in very ancient times, thoſe who were created counts or earls, were of the blood royal; our Britiſh monarchs to this day call them in all public writings *our moſt dear couſin*; an appellation as ancient as the reign of Henry IV. They alſo originally did, and ſtill may, uſe the ſtyle of *nos*.

EARL-*marſhal* is one of the great officers of the crown; who takes cognizance of all matters relating to honour and arms, determines contracts that reſpects deeds of arms out of the realm upon land, and matters concerning war within the realm, which cannot be determined by common law, in which he uſually proceeds according to the civil law. He had, anciently, ſeveral courts under his juriſdiction, as the court of chivalry, now almoſt forgotten; and the court of honour.

He has alſo ſome pre-eminence in the court of marſhalſea, where he may ſit in judgment againſt criminals offending within the verge of the court; whence the chief officer under him is called *knight-marſhal*. Under him is alſo the heralds office, or college of arms. See COLLEGE and COURT.

The office of *earl-marſhal* is hereditary in the family of Howard; and enjoyed by the duke of Norfolk, the principal branch thereof; though now, on account of the religion of the duke of Norfolk, which renders him incapable of adminiſtering it in perſon, it is diſcharged by deputation; but yet it is to be obſerved, it is not given out of the name and family of Howard.

EARNEST, *Arrhæ*, money advanced to complete or aſſure a verbal bargain, and bind the parties to the performance thereof.

By the civil law, he who recedes from his bargain, loſes his *earneſt*; or, if the perſon who received the *earneſt* give back, he is to return the *earneſt* double. But, with us, the effect of *earneſt* is more: the perſon who gave it is, in ſtrictneſs, obliged thereby to abide by his bargain; and, in caſe he decline it, is not diſcharged upon forfeiting his *earneſt*; but may be ſued for the whole money ſtipulated. And by 29 Car. II. cap. 3. no contract for the ſale of goods, to the value of 10*l.* or more, ſhall be valid, unleſs the buyer receives part of the goods ſold by way of earneſt on his part, or unleſs he gives part of

the

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the price to the vender by way of *earneſt*, to bind the bargain, &c.

EARNING, or YEARNING, a name uſed in ſeveral parts of the kingdom for rennet. See RUNNET.

EARSH. See EDDISH.

EARTH, *Terra*, in *Natural Philoſophy*, one of the four vulgar, or peripatetical elements; deſined a ſimple, dry, and cold ſubſtance; and, as ſuch, an ingredient in the compoſition of all natural bodies.

It ſhould be well obſerved, that the element *earth* is a very different matter from the *earth* whereon we tread. Ariſtotle, having laid down cold and dry as his firſt element, to give it a ſuitable name, looked among the diverſe bodies for that which ſhould come the neareſt thereto; which being *earth*, he gave his firſt element that denomination; though thus borrowing a word that had been uſed for a different thing, occaſioned a great part of his followers to run into an extravagant error, and to ſuppoſe, that this habitable foſſil *earth* was an element.

EARTH, in *Chemiſtry*, is the fourth of the chemical elements, or principles, into which all bodies are reſolvable by fire.

After drawing off the ſpirit, ſulphur, and phlegm, and ſalt, e. gr. of wine, what remains in the retort is a taſteleſs, ſcentleſs, duſty matter, not capable, either of being raiſed by diſtillation, or diſſolved by ſolution; and is called *earth*, or *terra damnata*, or *caput mortuum*. See CAPUT *Mortuum*.

This *earth* is ſuppoſed to be the baſis, or ſubſtratum of all bodies; and that wherein the other principles reſide. It is all that is ſolid, e. gr. in an animal, or vegetable body, i. e. all the real vaſcular parts; the reſt being juices.

There is plainly a ſubtile *earth*, which may be ſeparated from all animal and vegetable ſubſtances, and is the ſame in all, and is the baſis of all. This remains after the ſeparation of the other principles by chemiſtry, from all animal and vegetable ſubſtances, and neither coheres together, nor ſuffers any change in the fire. The aſſayers acknowlege no difference between the *earth* of animals and vegetables, but make their teſts for the niceſt uſes equally of both. If water be poured on theſe aſhes, they acquire ſome degree of tenacity, ſo as to become capable of being formed into veſſels; but if oil be added, they cohere into a much ſtronger and more compact maſs; hence it ſhould appear, that oil and *earth* are the principles which give conſiſtence and tenacity to plants. This oil, as well as this *earth*, ſeems the ſame in all, and poſſeſſes nothing of the poiſonous or medicinal virtues of this peculiar plant, they being all ſeparable by decoction, diſtillation, and other proceſſes of that kind, and not remaining in the caput mortuum, which conſiſts of the *earth*, and this connecting oil. Long drying will diveſt plants of all their virtues; ſo that nothing but theſe principles ſhall remain in them, theſe giving ſolidity and figure, the plant retains its former appearance; but only theſe remaining, it poſſeſſes none of its virtues. Boerhaave's Chemiſt. part ii. p. 21.

To obtain this chemical principle pure and unmixed from the common analyſis of vegetables, and other bodies, let the remaining maſs, after diſtillation, be thoroughly calcined, then boiled in ſeveral waters, to get out all its ſalt, and after this dryed in a clear fire, or in the ſun, and the dryed maſs will be the pure earth. Shaw's Lectures, p. 151.

EARTH *of dew*, an *earth* much valued by many of the chemical experimenters, and prepared in the following manner: a large quantity of dew is to be collected, and ſet in a wooden veſſel, in a cool ſhady place, covered with a canvas, to keep out duſt and flies, there will in three weeks, and ſometimes longer, come on a putrefaction in the liquor. During the time of this putrefaction, certain ſilms are daily formed on the ſurface of the liquor, and theſe falling down to the bottom, one after the other, form, by degrees, a ſediment of a ſort of mud. This is to be thrown away, and the dew, when ſeparated from it, is to be filtred clear, and evaporated to a drineſs, the remainder is a greyiſh *earth*, which is the true *earth* of dew; this is very light and friable, and is of a foliated ſtructure in the maſs, looking like ſo many leaves of brown paper, ſpread very thin and even over one another. Phil. Tranſ. N° 3.

This *earth*, expoſed to a ſmart fire, loſes its foliated texture, and runs into a maſs, reſembling a mixture of ſalt and brimſtone melted together, but it is not at all inflammable. This, ground on a levigating ſtone, tinges the water to a purpliſh colour. A pound of this *earth*, properly treated by calcination and elixiviation, will yield an ounce of a pure and white ſalt, ſomewhat reſembling nitre. The chemiſts have been at great pains to procure this *earth*, but they do not ſeem yet to have made any very important uſe of it; and, in all probability, it is no other than that common ſpar which we know to be contained in all water, and which encruſts the ſides of our tea-kettles, and other veſſels, in which water is often boiled. We know, by manifold inſtances, that ſpar is rarifiable into vapour with water, and therefore it would be a greater wonder if dew were found not to contain it, than that it does.

EARTH, in *Natural Hiſtory*, is a foſſil or terreſtrial matter, whereof our globe principally conſiſts. It is either ſimple, or compoſed of entirely ſimilar particles; or compound, having a mixture of ſuch as are heterogeneous, as ſand, or the like, among them.

Earths are defined to be friable, opake, inſipid bodies; not inflammable, vitriſiable by extreme heat, diffuſible in water, and ſeparable from it by filtration.

The ſimple *earths* are divided into two orders; and under thoſe, into five genera. Of the firſt order are thoſe *earths* which are naturally moiſt, of ſmooth ſurfaces, and of a firmer texture; and of the ſecond are thoſe which are naturally dry, of rough duſty ſurfaces, and of a looſer texture. Of the firſt of theſe orders, there are three genera, the boles, the clays, and the marles; and of the ſecond there are two, the ochres, and the tripelas, according to Hill's diſtribution; and chalks, according to Da Coſta. The ſeveral diſtinguiſhing characters of which are theſe.

Of the firſt order. 1. *Boles* are *earths* moderately coherent, ponderous, ſoft, not ſtiff or viſcid, but, in ſome degree, ductile while moiſt, compoſed of fine particles, ſmooth to the touch, eaſily breaking between the fingers, readily diffuſible in water, and freely and eaſily ſubſiding from it. See BOLE.

2. *Clays* are *earths* firmly coherent, weighty, and compact, very ſtiff and viſcid, ductile to a great degree while moiſt, ſmooth to the touch, not eaſily breaking between the fingers, nor eaſily diffuſible in water, and, when mixed in it, not readily ſubſiding from it. See CLAY.

3. *Marles* are *earths* but ſlightly coherent, not ductile, ſtiff, or viſcid, while moiſt, moſt eaſily diffuſible in, and diſunited by water, and by it reduced to a ſoft, looſe, incoherent maſs. See MARLE.

Of the ſecond order are, 1. *Ochres*. Theſe are *earths* ſlightly coherent, compoſed of fine, ſmooth, ſoft argillaceous particles, rough to the touch, and readily diffuſible in water. See OCHRE.

2. *Tripelas* are *earths* firmly coherent, compoſed of fine, but hard, particles, and not readily diffuſible in water. M. De la Coſta, inſtead of *tripelas*, ſubſtitutes the genus of chalks, which he defines to be earths generally hard and dry, harſh and rough to the touch, and readily diffuſible in water. See CHALK. Hiſt. of Foſſils, p. 75.

The compound *earths* are a claſs of foſſile bodies, uſually confounded with the genuine and ſimple *earths*, as if ſubſtances of the ſame kind, but being of a very different nature and origin. They are foſſils compoſed of argillaceous and marly particles, ſeparated and divided by adventitious matter, and never found free from thoſe admixtures, or in the ſtate of pure ſimple marles or clays.

Of this claſs of foſſils there are two general orders; thoſe of the one are known by the name of loams, and are compoſed of ſand and clay; and thoſe of the other are called moulds; theſe are the *earths* that vegetables grow in, and are compoſed of argillaceous and marly particles, ſeparated by ſand, ſmall pebbles, and the gritt of ſtone, and uſually intermixed with, and enriched by, the putrified remains of animal and vegetable ſubſtances. Of each of theſe there are ſeveral genera. Hill's Hiſt. of Foſſils. See LOAM, MOULD, and TERRA.

The ancient naturaliſts contented themſelves with diſtributing *earths* according to their uſes, into medical *earths*, and ſuch as are uſed for pottery, painting, and other mechanical purpoſes. Dr. Woodward, in his Method of Foſſils, divides earth into two claſſes, viz. thoſe that are ſmooth or unctuous, ſubdivided into ſuch as do and do not adhere to the tongue, and thoſe that are dry, harſh, and rough to the touch. Stahl divided them into the calcareous and vitriſiable earths. Pott, who is followed by Macquer, into alcaline or calcareous, argillaceous, vitriſiable, and gypſeous. Linnæus, into ochres, ſand, clay, calx, or animal *earth*, and *humus*, or vegetable earth. Other authors have enlarged or contracted the number of diviſions; for a general account of which, we refer to the tables at the beginning of Linnæus's Syſtema Naturæ, tom. iii. 1770. See alſo Da Coſta's Foſſils, 119, &c.

See the divers kinds of *earths* deſcribed under their proper articles, BOLE, CHALK, PUMICE, SIGILLATA *Terra*, &c.

Naturaliſts generally rank ſand as a ſpecies of *earth*, though with no great propriety; ſands being, in ſtrictneſs, a ſort of cryſtals, or little tranſparent pebbles, calcinable, and by the addition of a fixed alcaline ſalt, fuſible, and convertible into glaſs; and therefore properly reducible to the claſs of ſtones.

By means of ſand it is, that the fatty earth is rendered

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fertile, and fit to feed vegetables, &c. for pure *earth* is liable to coaleſce into a hard coherent maſs, as is clay; and *earth* thus embodied, and, as it were, glued together, would be very unfit to nouriſh plants. But if with ſuch *earth*, ſand, i. e. hard cryſtals, which are indiſſoluble in water, and ſtill retain their figure, be intermixed, they will keep the pores of the *earth* open, and the *earth* itſelf looſe and incompact, and by that means will give room for the juices to move, aſcend, &c. and for plants to be nouriſhed thereby. Thus a vegetable planted either in the ſand alone, or in the fat glebe and *earth* alone, receives no growth or increaſe; but is either ſtarved or ſuffocated; but mix the two, and the maſs becomes fertile. In effect, by means of ſand, the *earth* is rendered in ſome meaſure organical: by preſerving a ſort of pores, and interſtices therein, ſomewhat analogous to veſſels, by which the juices of the *earth* may be conveyed, prepared, digeſted, circulated, and at length excreted and thrown off into the roots of plants.

EARTH, *animal*, belongs to the claſs of chalks in the above diſtribution, and conſiſts of ſhells of animals; or that which is obtained by calcination, or putrefaction of animal ſubſtances. To this head we may reduce the *earth* of the ſhells of fiſhes, and of eggs, which have the general properties of calcareous *earths*; the *earths* of calcined bones and horns, which are ſoluble by the nitrous, marine, and vegetable acids, but not capable of being converted into quicklime by calcination, and unfuſible in other fuſible mixtures; and the *earth* of blood, fleſh, and ſkins of animals, which is ſoluble by all acids, and fuſible by fire, but not calcareous.

EARTH, *mercurial*, is a ſubſtance which, according to Becher, and other chemiſts, enters into the compoſition of many bodies, chiefly the metallic, together with vitrifiable *earth* and phlogiſton, called by him the inflammable *earth*. But the exiſtence of this mercurial *earth* has not yet been ſatisfactorily demonſtrated. Macquer.

EARTHS, *vegetable*, are diſtributed by Wallerius into three claſſes: the firſt claſs includes thoſe which are obtained by becoming ſoft, ſpongy, and farinaceous plants; they are partly ſoluble by vitriolic acids, and fuſible by fire, more or leſs, as the plant was more or leſs nouriſhing The ſecond claſs is had by burning the harder and leſs ſucculent plants; this *earth* is more ſoluble than the former in nitrous and marine acids, but leſs ſoluble in vitriolic acid; it is alſo fuſible by fire. The third claſs is obtained by burning wood, which is calcareous, and fuſible with greater difficulty, as the wood which yielded it is harder; and thus it is found that aſhes of the hardeſt woods make the moſt unfuſible glaſs. Swed. Mem. 1760.

EARTH, in *Agriculture* and *Gardening*. See SOIL, LAND, &c.

EARTH, *untried*, the ſoil, or *earth*, which is ſix or ſeven inches deep, where neither ſpade nor plough has reached. This is greatly recommended by Mr. Lawrence, for amendments and improvements, both in the fruit and kitchen garden. He aſſures us, from his own experience, that no kind of compoſt, made with art, exceeds it; and adds, that if the choiceſt fruit-trees be planted herein, they preſently diſcover an uncommon healthfulneſs and vigour; and that, if any tender ſort of annuals be diſcretely ſown in this *earth*, made fine by ſifting, their looks, colour, &c. ſoon diſcover that they like the ſoil. Melons and cucumbers need no other compoſt but this *untried earth*; and aſparagus itſelf will proſper, at leaſt, as well in this *untried earth*, if laid a foot and a half deep, as with all the uſual expence of dung; though for the tenderer flowers, and exotics, this *earth* is not found to have any extraordinary excellencies. For annual plants, produced from ſeed, a coat of this *untried earth*, two inches deep, may ſuffice: on other occaſions a greater depth is required.

EARTH, *Japan*. See CATECHU.

EARTH, *Black*. See BLACK.

EARTH, *Fullers*. See FULLERS *Earth*.

EARTH, *Lemnian*. See LEMNIAN *Earth*.

EARTH, *Livonian*. See LIVONICA *Terra*.

EARTH *of Malta*. See MELITENSIS *Terra*.

EARTHS *of mineral waters*. All mineral waters contain *earth* of ſome kind, though very different in quantity and in nature. Theſe are found, in different waters, of very different colours and appearances, ſome white, ſome grey, ſome yellowiſh, ſome reddiſh, and ſome brown. They are alſo as different in their qualities as in their form; ſome of them are ſoluble in acids, others are not ſo; ſome fuſible in the fire; others not; and ſome retain their natural colour, after burning; others change it in the fire. By this we learn, that ſome are marly, others argillaceous, others ochreous, and ſome ſandy; others there are which are produced by the concretion of certain juices, ſaline or ſulphureous, and others not ſo. Some are ſimply mineral, others are metallic. And as many of theſe are very different from any of the known *earths*, even in their pure and ſeparate ſtate, they are yet much leſs diſtinguiſhable when mixed one with another, as they very frequently are in the waters of even our common ſprings, much more ſo in the mineral medicinal ones.

The ſimple infuſions of certain ſulphureous mineral *earths* may remarkably alter the waters of wells and fountains, without having any thing of thoſe *earths* remaining, after their diſtillation; in the ſame manner as nothing is ſeparable, by art, from certain liquors, rendered emetic by antimony. The hot mineral waters may contract ſome alteration from the ſulphureous and bituminous matters which they meet with in their courſe; for theſe ſubſtances all contain ſubtile ſalts, which hot water may take up, and carry away with it.

EARTH *of Nocera*. See NOCERIANA *Terra*.

EARTH *of Portugal*. See PORTUGALLICA *Terra*.

EARTH, *Samian*. See SAMIA *Terra*.

EARTH, *Sealed*. See SIGILLATA *Terra*.

EARTH, *Soap*. See SOAP *Earth*.

EARTH-*bags*, *Sacs à terre*, in *Fortification*. See SACKS *of* EARTH, and SAND-*Bags*.

EARTH-*banks*, in *Huſbandry*, &c. are a very common fence about London, and in ſeveral other parts of England. Where ſtones are not to be had cheap, theſe are to be preferred to all other fences, both for ſoundneſs and duration.

The beſt manner of making them is this: dig up ſome turf in a graſſy place, a ſpit deep, or nearly to the breadth of the ſpade, and about four or five inches thick; lay theſe turfs with the graſs outward, even by a line on one ſide, and on the backſide of theſe lay another row of turf, having a foot ſpace of ſolid ground on the outſide, to prevent the bank from ſlipping in, if it ſhould be any way faulty. On the outſide of this make a ditch, or elſe let the ſides be lowered both ways with a ſlope two feet deep, and there will be no paſture loſt by the fence, becauſe it will bear graſs on both ſides.

The *earth* that is dug out of the ditches, or from the ſlopes, muſt be thrown in between the two rows of turf, till the middle is made level with the reſt. Then lay on two more rows of turf in the ſame manner, and with more of the *earth* fill up, and make level as before. Let this method be continued till the bank is raiſed four foot high, or more if neceſſary, only obſerving, that the higher it is to be carried, the wider the foundation muſt be made. As the bank is carried up, the ſides muſt not be raiſed perpendicular, but ſloping inward both ways, ſo that at the top it may be about two foot and a half wide. This ſort of fence, when made with leſs care, and faced with clay, is left naked, and ſerves very well in ſome places; but when it is thus managed with the turf, the joining of the ſeveral pieces are hid in a little time, by the growth of the graſſy part of the turf on each ſide; and it makes a beautiful fence, of as green and pleaſant a colour as the reſt of the field.

The great improvement upon this plan, is the planting quickſets, or young white-thorn plants, in the middle of the top of the bank. The *earth* on each ſide of theſe may be raiſed up with a ſort of wall, and the rain that falls wholly preſerved for the plants. This plenty of water, and depth of fine *earth*, make the young plants grow quicker and more vigorouſly than in any other way; and the moſt beautiful of all hedges is formed in this manner. When this ſort of hedge is young, there muſt be placed on each ſide of it a ſhort dry hedge, of about a foot high, to keep the ſheep from cropping the young plants, but this may be taken away after a little time.

There is one caution neceſſary in regard to the making of theſe banks, which is, that they muſt never be made in a very dry ſeaſon, becauſe if much rain ſhould follow, the *earth* of the bank would ſwell and burſt out, or ſpoil the ſhape of the bank; but if this ſhould happen, it is eaſily enough repaired. This beautiful fence may be made at a ſmaller price than thoſe unaccuſtomed to theſe things may imagine. In good digging ground, where men work for fourteen-pence a day, it may be made and planted with quick for two ſhillings a pole. It may be made proper for the keeping in of deer, only by the ſmall addition of planting, at every eight or ten foot diſtance, a poſt a little ſlanting, with a mortiſe in it; let this ſtand about two foot above the bank, and into the mortiſes all along, put a rail made of a bough of any tree, no deer will ever go over this, nor can they creep under it, as they often do when a pale tumbles down. The quick, on the top of this bank, may be kept clipped, and will grow very thick, and afford the beſt ſhelter for cattle of any fence in uſe with us. Mortimer's Huſbandry.

EARTH-*board*, in *Huſbandry*, that part of a PLOUGH which turns over the *earth*.

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EARTH-*flax*. See *Plume* ALLUM.

EARTH-*nut*, *Arachis*, in *Botany*, a genus of the *diadelphia decandria* claſs. Its characters are theſe: the empalement of the flower opens in two parts; the flower is of the butterfly-kind, and has ten ſtamina, nine of which coaleſce, and the upper one ſtands off. In the center is ſituated an oblong germen, which turns to an oblong pod, containing two or three oblong blunt ſeeds. We have but one ſpecies of this plant, which, it is thought, came originally from Africa, though our ſettlements in America abound with it, where the negroes cultivate it for food, and eat it both raw and roaſted. It multiplies very faſt in a warm country; but being impatient of cold, cannot be propagated in the open air in England. Miller.

This plant, with ſome others of the trifoliate kind, has the property of burying its ſeeds under ground. As ſoon as the plant is in flower, it is bent towards the ground till it touches it. The pointal of the flower is then thruſt into the ground to a ſufficient depth, where it extends itſelf, and forms the ſeed-veſſel and fruit, which is brought to maturity under-ground. An oil is expreſſed from the ground-peas, which Sir Hans Sloane maintains to be as good as that of almonds, and which, it is ſaid, may be uſed, at a very cheap price, for the ſame purpoſes, both of food and phyſic, as the oil of almonds, or olives. Phil. Tranſ. vol. lix. N° 52. an. 1769.

EARTH-*nut peas*. See *Chickling* VETCH.

EARTH-*pitch*. See PISSASPHALTUM.

EARTH-*pucerons*, in *Natural Hiſtory*, a name given by authors to a ſpecies of puceron very ſingular in its place of abode. In the month of March, if the turf be raiſed in ſeveral places in any dry paſture, there will be found, under ſome parts of it, cluſters of ants, and, on a further ſearch, it will be uſually found, that theſe animals are gathered about ſome pucerons of a peculiar ſpecies. Theſe are large, and of a greyiſh colour, and are uſually found in the midſt of the cluſters of ants. See PUCERON.

The common abode of the ſeveral other ſpecies of pucerons is on the young branches or leaves of trees; as their only food is the ſap or juice of vegetables, probably theſe *earth* kinds draw out thoſe juices from the roots of the graſſes and other plants, in the ſame manner that the others do from the other parts. The ants that conduct us to theſe, are alſo our guides where to find the greater part of the others; and the reaſon of this is, that as theſe creatures feed on the ſaccharine juices of plants, they are evacuated from their bodies in a liquid form, very little altered from their original ſtate; and the ants, who love ſuch food, find it ready prepared for them, in the excrements which theſe little animals are continually voiding. Reaumur.

EARTH, in *Geography*, this terraqueous globe, or ball, whereon we inhabit, conſiſting of land and ſea.

EARTH, *the figure of the*, is demonſtrated to be nearly ſpherical. Thus the moon is frequently ſeen eclipſed by the ſhadow of the *earth*; and, in all eclipſes, that ſhadow appears circular, what way ſoever it be projected, whether towards eaſt, weſt, north, or ſouth, and howſoever its diameter vary, according to the greater or leſs diſtance from the *earth*.

Hence it follows, that the ſhadow of the *earth*, in all ſituations, is really conical; and, conſequently, the body that projects it, i. e. the *earth*, is nearly ſpherical.

The natural cauſe of this ſphericity of the globe is, according to Sir Iſaac Newton, the great principle of attraction, which the Creator has ſtamped on all the matter of the univerſe; and whereby all bodies, and all the parts of bodies, mutually attract one another.

And the ſame is the cauſe of the ſphericity of the drops of rain, quickſilver, &c.

We ſay it is nearly ſpherical; for the inequalities on its ſurface prevent its being perfectly ſo: beſides that, Huygens and Sir Iſaac Newton have ſhewn, that the *earth* is higher and bigger under the equator, than at the poles; ſo that its figure, nearly, is that of an oblate ſpheroid, ſwelling out towards the equatorial parts; and flatted, or contracted, towards the poles.

Though Sir Iſaac Newton in his Principia, firſt printed in 1686, had demonſtrated from the theory of gravity, that this muſt be the real form of the earth, as it revolved about an axis; yet Meſſrs. Caſſini, both father and ſon, the one in 1713, and the other in 1701, attempted to prove, in the Memoirs of the Royal Academy of Sciences at Paris, that the *earth* was an oblong ſpheroid; and in 1718, M. Caſſini again undertook, from obſervations, to ſhew the contrary, or that the longeſt diameter paſſes through the poles, which gave occaſion for Mr. John Bernouilli, in his Eſſai d'une Nouvelle Phyſique Celeſte, printed at Paris in 1735, to triumph over the Britiſh philoſopher, apprehending that theſe obſervations would invalidate what Sir Iſaac had demonſtrated. In 1720, M. de Mairan advanced arguments, ſuppoſed to be ſtrengthened by geometrical demonſtrations, farther to confirm M. Caſſini's aſſertion. But in 1735 two companies of mathematicians were employed, one for a northern, and another for a ſouthern expedition, the reſult of whoſe obſervations and meaſurement plainly proved that the *earth* was flatted at the poles. See DEGREE.

Having found that the centrifugal force at the equator is $\frac{1}{289}$th of gravity, he aſſumes, as an hypotheſis, that the axis of the *earth* is to the diameter of the equator as 100 to 101, and thence determines what muſt be the centrifugal force at the equator to give the *earth* ſuch a form, and finds it to be $\frac{4}{500}$th of gravity: then, by the rule of proportion, if a centrifugal force equal to $\frac{4}{578}$th of gravity would make the *earth* higher at the equator than at the poles by $\frac{1}{100}$ of the whole height at the poles, a centrifugal force that is the $\frac{1}{289}$th of gravity, will make it higher by a proportional exceſs, which by calculation is $\frac{1}{229}$th of the height at the poles; and thus he diſcovered that the diameter at the equator is to the diameter at the poles, or the axis, as 230 to 229. But this computation ſuppoſes the *earth* to be every where of an uniform denſity; for if the *earth* is more denſe near the center, then bodies at the poles will be more attracted by this additional matter being nearer; and therefore the exceſs of the ſemidiameter of the equator above the ſemiaxis will be different.

This roundneſs of the *earth* is farther confirmed, by its having been frequently ſailed round: the firſt time was in the year 1519, when Ferd. Magellan made the tour of the whole globe in 1124 days. In the year 1557, our countryman, Drake, performed the ſame in 1056 days; in the year 1586, Sir Thomas Cavendiſh made the ſame voyage in 777 days; Simon Cordes, of Rotterdam, in the year 1590, and in the year 1598; Oliver Noort, a Hollander, in 1077 days; Will. Corn. Van Schouten, in the year 1615, in 749 days; Jac. Heremites, and Joh. Huygens, in the year 1623, in 802 days; and many others have ſince performed the ſame navigation, particularly our own countryman, lord Anſon. All of whom, ſailing continually from eaſt to weſt, at length arrived in Europe, whence they ſet forth; and, in the courſe of their voyage, obſerved all the phænomena, both of the heavens and earth, to correſpond to, and evince this ſpherical figure.

Thus as we go ſouthwards the northern ſtars are depreſſed, and the ſouthern ſtars elevated; and the ſun arrives at the meridian of places that are more eaſterly, ſooner than to the meridian of thoſe towards the weſt, in proportion to the diſtance of the meridians meaſured upon the equator. The ſame globular figure is likewiſe inferred from the operation of LEVELLING, in which it is found neceſſary to make an allowance for the difference between the apparent and the true level.

What the *earth* loſes of its ſphericity by mountains and vallies, is nothing conſiderable; the higheſt eminence being ſcarce equivalent to the minuteſt protuberance on the ſurface of a lemon; what it loſes by the ſwelling of the equatorial parts, on account of the diurnal rotation of the earth on its axis, is more ſenſible. Huygens determines the ratio of the greater diameter to the leſs to be as 578 to 577.

Sir Iſaac Newton makes the greateſt diameter 34½ miles longer than the leſs, fixing the ratio as 692 to 688, or as 230 to 229. If the *earth* were in a fluid ſtate, its revolution round its axis would neceſſarily make it put on ſuch a figure, becauſe the centrifugal force being greateſt towards the equator, the fluid would there riſe and ſwell moſt; and that its figure really ſhould be ſo now, ſeems neceſſary, to keep the ſea in the equinoctial regions from overflowing the earth thereabouts.

The proportion of the equatorial diameter to the polar, as ſtated by the gentlemen employed on the northern expedition for meaſuring a DEGREE of the meridian, is as 1 to 0,9891; by the Spaniſh mathematicians as 266 to 265, or as 1 to 0,99624; by M. Bouguer as 179 to 178, or 1 to 0,99441, which colonel Roy alſo deduced from collecting the beſt experiments that have hitherto been made with the pendulum into one view, and applying the equation which the denſity of the air, in which they ſeverally vibrated, ſeemed to require; and he obſerves, that this proportion agrees very nearly with the mean reſult from the meaſurement of the degrees of the meridian. Phil. Tranſ. vol. lxvii. part ii. p. 767.

The following problem, communicated by Dr. Leatherland to Dr. Pemberton, and publiſhed by Dr. Robertſon, will ſerve for finding the proportion between the axis and the equatorial diameter, from meaſures taken of a de-

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gree of the meridian in two different latitudes, ſuppoſing the *earth* to be a ſpheroid, with its axis leſs than the equatorial diameter.

Let *a* P A *p* (*Tab.* II. *Aſtronomy, fig.* 68.) be an ellipſis repreſenting a ſection of the *earth* through its axis P *p*; the equatorial diameter, or the greater axis of the ellipſis, being A *a*; let E and F be two places, where the meaſure of a degree has been taken; theſe meaſures are proportional to the radii of curvature in the ellipſis at thoſe places; and if CQ, CR, are conjugates to the diameters, whoſe vertices are E and F, CQ will be to CR in the ſubtriplicate ratio of the radius of curvature in E to that in F, by Cor. 1. Prop. iv. part vi. of Milnes's Conic Sections, and therefore in a given ratio to one another. Then QV and RZS being drawn parallel to P *p*, and QXYW parallel to *a* A, the angles QCP, RCP are the latitudes of E and F; ſo that theſe angles, and the ratio of CQ to CR being given, the rectilinear figure CVQXRY is given in ſpecies; and the ratio of $VC^2 - ZC^2$ (= QX × XW) to $RZ^2 - QV^2$ (= RX × XS) is given, which is the ratio of CA^2 to CP^2; therefore the ratio of CA to CP is given. Hence, if the ſine and coſine of the greater latitude be each augmented in the ſubtriplicate ratio of the meaſure of the degree in the greater latitude to that in the leſſer, then the difference of the ſquares of the augmented ſine, and the ſine of the leſſer latitude, will be to the difference of the ſquares of the coſine of the leſſer latitude, and the augmented coſine, in the duplicate ratio of the equatorial to the polar diameter. Becauſe C *q* being taken in CQ equal to CR, and *q v* drawn parallel to QV, C *v* and *v q*, CZ and ZR will be the ſines and coſines of the reſpective latitudes to the ſame radius; and CV, VQ will be the augmentations of C *v* and C *q* in the ratio named. Then, in order to find the ratio between the two axes of the *earth*, let E denote the greater, and F the leſſer of the two latitudes, M and N the reſpective meaſures taken in each; and let O denote $\sqrt[3]{\frac{M}{N}}$:

And $\sqrt{\frac{\dot{s}\dot{s}, F - O^2 \times \dot{s}\dot{s}, E}{O^2 \times s\,s, E - s\,s, F}}$ is $= \frac{\text{leſſer axis}}{\text{greater axis}}$.

It alſo appears by the above problem, that if one of the degrees meaſured is at the equator, the coſine of the latitude of the other being augmented in the ſubtriplicate ratio of the degrees, the tangent of the latitude will be to the tangent anſwering to the augmented coſine in the ratio of the greater axis to the leſſer. For ſuppoſing the place out of the equator to be E; if the ſemicircle P *l m n p* be deſcribed, and *l* C joined, and *m o* drawn parallel to *a* C; C *o* is the coſine of the latitude to the radius CP; and CY that coſine augmented in the expreſſed ratio; YQ being to Y *l*, i. e. C *a* to C *n*, or CP, as the tangent of the angle YCQ, the latitude of the point E, to the tangent of the angle YC *l*, belonging to the augmented coſine. Thus if M repreſent the meaſure in a latitude denoted by E, and N the meaſure at the equator, let A denote an angle, whoſe meaſure is $\sqrt[3]{\frac{M}{N}} \times \dot{s}$, E. Then $\frac{t, A}{t, E}$ is $= \frac{\text{leſſer axis}}{\text{greater axis}}$. But M, or the length of a DEGREE, obtained by actual menſuration in different latitudes, is known from the following table.

	°	′		Toiſes
Maupertuis and aſſociates in lat.	66	20	found	M = 57438
Caſſini and De la Caille	49	22		M = 57074
	45	0		M = 57050
Boſcovich	43	0		M = 56972
De la Caille	33	18		M = 57037
Juan and Ulloa	At the Equator			M = 56768
Bouguer				M = 56753
De la Condamine				M = 56749

By comparing the firſt of theſe meaſures with each of the following, the ſecond with each of the following, &c. by the problem, and its corollary, we ſhall obtain twenty-five reſults, ſhewing the relation of the axes or diameters; and from the arithmetical means of the ſeveral compariſons, we ſhall have the ratio of the greater axis to the leſs as 1 to 0,9940688; or as 1 to 0,9946736; or as 1 to 0,9952621; or as 1 to 0,9972818; or as 1 to 0,9947082; and from the mean of all of them as 1 to 0,9951989. If the meaſures of the latitudes of 49° 22′, and of 45°, which fall within the meridian line drawn through France, and which have been re-examined and corrected, ſince the northern and ſouthern expedition, be compared with theſe of Maupertuis and his aſſociates in the north, and that of Bouguer at the equator, the ratio of the greater axis to the leſs will be reduced to the following ſix; viz. as 1 to 0,9919994, 1 to 0,99337, 1 to 0,9952717, 1 to 0,9981542, 1 to 0,9967698, and 1 to 0,9965152; the arithmetical mean of which ratios, or that of 1 to 0,9953467, may be taken for the ratio of the greater axis to the leſs; which is as 230 to 228,92974 nearly the ſame with that aſſigned by Sir Iſaac Newton.

Add, that experiments made on pendulums, which muſt be of different lengths, to ſwing equal times here and at the equator, evince the ſame thing. Thus, a pendulum muſt be $2\frac{69}{100}$ lines ſhorter at the equator than at the poles.

M. de la Hire, and Mr. Derham, indeed, have ſhewn, that this diverſity may ariſe, either from the greater heat, or the greater rarity, of the air there than here; as having obſerved a like variation between pendulums, when heated, and cold; and when in vacuo, and open air. But, beſides that Sir Iſaac Newton, and M. Bernouilli, have ſet aſide theſe cauſes, as inſufficient, it has been found, by actual menſuration, that the degrees of a meridian grow larger, the farther we go towards the line; which puts the ſpheroidiſm of the *earth* beyond queſtion.

The ancients had various opinions as to the figure of the *earth:* ſome, as Anaximander, held it cylindrical; and others, as Leucippus, in form of a drum. But the principal opinion was, that it was flat; that the viſible horizon was the bounds of the *earth*, and the ocean the bounds of the horizon; that the heavens and *earth* above this ocean were the whole viſible univerſe; and that all beneath the ocean was hades: of which opinion were not only divers of the ancient poets and philoſophers, but alſo ſome of the Chriſtian fathers, as Lactantius, St. Auguſtine, &c.

F. Tacquet draws ſome pretty concluſions from the ſpherical figure of the *earth*; as, 1. That if any part of the ſurface of the *earth* were quite plain, a man could no more walk upright thereon, than on the ſide of a mountain. 2. That the traveller's head goes a greater ſpace than his feet; and a horſeman than a footman, as moving equal arches of greater circles. 3. That a veſſel, full of water, being raiſed perpendicularly, ſome of the water will be continually flowing out, yet the veſſel ſtill remain full; and, on the contrary, if a veſſel full of water be let perpendicularly down, though nothing flow out, yet it will ceaſe to be full: conſequently, there is more water contained in the ſame veſſel at the foot of a mountain, than on the top; becauſe the ſurface of the water is compreſſed into a ſegment of a leſs ſphere below than above. Tacq. Aſtronom. lib. i. cap. 2.

EARTH, *changes of the.* Mr. Boyle ſuſpects there are great, though ſlow internal changes, in the maſs of the *earth*. He argues from the varieties obſerved in the change of the magnetic needle, and from the obſerved changes in the temperature of climates. But as to the latter, we doubt whether he could have diaries of the weather ſufficient to direct his judgment. Boyle's Works abr. vol. i. p. 292, 293. See ABSORPTIONS *of the earth.*

EARTH, *magnetiſm of the.* The notion of the magnetiſm of the *earth* was ſtarted by Gilbert; and Mr. Boyle ſuppoſes magnetic effluvia moving from one pole to the other. See Works abr. vol. i. p. 285, 290.

Dr. Knight alſo thinks, the *earth* may be conſidered as a great loadſtone, whoſe magnetical parts are diſpoſed in a very irregular manner; and that the ſouth pole of the *earth* is analogous to the north pole in magnets, that is, the pole by which the magnetical ſtream enters. See MAGNET.

He obſerves, that all the phænomena attending the direction of the needle, in different parts of the *earth*, in great meaſure correſpond with what happens to a needle, when placed upon a large terella; if we make allowances for the different diſpoſitions of the magnetical parts, with reſpect to each other, and conſider the ſouth pole of the *earth* to be a north pole, with regard to magnetiſm. The *earth* might become magnetical by the iron ores it contains, for all iron ores are capable of magnetiſm. It is true, the globe might notwithſtanding have remained unmagnetical, unleſs ſome cauſe had exiſted capable of making that repellent matter producing magnetiſm move in a ſtream through the *earth*.

Now the doctor thinks that ſuch a cauſe does exiſt. For if the *earth* revolves round the ſun in an ellipſis, and the ſouth pole of the *earth* is directed towards the ſun, at the time of its deſcent towards it, a ſtream of repellent matter will thereby be made to enter at the ſouth pole, and come out at the north. And he ſuggeſts, that the *earth's* being in its perihelion in winter may be one reaſon why magnetiſm is ſtronger in this ſeaſon than in ſummer.

This cauſe here aſſigned for the *earth's* magnetiſm muſt continue, and perhaps improve it from year to year. Hence the doctor thinks it probable, that the *earth's* magnetiſm has been improving ever ſince the creation, and that this may be one reaſon why the uſe of the compaſs was not diſcovered ſooner. See Dr. Knight's Attempt to demonſtrate, that all the Phænomena in Nature may

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may be explained by Attraction and Repulsion. prop. 87.

EARTH, *the magnitude of the*, and the number of miles its diameter contains, have been variously determined by various authors, ancient and modern. The way to arrive at it is, by finding the quantity of a degree of a great circle of the *earth*; but this degree is found very different, according to the different methods and instruments made use of, as well as the different observers.

The method observed by Mr. Norwood, and the French astronomers, Picard, Cassini, &c. viz. by measuring the distance between two remote places on the same meridian, is undoubtedly the best, and was performed with great accuracy, especially by M. Cassini, and since by others. See DEGREE *of latitude*. According to that author, the ambit, or circumference of the *earth*, is 123750720 Paris feet, or 134650777 English feet, or 25031½ of our statute miles; whence, supposing the *earth* sperical, its diameter must be 7967 statute miles; and, consequently its radius, or semidiameter may be taken in a round number, for 20000000 feet, its surface will be 199444206 miles; which, being multiplied into ⅓ of its semidiameter, gives the solid content of the globe of the *earth* 26485600000 cubic miles. These several dimensions are greater or less, according to the assumed measure of a degree. Cassini adopted Picard's measure of 57060 toises. But the magnitude, as well as the FIGURE of the *earth*, may be deduced from the preceding problem. For, as half the *latus rectum* of the greater axis A *a*, (*Tab.* II. *Ast. fig.* 68.) is the radius of curvature in A, it is given in magnitude from the degree measured there, and thence we shall have the axes themselves. Thus, the circular arch equal to the radius being 57,29578 degrees, if this number be multiplied by 56753 toises, the measure of a degree at the equator, as Bouguer has stated it, we shall have the radius of curvature there, or half the *latus rectum* of the greater axis; and this is to half the lesser axis in the ratio of the lesser axis to the greater, i. e. as 0,9953467 to 1: whence the lesser semiaxis will be 326691o toises, and the greater 3282183.

From the same problem and figure it appears, that if an angle be taken, whose tangent shall be to the tangent of either latitude, as the lesser axis to the greater, the measure of a degree in that latitude will be to the measure of a degree at the equator, in the triplicate ratio of the cosine of this angle to the cosine of the latitude, e. g. If E be one of the places measured, the tangent of the angle YC*l* will be to the tangent of YCQ the latitude of E, as Y*l* to YQ, i. e. as the lesser axis to the greater; and CQ : C*l* :: S, C*l*Y : S, CQY : : cos. *l*CY : cos. QCY; but by the property of the ellipse, $QC^3 : Cl^3$ (CP^3) : : the radius of curvature in E to the radius of curvature in A, i. e. as the measure of a degree in E to the measure of a degree in A. Therefore, if M represents the measure in a latitude E, and N the measure at the equator; and an angle A be found, so that *t*, A may be $= \frac{\text{lesser axis}}{\text{greater axis}} \times t$, E, N will be $= M + \text{cube } \frac{\text{s, E}}{\text{s, A}}$: and hence the axes may be known as above. Thus from the six ratios between the axes already found, see *Figure of the* EARTH, we may obtain nine values of the axes, by comparing each ratio with both of its respective latitudes and measures; and the means will be, for the greater semiaxis, 3276473 toises; and for the lesser, 3260299: and these, proportioned again by the mean ratio of the axes above stated, and by their assigned magnitudes will give, for the greater semiaxis 3279328 French toises, and for the lesser semiaxis 3264068; and allowing 6 Paris feet to a toise, and the proportion of the English foot to the French, as 107 to 114, the greater semiaxis will be 3493863 English fathoms, or, dividing by 880, the number of fathoms in an English mile, 3970,298 miles; and the lesser semiaxis 3477606 fathoms, or 3951,824 miles; and the greater axis, or equatorial diameter, equal to 7940,596 miles; and the lesser, or polar diameter, equal to 7903,648 miles; so that the equatorial diameter is about 36,948 miles longer than the polar or *earth*'s axis. See farther on this subject, Suite des Mem. de l'Acad. R. ann. 1718, p. 247. Maclaurin's Fluxions, vol. ii. book i. ch. 14. Robertson's Navigation, book viii. sect. 8.

On the surface of the *earth* are conceived the same circles as on the surface of the mundane sphere elsewhere described, viz. an EQUATOR, ECLIPTIC, TROPICS, POLAR *Circles*, MERIDIANS, HORIZON, PARALLELS, &c. which see; as also SPHERE and GLOBE. The seas and unknown parts of the *earth*, by a measurement of the best maps, contain 160522026 square miles; the inhabited parts, 38990569; Europe, 4456065; Asia, 10768823; Africa, 9654807; America, 14110874: in all, 199512595, which is the number of square miles on the whole surface of our globe.

The terraqueous globe is now generally granted to have two motions, besides that on which depends the PRECESSION of the equinoxes; the one DIURNAL, around its own axis in the space of 24 hours, which constitutes the natural day or nycthemeron. The other annual, round the sun, in an elliptical orbit or tract, in 365 days, 6 hours, constituting the year.

From the former we derive the diversities of NIGHT and DAY. And from the latter the vicissitudes of seasons, spring, summer, &c.

See the motion of the *earth* proved, under EARTH *in astronomy*.

In the terraqueous globe we distinguish three parts, or regions, viz. 1. The external part, or crust, which is that from which vegetables arise and animals are nourished. 2. The middle, or intermediate part, which is possessed by fossils, extending farther than human labour ever yet penetrated. 3. The internal, or central part, which is unknown to us, though by many authors supposed of a magnetic nature; by others, a mass or sphere of fire; by others, an abyss, or collection of waters, surrounded by the strata of *earth*; and by others, a hollow, empty space, inhabited by animals, who have their sun, moon, planets, and other conveniencies within the same: others divide the body of the globe into two parts, viz. the external part, which they call the cortex, including the whole depth or mass of the strata of the *earth*; and the internal, which they call the nucleus, being of a different nature from the former, and possessed by fire, water, or the like.

The external part of the globe either exhibits inequalities, as mountains or vallies; or it is plain and level; or dug in chanels, fissures, beds, &c. for rivers, lakes, seas, &c.

These inequalities in the face of the *earth* are, by most naturalists, supposed to have arisen from a rupture or subversion of the *earth*, by the force either of the subterraneous fires or waters. The *earth*, in its natural and original state, De Cartes, and after him, Burnet, Steno, Woodward, Whiston, and others, suppose to have been perfectly round, smooth, and equable; and they account for its present rude and irregular form principally from the great deluge. See DELUGE.

In the external, or cortical part of the *earth*, we meet with various strata, which are supposed to be the sediments of various floods; the waters whereof, being replete with matters of divers kinds, as they dried up, or ousted through, deposited these different matters, which in time hardened into strata of stone, sand, coal, clay, &c.

Dr. Woodward has considered the subject of these strata with great attention, viz. their order, number, situation with respect to the horizon, depth, intersections, fissures, colour, consistence, &c. He ascribes the origin and formation of them all, to the great flood or cataclysmus. At that terrible revolution, he supposes all the terrestrial bodies of all kinds to have been dissolved and mixed with the waters, and sustained therein, so as only to constitute one common mass therewith. This mass of terrestrial particles, intermixed with water, he supposes to have been at length precipitated to the bottom; and that generally, according to the laws of gravity, the heaviest sinking first, and the lighter in their order. By such means were the strata formed whereof the *earth* consists; which, attaining their solidity and hardness by degrees, have continued so ever since. These sediments, he farther concludes, to have been at first all parallel and concentrical; and the surface of the *earth* formed thereby, perfectly smooth and regular; but that in course of time, divers changes happening, from earthquakes, volcanos, &c. the order and regularity of the strata was disturbed and broken, and the surface of the *earth* by such means brought to the irregular form in which it now appears. M. de Buffon supposes that the *earth*, as well as the other planets, are parts struck off from the body of the sun by the collision of comets; and that, when the *earth* assumed its form, it was in a state of liquefaction by fire. See farther particulars under DELUGE.

EARTH, in *Astronomy*, is one of the primary planets, according to the system of Copernicus. Its character is ⊖.

In the hypothesis of Ptolemy, the *earth* is the centre of the system.

Whether the earth move, or remain at rest, i. e. whether it be fixed in the centre, with the sun, heavens, and stars moving round the same from east to west; or whether the heavens and stars being at rest, the *earth* moves from west to east, is the great article that distinguishes the Ptolemaic from the Copernican system.

EARTH,

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EARTH, *motion of the.* The happy induſtry of the aſtronomers of our age has put the mobility of the *earth* beyond all reaſonable doubt; on which account, the names of Copernicus, Gaſſendus, Kepler, Hook, Flamſteed, Bradley, &c. will ever be mentioned with the higheſt honour.

Indeed, the ſame motion had been held by many of the ancient philoſophers. Cicero, in his Tuſc. Quæſt. aſſures us, that Nicetas of Syracuſe firſt diſcovered that the *earth* had a diurnal motion, by which it revolved round its axis in the ſpace of 24 hours; and Plutarch, de Placit. Philoſoph. tells us, that Philolaus diſcovered its annual motion round the ſun; and about 100 years after Philolaus, Ariſtarchus, the Samian, propoſed the motion of the *earth* in ſtronger and clearer terms, as we are aſſured by Archimedes in Arenar.

But the religious opinions of the heathen world prevented the doctrine's becoming more cultivated. For Ariſtarchus being accuſed of ſacrilege by Cleanthes for moving Veſta and the tutelar deities of the univerſe out of their places, the philoſophers began to lay aſide ſo perilous a poſition.

Many ages afterwards, Nic. Cuſanus revived the ancient ſyſtem, in his Doct. de Pignorant. and aſſerted the motion of the *earth:* but the dogma gained very little ground till the time of Copernicus, who ſhewed its great uſe and advantages in aſtronomy; and who had immediately all the philoſophers and aſtronomers who dared to differ from the croud, and were not afraid of eccleſiaſtical cenſures, on his ſide. So that Kepler, his contemporary, made no ſcruple to cry, *Hodierno tempore præſtantiſſimi quique philoſophorum & aſtronomorum Copernico adſtipulantur: ſecta eſt hæc glacies; vincimus ſuffragiis melioribus: ceteris pene ſola obſtat ſuperſtitio, aut metus a Cleanthibus.* See COPERNICAN.

The arguments alleged againſt the motion of the *earth* are weak and frivolous. Such are,

1. That it is a heavy body, and very unfit for motion.

2. That if the *earth* were to move round its axis in 24 hours, all our houſes, buildings, &c. would tumble down.

3. That bodies would not fall upon the places perpendicularly under them; nor could a bullet, e. gr. ſhot perpendicularly from the ground, fall back again upon the ſame ſpot.

4. That it is contrary to the words of ſcripture. And

5. That it is repugnant to our ſenſes, which repreſent the *earth* at reſt, and the ſun in motion.

But the principal argument againſt the annual motion of the *earth*, is the want of an annual parallax in the fixed ſtars. For let TA*t* (*Tab.* II. *Aſt. fig.* 69.) repreſent the *earth*'s orbit about the ſun S, TX the axis of the *earth*, and *t x* parallel to TX, will repreſent the poſition of the ſame axis at the oppoſite point *t*. Suppoſe TX to be directed towards the ſtar P; and it is manifeſt, that the axis of the *earth* will not be directed to the ſame ſtar, when it comes to the ſituation *t x*, but will contain an angle *x t* P with the line *t* P, joining the *earth* and ſtar, equal to the angle *t* P T, under which the diameter T*t* of the *earth*'s orbit appears to a ſpectator, viewed from the ſtar P. It might be expected, therefore, that by obſerving the fixed ſtar P, from the different parts of the *earth*'s orbit, we might judge of the angle TP*t*, and conſequently of the proportion of TP, the diſtance of the ſtar to T*t*, the diameter of the *earth*'s orbit, or double diſtance of the ſun. Yet it is certain, that aſtronomers have not hitherto been able to diſcover any difference in the apparent ſituation of the fixed ſtars with reſpect to the axis of the *earth*, or to one another, that can ariſe from the motion of the *earth:* though, ſince the reſtoration of the Pythagorean doctrine of the *earth*'s motion, they have taken great pains to examine the matter.

The ſeeming motion of the pole-ſtar, obſerved by Mr. Flamſteed, was by ſome miſtaken for a proof of its annual parallax; but this phænomenon has ſince been accounted for in the moſt ingenious manner by Mr. Bradley, from the motion of light combined with that of the *earth* in its orbit. See PARALLAX and LIGHT.

The objection to the *earth*'s motion, from there being no diſcernible parallax of the fixed ſtars, is anſwered by obſerving, that the diſtance of the fixed ſtars is ſo great, that the diameter of the *earth*'s orbit bears no ſenſible proportion to it; ſo that the parallax is not to be diſcovered by our exacteſt inſtruments. Nor is this immenſe diſtance of the fixed ſtars advanced by the Copernicans merely as an hypotheſis for the ſake of ſolving the objection. For there ſeems great reaſon to ſuppoſe fixed ſtars like to our ſun, and hence to conclude their diſtance to be vaſtly great, ſince they appear to us with ſo faint a light, and of no ſenſible diameter, even in the largeſt teleſcopes.

But from the diligence and accuracy of late aſtronomers, we learn ſeveral curious things in confirmation of the motion of the *earth* about the ſun, and ſerving to ſolve this only material objection againſt it. See LIGHT.

The arguments for the motion of the *earth* are of a different kind to the objections againſt it, and carry other ſort of evidence with them, being deduced from actual obſervation and phenomena, and not from the fanciful ſurmiſes of timorous zealots. They are theſe: 1. The ſun will equally appear in motion, and the *earth* as ſtanding ſtill, to a ſpectator on the *earth*, whether the ſun really move round the *earth* at reſt, or the *earth* move round the ſun at reſt.

For ſuppoſe the *earth* in T (*Tab. Aſtronom. fig.* 15. N° 2.) and the ſun in 1; the ſun will then appear in ♈. And, ſuppoſe the ſun to proceed in an orbit ſurrounding the *earth* from 1 to 2, he will then appear in ♉; and, if he proceed farther to 3, he will ſeem in ♊: and thus will he appear to go on, according to the order of the ſigns in the ecliptic. Suppoſe, again, the *earth* in 1, and the ſun in T, the ſun will now be ſeen in ♎; let the *earth* go on from 1 to 2, the ſun will appear to the inhabitants of the *earth* to have proceeded from ♎ to ♏; and if the *earth* proceed to 3, the ſun will appear to have advanced farther from ♏ to ♐; and ſo on, according to the ſucceſſion of the ſigns of the ecliptic.

Thus does the ſun appear alike to move, whether he really move or ſtand ſtill; ſo that the objection from ſenſe is of no force. But again,

2. If one of the planets be ſuppoſed to have moved a certain ſpace from weſt to eaſt, the ſun, *earth*, and other planets, together with the fixed ſtars, will all ſeem to an inhabitant of that planet to have moved juſt ſo far round it the contrary way.

For, ſuppoſe a ſtar M (*fig.* 16. N° 2.) in the zenith of an inhabitant of a planet placed in T; and ſuppoſe the planet to have revolved on its axis from weſt to eaſt; in a certain ſpace of time the ſun S will have arrived at the zenith of T, then the ſtar I, then N, then the *earth* L, and at length the ſtar M again. To the inhabitant of the planet, therefore, the ſun S, with the *earth* L, and the ſtars I, N, M, &c. will appear to have moved round the planet a contrary way.

Thus, to the inhabitants of the planets (if any ſuch there be) the mundane ſphere, with the ſun, ſtars, and all the other planets, will, as to us, appear to move round them from eaſt to weſt; and accordingly, the inhabitants of our planet, the *earth*, are only liable to the ſame deluſive appearances with thoſe of the reſt.

3. The orbits of the planets include the ſun as the common centre of them all; but it is only the orbits of the ſuperior planets that include the *earth*; which, however, is not in the centre of any of them, as is ſhewn under SUN and PLANET.

4. The *earth*'s orbit being proved to be between thoſe of Venus and Mars, it follows, that the *earth* muſt turn round the ſun; for, as it lies within the orbits of the ſuperior planets. their motion would appear unequal and irregular; but they would never either be ſtationary or retrogade without this ſuppoſition.

5. From the orbits and periods of the ſeveral planets about the ſun, and of the moon and ſatellites round the *earth*, Jupiter and Saturn, it is evident, that the law of gravitation is the ſame towards the *earth*, Jupiter, and Saturn, as towards the ſun; and the periodical times of the ſeveral bodies moving around each, are in the ſame ratio to their ſeveral diſtances from them.

Now it is certain, that, on the hypotheſis of the *earth*'s annual motion, her periodical time exactly ſuits this law, bearing ſuch a proportion between thoſe of Mars and Venus as the ſeveral other bodies directed by the ſame law do bear; i. e. the ſquares of the periods are, in all, as the cubes of the diſtances from the centre of their orbits. But ſuppoſing the *earth* too at reſt, this law is broken moſt exorbitantly.

For, if the *earth* does not move round the ſun, the ſun muſt move with the moon round the *earth:* now, the diſtance of the ſun to that of the moon being as 23750 ſemidiameters of the *earth* to 60, or nearly as 396 to 1; and the moon's period being leſs than 28 days, the ſun's period ſhould be found no leſs than 212775 days, or 583 years; whereas, in fact, it is but one year. Which ſingle conſideration Mr. Whiſton thinks of weight enough to determine the controverſy between the two ſyſtems, and to eſtabliſh the motion of the earth for ever.

Whereas, ſuppoſing our *earth* to have once revolved about the ſun in a circular orbit, whoſe ſemidiameter were equal to the *earth*'s original diſtance from the ſun ſix degrees paſt its perihelion, the annual period would be found exactly and ſurpriſingly equal to the lunar or the ancient ſolar year, which were exactly commenſu-

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rate, containing 12 ſynodical, or 13 periodical months, i. e. 365 days, 4 hours, 19 minutes.

6. The diſtances of certain of the fixed ſtars from the zenith have been obſerved to be various at various times of the year. That particularly of the pole-ſtar from the pole, has been diſcovered by Mr. Flamſteed from repeated obſervations, for ſeven years ſucceſſively, to be greater about the ſummer ſolſtice than about the winter, by about 40 ſeconds. Whence it appears, that the *earth* changes its ſituation, receding from the pole-ſtar, and returning back to it again annually.

Which argument is farther confirmed from this, that the *earth* is nearer the ſun at Chriſtmas than at Midſummer; as appears, both from the ſun's apparent diameter being greater in December than in June; and from its motion being ſwifter, by one twenty-fifth part in the former ſeaſon than the latter; whence it is, that there are about eight days more in the ſummer half-year, viz. from March to September, than in the winter, from September to March.

7. Either the heavenly bodies revolve round the *earth* in 24 hours, or the *earth* revolves round its axis in that time. Now, the planets revolving round the ſun, perform their revolutions in greater or leſs times, as their orbits are greater or leſs, i. e. as they are more or leſs remote from the ſun. Of conſequence, if the ſtars and planets revolved round the *earth*, they would perform their revolutions in unequal times, according as their orbits or their diſtances were unequally big. At leaſt, the fixed ſtars, which are at ſuch prodigious diſtances from the *earth*, would never move round it in 24 hours, as the neareſt planet is ſuppoſed to do.

This is an inelegancy, which is avoided in the ſyſtem where the *earth* is ſuppoſed to move; and where every planet is ſo much the longer in deſcribing its annual orbit round the ſun as that orbit is greater.

8. In all the works of nature with which we are acquainted, the Creator appears to act by the ſhorteſt, eaſieſt, and ſimpleſt means. Now, if the *earth* be at reſt, and the ſtars move, the velocity of theſe latter muſt be immenſe; and yet all the purpoſes thereof might have been anſwered by a moderate motion of the *earth* alone.

For the moon's diſtance from the *earth* amounts to 240000 miles. Hence, the circumference of the moon's diurnal circle being 1507968 ſuch miles, the moon's horary motion muſt be 62832 miles inſtead of 2290 miles, which is really the caſe; conſequently, in each ſecond, a ſpace leſs than that of the pulſe of an artery, the moon, though the ſloweſt of all the heavenly bodies, muſt move more than 17 miles. Again, the ſun's mean diſtance from the *earth* is 23750 ſemidiameters of the *earth*, or 95000000 miles; conſequently the ſun's diurnal path when in the equator, muſt be 596904000 miles; and therefore, in the ſpace of one ſecond, i. e. in the twinkling of an eye, he muſt move more than 6908 miles.

Again, the diſtance of the ſun from the *earth* is to that of Mars, ſuppoſing the *earth*, and not the ſun to be the centre of the ſyſtem, nearly as one and a half; to that of Jupiter, as one to five and a quarter; and to that of Saturn, as one to nine: wherefore, as the diurnal ſpace, and all other things deſcribed in the ſame time, are in the ſame ratio, Mars, in one twinkling of an eye, muſt fly 10362, Jupiter 36266, and Saturn 62172 miles. Laſtly, the fixed ſtars being yet vaſtly more remote from the *earth* than Saturn, their motion in or near the equator muſt be vaſtly ſwifter than that of Saturn.

9. If the *earth* be at reſt, and the ſtars move by any common motion, the ſeveral planets muſt each day deſcribe ſeveral ſpirals running forth to a certain term towards the north, and thence returning to the oppoſite term towards the ſouth, ſometimes narrower and ſometimes broader.

For the diſtances of the ſeveral planets from the zenith alter every day, increaſing to a certain point towards the north, and thence decreaſing again towards the ſouth; conſequently, the altitude of the pole being always found the ſame, and the planets not returning to the ſame point of the meridian, they do not deſcribe circles, but ſpirals. Add, that as the ſeveral planets do not retain the ſame diſtance from the *earth*, but are ſometimes nearer, and ſometimes recede farther from it, at a greater diſtance, a greater ſpiral, and at a leſs, a leſs is deſcribed.

Farther, as their motion is ſlower when the planet is farther from the *earth*, the greater ſpirals are deſcribed in leſſer times than the leſſer; and, as the greateſt and leaſt diſtance of the planets from the *earth* is not affixed to the ſame point of the heavens, the planets have moved in different tracts every day from the beginning.

Beſides, the force by which the ſtars and planets revolve in their orbits are not directed to the centre of the *earth*, but to the centres of the ſeveral orbits which they deſcribe, or to innumerable imaginary points in the axis of the *earth*; and theſe forces tending to different and continually varying centres muſt likewiſe increaſe exactly in proportion to the diſtances from the axis; whereas the force of attraction is found to decreaſe.

10. Bodies let fall from any conſiderable height, are found by experiment, not to fall upon the ſpot perpendicularly under them, but to the ſouth-eaſt thereof.

The experiment was propoſed to Dr. Hook in the year 1679, by a perſon who ſuggeſted, that, if the *earth* had any diurnal motion, the body would fall to the eaſt of the perpendicular. Dr. Hook, on that occaſion, read a diſcourſe before the Royal Society, wherein he endeavoured, *à priori*, to aſſign what curve a falling body would deſcribe; aſſerting, particularly, that the fall of the body would not be directly eaſt, but ſouth-eaſt; which was confirmed by divers actual trials. The objection which ſuppoſes, that e. g. a ball fired perpendicularly upward in the air ſhould fall weſtward of the place from which it was projected, on the ſuppoſition of the *earth*'s revolution eaſtward, can have no weight, when it is conſidered that the gun and ball partake of the *earth*'s motion; and therefore, being carried forward with the air as quick as the *earth* and air turn, it muſt fall down on the ſame place, deſcribing in its deſcent the diagonal of a parallelogram, whoſe two ſides are proportional to the forces acquired from the *earth*'s motion and the gravity of the ball. Thus a ſtone let fall from the top of a main-maſt, if it meets with no obſtacle, falls on the deck as near the foot of the maſt when the ſhip ſails as when it does not.

11. The power of gravity is found to decreaſe as you approach nearer to the equator, which is a circumſtance that agrees to all bodies which have a motion on their axis, and to them only, as being really the neceſſary reſult of ſuch motion.

For a body, revolving on its axis, the parts or appendages thereof, are continually endeavouring to recede from the centre. Conſequently, the equator being a great circle, and the parallels all decreaſing towards the poles, the centrifugal force is greateſt in the equator, and decreaſes towards the poles in the ratio of the diameters of the parallels to that of the equator. Now the power of gravity determines the ſeveral parts or appendages towards the centre of the whole: conſequently, the centrifugal force, acting contrary to the power of gravity, retards the deſcent of bodies, and that moſt where it is greateſt.

Dr. Keil computes, that the force of gravity to the centrifugal force at the equator is as 289 to 1; conſequently, a body placed there, would loſe one 289th part of the weight it would have were the *earth* at reſt; conſequently, the centrifugal force at the poles being infinitely ſmall, a body will there weigh 289 pounds, which at the equator only weighs 288.

12. The following is an actual demonſtration of the *earth*'s motion, drawn from phyſical cauſes, for which we are indebted to the diſcoveries of Sir Iſaac Newton, and which Dr. Keil takes for concluſive and unanſwerable.

All planets, it is demonſtrated, gravitate towards the ſun; and obſervations teſtify to us, either that the *earth* turns round the ſun, or the ſun round the *earth*, in ſuch a manner as to deſcribe equal areas in equal times. But it is demonſtrated farther, that whenever bodies turn round each other, and regulate their motions by ſuch a law, the one muſt of neceſſity gravitate to the other: conſequently, if the ſun in its motion doth gravitate to the *earth*, action or re-action being equal and contrary, the *earth* muſt likewiſe gravitate towards the ſun.

Again, the ſame author has demonſtrated, that when two bodies gravitate to one another, without directly approaching one another in right lines, they muſt both of them turn round their common centre of gravity; the ſun and *earth*, therefore, do both turn round their common centre of gravity; but the ſun is ſo great a body in reſpect of our *earth*, which is, as it were but a point; that the common centre of gravity of the two bodies will lie within the body of the ſun itſelf, and not far from the centre of the ſun. The *earth*, therefore, turns round a point, which is in the body of the ſun, and therefore it turns round the ſun. Q. E. D.

13. Beſides, if the ſun moves about the *earth*, the *earth*'s attractive power muſt draw the ſun towards it from the line of projection, ſo as to bend its motion with a curve; but the ſun being at leaſt 227000 times as heavy as the *earth*, it muſt move 227000 times as ſlowly toward the *earth* as the *earth* does toward the ſun; and conſequently the *earth* would fall to the ſun in a ſhort time, if it had not a very ſtrong projectile motion to carry it off.

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There is indeed no ſuch thing in nature as a heavy body moving round a light one as its centre of motion. A pebble, as Mr. Ferguſon familiarly illuſtrates this matter, faſtened to a mill-ſtone by a ſtring, may, by an eaſy impulſe, be made to circulate round the mill-ſtone; but no impulſe can make a mill-ſtone circulate round a looſe pebble, for the mill-ſtone would go off and carry the pebble along with it.

14. Dr. Bradley, late aſtronomer royal, has found, by a long ſeries of the moſt accurate obſervations, that there is a ſmall apparent motion of the fixed ſtars, occaſioned by the obſervation of their light, and ſo exactly anſwering to an annual motion of the *earth*, as evinces the ſame even to a mathematical demonſtration. See LIGHT.

To ſay no more; to ſuppoſe the *earth* at reſt, confounds and deſtroys all the order and harmony of the univerſe, annuls its laws, and ſets every part at variance with each other, robs the Creator of half the praiſe of his work, and mankind of the pleaſure of the contemplation thereof. In effect, it renders the motions of the planets inexplicable and uſeleſs, which otherwiſe are plain and ſimple. So that ſuch of the later aſtronomers, as have aſſerted it with the moſt zeal, have been forced to ſet it aſide, when they came to compute the motions of the planets. None of them would ever attempt to compute theſe motions in variable ſpirals; but in all their theories they tacitly ſuppoſe the *earth* to move on its axis, ſo as to turn the diurnal ſpirals into circles.

Thus, the Jeſuit Ricciolus, though he, at the pope's command, oppoſed the motion of the *earth* with all his might, as ſomething contrary to holy ſcripture; yet, to frame aſtronomical tables, which ſhould tolerably agree with obſervation, he was forced to have recourſe to the motion of the *earth* as his only refuge.

This, De Chales, another of the ſame fraternity, frankly confeſſes: "P. Ricciolus—*nullas tabulas aptare potuit, quæ* "*vel mediocriter obſervationibus reſponderent; niſi ſecundum* "*ſyſtema terræ motæ*; notwithſtanding that he called in "all the foreign and forced aſſiſtances of moveable epi- "cycles, ſo that in his Aſtronomia Reformata, where he "undertakes to give accurate tables of the celeſtial mo- "tions, he gives into the hypotheſis of the motion of the *earth*." De Chales Aſtron. Reformat. lib. x. cap. 1. See COPERNICAN.

The ſyſtem then, which ſuppoſes the *earth* at reſt, is of itſelf of no uſe or ſignificancy in aſtronomy; nor does it avail more in phyſics; for the principal phænomena are no way deducible from it; but the retainers of it are either forced to fly to the immediate agency of the Deity (which in phyſics is the ſame as the *reductio ad abſurdum* in *Geometry*) or to reaſons and principles unknown.

Some oppoſe the motion of the *earth* as contrary to revelation; there being mention made in holy ſcripture of the ſun's riſing and ſetting, of his ſtanding ſtill in the time of Joſhua, and his going back in that of Hezekiah.

Now, to take the genuine ſenſe of theſe paſſages, the laws of interpretation muſt be ſettled. 1. Then, we ſuppoſe, that the ſeveral words of ſcripture have their ſeveral ideas correſponding to them; and that a man takes their ſenſe, in whom thoſe ideas are excited by the reading. 2. That the words of ſcripture, attentively read, are ſufficient to excite thoſe ideas in a mind not prepoſſeſſed. Hence, 3. It follows, that either God muſt have exhibited the definitions of the words that occur in ſcripture; or, that he ſuppoſes prior notions, and leaves us to take their ſenſe in the ordinary way. Hence, 4. We argue, that no other ideas are to be affixed to the words of ſcripture, but ſuch as occur to a perſon who looks or attends to the things themſelves ſpoken of.

By the ſun's riſing, therefore, is meant no more than his re-appearance in the horizon, after he had been hid below it; and, by his ſetting, an occultation of the ſun, which was before viſible in the horizon. When the preacher therefore ſays, Eccleſ. i. 5. *The ſun alſo ariſeth, and the ſun goeth down, and haſteth to his place where he aroſe*, he means, doubtleſs, no more than that the ſun, which before was hid, is now ſeen in the horizon; and after being there conſpicuous, is hid again, and at length re-appears in the eaſt. For thus much only appears to a perſon who views the ſun; and therefore thus much, and no more, is expreſſed by the ſacred writers.

In like manner, when in Joſh. x. 12, 13. the ſun and moon are ſaid to have ſtood ſtill; all meant by ſtation is, that they did not change their place with reſpect to the *earth*. For that general, by *Sun, ſtand thou ſtill upon Gibeon, and thou moon, in the valley of Aijalon*, required no more, than that the ſun, which then appeared over that city, ſhould not change its ſituation. And from his bidding the ſun to keep its ſituation, it would be unjuſt to infer, that it moves round the *earth* at reſt.

Theſe, and ſimilar expreſſions, are true and proper deſcriptions of the phenomena, as they appear to us; but as the ſcriptures were never intended to inſtruct us in philoſophy and aſtronomy, they do not at all determine by what motions theſe phenomena are occaſioned. And it has been juſtly obſerved, that part of the account recorded in the book of Joſhua is merely a deſcription of the appearance; Gibeon and Aijalon, and the whole land of Canaan lying in too northern a latitude for the ſun or moon ever to be vertical to any part of it; and yet this was a juſt deſcription of the phenomenon as it appeared to Joſhua in the place where he then was; and if one part of the account merely deſcribe the phenomena, the other muſt likewiſe be underſtood in the ſame manner.

Gaſſendus, very pertinently to the ſame purpoſe, diſtinguiſhes "two ſacred volumes, the one written, called "the *Bible*; the other, *Nature*, or the *World*; God hav- "ing manifeſted himſelf by two lights, the one of reve- "lation, and the other of demonſtration; accordingly, "the interpreters of the former are divines, of the lat- "ter, mathematicians. As to matters of natural know- "ledge, the mathematicians are to be conſulted; and as "to the objects of faith, the prophets; the former be- "ing no leſs interpreters, or apoſtles, from God to men, "than the latter. And as the mathematician would be "judged to wander out of his province, if he ſhould "pretend to controvert, or ſet aſide any article of faith "from principles of geometry; ſo it muſt be granted, "the divines are no leſs out of their limits, when they "venture to pronounce on a point of natural know- "ledge, beyond the reach of any not verſed in geo- "metry and optics, merely from holy ſcripture, which "does not pretend to teach any thing of the mat- "ter.

"For inſtances, we may quote Lactantius and Au- "guſtine; the firſt of whom rendered himſelf ridicu- "lous by diſputing from ſcripture, againſt the round- "neſs of the *earth*; and the latter, againſt the antipodes." See ANTIPODES.

Having thus proved the motion of the *earth*, it is to be farther obſerved, that the altitude of the pole being found at all times of the year, i. e. in all points of its annual orbit (the ecliptic) to be the ſame; it follows, that the *earth* proceeds in ſuch manner along its orbit, as that its axis is conſtantly parallel to the axis of the world, and of conſequence parallel to itſelf.

This motion, which Copernicus calls the *motion of libration*, may be well enough illuſtrated, by ſuppoſing a globe, with its axis parallel to that of the *earth*, painted on a flag, or ancient of a maſt, moveable on its axis, and continually driven by the weſt wind, while it makes the tour of an iſland; it is evident, that in every ſituation of the ſhip, the axis of the painted globe will continue parallel to the axis of the world.

According to Sir Iſaac Newton's principles, the *earth*'s axis does, in every annual revolution, incline twice towards the ecliptic, and twice return to its former poſition: on which mutation it is, that the preceſſion of the equinoctial points is ſuppoſed to depend.

EARTH, *Latitude and Longitude of the.* See LATITUDE and LONGITUDE.

EARTH, *Inclination of the Axis of the.* See INCLINATION, AXIS, and ANGLE.

EARTH, *Quantity of matter, denſity, and attractive power at its ſurface.* See DENSITY and PLANETS.

EARTHED *ſugar.* See SUGAR.

EARTHEN *floors.* See FLOOR.

EARTHING, in the general ſenſe. See INTERRMENT.

EARTHING, in *Agriculture* and *Gardening*, denotes the covering of vines, celery, and other ſhrubs and plants with *earth*.

EARTHQUAKE, in *Natural Hiſtory*, a vehement ſhake, or agitation of ſome conſiderable place or part of the earth, from natural cauſes, attended with a terrible noiſe like thunder, and frequently with an eruption of water or fire, or elſe of ſmoke or winds.

Earthquakes are the greateſt and moſt formidable phenomena of nature. Ariſtotle and Pliny diſtinguiſh two kinds with reſpect to the manner of the ſhake, viz. a *tremor* and a *pulſe*; the firſt being horizontal, in alternate vibrations, compared to the ſhaking of a perſon in an ague; the ſecond perpendicular, up and down; which latter kind are alſo called by Ariſtotle, βεᾶσσαι, from the reſemblance of their motion to that of boiling.

EARTHQUAKES, *Phenomena of.* The Philoſoph. Tranſact. furniſh us with abundance of hiſtories of *earthquakes*; particularly, on at Oxford in 1665, by Dr. Wallis and Mr. Boyle. Another at the ſame place in 1683, by Mr. Pigot. And another in Sicily in 1692-3, by Mr. Hartop, Fa. Aleſſandro Burgos, and Vin Bonajutus, which laſt is one of the moſt terrible ones in all hiſtory.

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This ſhook the whole iſland; and not only that, but Naples and Malta ſhared in the ſhock. It was of the ſecond kind mentioned by Ariſtotle and Pliny, viz. a perpendicular pulſation or ſucceſſion. It was impoſſible, ſaid the noble Bonajutus, for any body in this country to keep on their legs on the dancing earth; nay, thoſe that lay on the ground were toſſed from ſide to ſide as on a rolling billow, and high walls leaped from their foundations ſeveral paces, &c. Phil. Tranſ. N° 207. The miſchief it did is amazing; almoſt all the buildings in the countries were thrown down. Fifty-four cities and towns, beſide an incredible number of villages, were either deſtroyed or greatly damaged. We ſhall only inſtance the fate of Catania, one of the moſt famous, ancient, and flouriſhing cities in the kingdom, the reſidence of ſeveral monarchs, and an univerſity. This once famous, now unhappy Catania, to uſe the words of Fa. Burgos, had the greateſt ſhare in the tragedy. F. Anton. Serrovita being on his way thither, and at the diſtance of a few miles, obſerved a black cloud like night, hovering over the city; and there aroſe from the mouth of Montgibello great ſpires of flame, which ſpread all around. The ſea, all of a ſudden, began to roar, and riſe in billows; and there was a noiſe as if all the artillery in the world had been at once diſcharged. The birds flew about aſtoniſhed; the cattle in the fields ran crying, &c. His and his companions horſes ſtopped ſhort, trembling; ſo that they were forced to alight. They were no ſooner off, but they were lifted from the ground above two palms; when caſting his eyes towards Catania, he with amazement ſaw nothing but a thick cloud of duſt in the air. This was the ſcene of their calamity; for of the magnificent Catania, there was not the leaſt footſtep to be ſeen. S. Bonajutus aſſures us, that of 18914 inhabitants, 18000 periſhed therein. The ſame author, from a computation of the inhabitants, before and after the *earthquake*, in the ſeveral cities and towns, finds that near 60000 periſhed out of 254900. Ibid. N° 202.

Jamaica is remarkable for *earthquakes*. The inhabitants, Dr. Sloane informs us, expect one every year. This author gives us the hiſtory of one in 1687; and another horrible one in 1692, is deſcribed by ſeveral anonymous authors. In two minutes time this ſhook down and drowned nine tenths of the town of Port-Royal. The houſes ſunk out-right, 30 or 40 fathoms deep. Phil. Tranſact. N° 209. The earth opening, ſwallowed up people; and they roſe in other ſtreets, ſome in the middle of the harbour; and yet many were ſaved, though there were 2000 people loſt, and 1000 acres of land ſunk. All the houſes were thrown down throughout the iſland. One Hopkins had his plantation removed half a mile from its place. Of all wells, from one fathom to ſix or ſeven, the water flew out at the top with a vehement motion. While the houſes on one ſide of the ſtreet were ſwallowed up, on the others they were thrown on heaps; and the ſand in the ſtreet roſe like waves in the ſea, lifting up every body that ſtood on it, and immediately dropping down into pits; and at the ſame inſtant a flood of water breaking in, rolled them over and over; ſome catching hold of beams and rafters, &c. Ships and ſloops in the harbour were overſet and loſt; the Swan frigate, particularly, was thrown over by the motion of the ſea and ſinking of the wharf, and was driven over the tops of many houſes. It was attended with a hollow rumbling noiſe like that of thunder. In leſs than a minute, three quarters of the houſes, and the ground they ſtood on, with the inhabitants, were all ſunk quite under water; and the little part left behind was no better than a heap of rubbiſh. The ſhake was ſo violent, that it threw people down on their knees or their faces as they were running about for ſhelter. The ground heaved and ſwelled like a rolling ſea; and ſeveral houſes, ſtill ſtanding, were ſhuffled and moved ſome yards out of their places. A whole ſtreet is ſaid to be twice as broad now as before; and in many places, the earth would crack, and open and ſhut, quick and faſt. Of which openings, two or three hundred might be ſeen at a time; in ſome whereof, the people were ſwallowed up; others, the earth cloſing, were caught by the middle, and preſſed to death; as to others, the heads only appeared. The larger openings ſwallowed up houſes; and out of ſome would iſſue whole rivers of waters, ſpouted up a great height into the air, and threatening a deluge to that part the *earthquake* ſpared. The whole was attended with ſtenches and offenſive ſmells, the noiſe of falling mountains at a diſtance, &c. and the ſky in a minute's time was turned dull and reddiſh like a glowing oven. Yet, as great a ſufferer as Port Royal was, more houſes were left ſtanding therein than on the whole iſland beſide. Scarce a planting-houſe or ſugar-work was left ſtanding in all Jamaica. A great part of them were ſwallowed up, houſes, people, trees, and all at once; in lieu of which, afterwards, appeared great pools of water, which, when dried up, left nothing but ſand, without any mark that ever tree or plant had been thereon. Above 12 miles from the ſea, the earth gaped, and ſpouted out with a prodigious force vaſt quantities of water into the air; yet the greateſt violences were among the mountains and rocks; and it is a general opinion, that the nearer the mountains the greater was the ſhake; and that the cauſe thereof lay there. Moſt of the rivers were ſtopped up for 24 hours, by the falling of the mountains, till ſwelling up, they made themſelves new tracts and channels, tearing up in their paſſage trees, &c. After the great ſhake, many of thoſe people who eſcaped got on board ſhips in the harbour, where many continued above two months; the ſhakes all that time being ſo violent, and coming ſo thick, ſometimes two or three in an hour, accompanied with frightful noiſes like a ruſtling wind, or a hollow rumbling thunder, with brimſtone-blaſts, that they durſt not come aſhore. The conſequence of the *earthquake* was a general ſickneſs, from the noiſome vapours belched forth, which ſwept away above 3000 perſons of thoſe who were left. Ibid. After the detail of theſe horrible convulſions, the reader will have but little curioſity left for the phenomena of the *earthquake* at Lima in 1687, deſcribed by Fa. Alvarez de Toledo, wherein above 5000 perſons were deſtroyed; this being of the vibratory kind, ſo that the bells in the church rung of themſelves; or that at Batavia, in 1699, by Witzen; that in the north of England, in 1703, by Mr. Thoreſby; thoſe in New-England in 1663 and 1670, by Dr. Mather; that of Italy in 1742; that of Lima and the port of Callas in Peru, in 1746, which laſted 15 minutes, and deſtroyed moſt of the buildings in the city, deſtroyed moſt of the inhabitants, and ſwallowed up ſeveral ſhips then in the port; that of London in 1749; thoſe in 1750, felt in many parts of England; that of 1777, felt in the north of England; or laſtly, that at Liſbon in 1755: though this deſerves a more particular account than many others of much leſs conſiderable extent and duration. The three preceding years had been remarkably dry, inſomuch, that ſome ſprings which had been plentifully ſupplied with water were totally loſt; and the predominant winds were eaſt and north-eaſt, accompanied with various, though very ſmall motions and tremblings of the earth. The ſpring of the year 1755 was very rainy and wet; the weather on the day preceding the *earthquake*, which happened on the 1ſt of November, was clear, and uncommonly warm for the ſeaſon, and had continued clear and rather warmer than uſual for ſeveral days before. The day of the *earthquake* broke with a ſerene ſky, the wind continuing at eaſt; but about 9 o'clock the ſun began to grow dim; and ſoon after was heard a rumbling noiſe, like that of carriages, which increaſed to ſuch a degree as to equal that of the loudeſt cannon; upon which the firſt ſhock was felt, which was immediately ſucceeded by a ſecond and third, the whole duration of which was about 8 minutes; about 12 o'clock another ſhock was felt. During the firſt ſhock, the greateſt part of the public edifices and other buildings of the city were thrown down; and not leſs than 60000 of its inhabitants buried in the ruins. The earth opened in fiſſures in ſeveral parts, and ſeveral light flames of fire were obſerved to iſſue from the ſides of the mountains reſembling thoſe of kindled charcoal. Subterraneous rumblings were alſo felt, attended with a diſcharge of great quantities of ſmoke. The water in the ſea roſe ſeveral times, and in a few minutes made three fluxes and re-fluxes, riſing above the greateſt ſpring-tides no leſs than 15 Engliſh feet. The ſhock was ſo violent 50 leagues off at ſea, as greatly to injure the deck of a ſhip, and to lead the captain to apprehend, that he had miſtaken his reckoning, and ſtruck on a rock. The ſhock was alſo felt about the ſame time at Oporto, by which the whole city was ſhaken, ſeveral chimnies, ſtones, and croſſes, were thrown down, and ſome buildings opened at top; and the ſwelling in the river was ſo conſiderable, that two large ſhips, which were juſt got over the bar, were driven back into the harbour. The ſame ſhock was equally violent at Madrid, Seville, and Cadiz; and in this laſt place the ſea roſe in a wave at leaſt 60 feet higher than uſual, daſhed againſt the rocks on the weſt part of the town, and againſt the walls with ſuch violence as to beat in the breaſt-work and a great part of the walls, ſo that ſeveral perſons were drowned by it. The day when the *earthquake* happened at Cadiz was as clear and ſerene as the fineſt ſummer-day in England. Many other cities, both in Spain and Portugal, were conſiderably damaged. The effects of this *earthquake*, in violently agitating the waters, were perceived in many parts of England, Scotland, and Ireland; and the ſhock not only reached to Switzerland, Holland, and other parts

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parts of Europe, but it was communicated to Africa, and deſtroyed ſeveral cities on the coaſt of Barbary; and it was alſo felt about the ſame time in the iſland of Madeira, where the water roſe full 15 feet perpendicular above high-water mark. See Phil. Tranſ. N° 462, 463. 497; or vol. xlvi. p. 601, &c. vol. xlix. art. lviii. p. 351.—444.

M. Lomonſow preſented a paper to the Royal Academy of Sciences at Paris in 1758, in which he endeavours to ſhew, that the formation of metals is a neceſſary conſequence of *earthquakes*. He ſuppoſes that the fire, occaſioned by the ſulphureous matter with which the interior parts of the earth abound, acts on the foſſile ſubſtances and the vegetable ſalts contained in them and depoſited in the cavities of the earth, and reduces the whole into a mineral ſtate; and that the minerals diſſolved by the fire are diſtributed into beds and veins, as they are found to exiſt in the mine.

We will now relieve the reader after this long account, with ſome attempts towards a theory of *earthquakes*.

EARTHQUAKES, *Cauſes of*. Naturaliſts are here divided. Some aſcribe *earthquakes* to water, others to fire, and others to air; and all of them with ſome reaſon. To conceive which, it is to be obſerved, that the earth every where abounds with huge ſubterraneous caverns, veins, and canals, particularly about the roots of mountains; that of theſe cavities, veins, &c. ſome are full of water, whence are compoſed gulphs, abyſſes, ſprings, rivulets; and others full of exhalations; and that ſome parts of the earth are replete with nitre, ſulphur, bitumen, vitriol, &c.

This premiſed, 1. The earth itſelf may be the cauſe of its own ſhaking; when the roots, or baſis of ſome large maſs being diſſolved, or worn away by a fluid underneath, it ſinks into the ſame; and, with its weight, occaſions a tremor of the adjacent parts, and produces a noiſe, and frequently an inundation of water.

2. The ſubterraneous waters may occaſion *earthquakes*, by their overflowing, cutting out new courſes, &c. Add, that the water, being heated, and rarefied by the ſubterraneous fires, may emit ſumes, blaſts, &c. which, by their action, either on the water, or immediately on the earth itſelf, may occaſion great ſuccuſſions.

3. The air may be the cauſe of *earthquakes*; for air being a collection of fumes and vapours raiſed from the earth and water, if it be pent up in the too narrow viſcera of the earth, the ſubterraneous, or its own native heat, rarefying and expanding it, the force wherewith it endeavours to eſcape may ſhake the earth: hence there will ariſe a diverſe ſpecies of *earthquakes*, according to the different poſition, quantity, &c. of the impriſoned air.

Laſtly, Fire is a principal cauſe of *earthquakes*; both as it produces the aforeſaid ſubterraneous aura or vapour; and as this aura or ſpirit, from the different matter and compoſition whereof ariſe ſulphur, bitumen, and other inflammable matters, is kindled either from ſome other fire it meets with, or from its colliſion againſt hard bodies, or its intermixture with other fluids; by which means burſting out into a greater compaſs, the place becomes too narrow for it; ſo that preſſing againſt it on all ſides, the adjoining parts are ſhaken; till, having made itſelf a paſſage, it ſpends itſelf in a volcano, or burning mountain.

But to come nearer to the point, Dr. Liſter, in Philoſoph. Tranſact. N° 157, is of opinion, that the material cauſe of thunder, lightning, and *earthquakes*, is one and the ſame, viz. the inflammable breath of the pyrites, which is a ſubſtantial ſulphur, and will take fire of itſelf. For the true theory of lightning, &c. ſee LIGHTNING.

The difference between theſe three terrible phenomena, he takes only to conſiſt in this: that this ſulphur in the former is fired in the air; and in the latter, under-ground; which is a notion that Pliny had long before him: *quid enim*, ſays he, *aliud eſt in terra tremor, quam in nube tonitru?*

This he thinks abundantly indicated by the ſame ſulphureous ſmell being found in any thing burnt with lightning, and in the waters, &c. caſt up in *earthquakes*, and even in the air before and after them.

Add, that they agree in the manner of the noiſe; which is carried on as in a train, fired; the one rolling and rattling through the air, takes fire as the vapours chance to drive; as the other fired under-ground, in like manner, moves with a deſultory noiſe.

Thunder, which is the effect of the trembling of the air, cauſed by the ſame vapours diſperſed through it, has force enough to ſhake our houſes; and it is by no means improbable that there may be thunder and lightning under-ground, in ſome vaſt repoſitories there; eſpecially if we reflect, that the matter which compoſes the noiſy vapour above us is contained in much larger quantities under-ground. Philoſophical Tranſactions, N° 202.

That the earth abounds in cavities, every body allows; and that theſe ſubterraneous cavities are, at certain times, and in certain ſeaſons, full of inflammable vapours, the damps in our mines ſufficiently witneſs; which, fired, do every thing as in an *earthquake*, only in a leſſer degree.

That the pyrites alone, of all the known minerals, yields this inflammable vapour, is highly probable; becauſe no mineral or ore whatſoever is ſulphureous, but as it is wholly or in part a pyrites; and there is but one ſpecies of brimſtone, at leaſt with us in England, which the pyrites naturally and only yields. The ſulphur vive or natural brimſtone, which is found in and about the burning mountains, is certainly the effect of ſublimation; and thoſe great quantities of it ſaid to be found about the ſkirts of volcanos, are only an argument of the long duration and vehemence of thoſe fires. Poſſibly, the pyrites of the volcanos, or burning mountains, may be more ſulphureous than ours; and indeed it is plain, that ſome of ours in England are very lean, and hold but little ſulphur; others again very much, which may be one reaſon why England is ſo little troubled with *earthquakes*; and Italy, and almoſt round the Mediterranean ſea, ſo very much; though another reaſon is, the paucity of pyrites in England, compared with thoſe places. Comparing our *earthquakes*, thunder and lightning, with theirs, it is obſerved, that there it lightens almoſt daily, eſpecially in ſummer-time, here ſeldom; there thunder and lightning are of long duration, here they are ſoon over; there the *earthquakes* are frequent, long, and terrible, with many paroxyſms in a day, and thus renewed for many days; here they are very ſhort, only of a few minutes, and ſcarce perceptible. To this purpoſe, the ſubterraneous cavities in England are ſmall and few, compared with the vaſt vaults in thoſe parts of the world, which is evident, from the ſudden diſappearance of whole mountains and iſlands.

Dr. Woodward gives us another theory of *earthquakes*. He endeavours to ſhew, that the ſubterraneous heat or fire (which is continually elevating water out of the abyſs to furniſh the earth with rain, dew, ſprings, and rivers) being ſtopped in any part of the earth, and ſo diverted from its ordinary courſe by ſome accidental glut or obſtruction in the pores or paſſages through which it uſed to aſcend to the ſurface, becomes by ſuch means, preternaturally aſſembled in a greater quantity than uſual, into one place, and therefore cauſeth a great rarefaction aad intumeſcence of the water of the abyſs, putting it into great commotions and diſorders, and at the ſame time making the like effort on the earth; which, being expanded upon the face of the abyſs, occaſions the agitation and concuſſion which we call an *earthquake*.

This effort, in ſome *earthquakes*, he obſerves, is ſo vehement that it ſplits and tears the earth, making cracks and chaſms in it ſome miles in length, which open at the inſtants of the ſhocks, and cloſe again at the intervals betwixt them; nay, it is ſometimes ſo violent, that it forces the ſuper-incumbent ſtrata, breaks them all throughout, and thereby perfectly undermines and ruins the foundation of them; ſo that theſe failing, the whole tract, as ſoon as the ſhock is over, ſinks down into the abyſs, and is ſwallowed up by it; the water thereof immediately riſing up, and forming a lake in the place where the ſaid tract before was. That this effort being made in all directions indifferently, the fire dilating and expanding on all hands, and endeavouring to get room, and making its way through all obſtacles, acts as violently on the water of the abyſs beneath as on the earth above, forcing it forth which way ſoever it can find vent or paſſage, as well through its ordinary exits, wells, ſprings, and the outlets of rivers, as through the chaſms then newly opened, through the camini or ſpiracles of Ætna, or other neighbouring volcanos; and thoſe hiatuſes at the bottom of the ſea, whereby the abyſs below opens into it, and communicates with it. That as the water reſident in the abyſs is, in all parts of it, ſtored with a conſiderable quantity of heat, and more eſpecially in thoſe where theſe extraordinary aggregations of this fire happen; ſo likewiſe is the water, which is thus forced out of it; inſomuch that, when thrown forth and mixed with the waters of wells, or ſprings of rivers, and the ſea, it renders them very ſenſibly hot.

He adds, that though the abyſs be liable to theſe commotions in all parts, yet the effects are no where very remarkable, except in thoſe countries which are mountainous, and conſequently ſtony and cavernous underneath; and eſpecially where the diſpoſition of the ſtrata is ſuch, that thoſe caverns open into the abyſs, and ſo freely admit and entertain the fire, which aſſembling therein, is the cauſe of the ſhock; it naturally ſteering its courſe that way, where it finds the readieſt reception, which is towards thoſe caverns. Beſides, that thoſe parts

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of the earth which abound with ſtrata of ſtone, or marble, making the ſtrongeſt oppoſition to this effort, are the moſt furiouſly ſhattered, and ſuffer much more by it than thoſe which conſiſt of gravel, ſand, and the like laxer matter, which more eaſily give way, and make not ſo great reſiſtance; but, above all, thoſe countries which yield great ſtore of ſulphur and nitre, are by far the moſt injured and incommoded by *earthquakes*; thoſe minerals conſtituting in the earth a kind of natural gunpowder, which taking fire upon this aſſemblage and approach of it, occaſions that murmuring noiſe or ſubterraneous thunder which is heard rumbling in the bowels of the earth during *earthquakes*; and, by the aſſiſtance of its exploſive power, renders the ſhock much greater, ſo as ſometimes to make miſerable havock and deſtruction.

And it is for this reaſon that Italy, Sicily, Anatolia, and ſome parts of Greece, have been ſo long and ſo often alarmed and haraſſed by *earthquakes*; theſe countries being all mountainous and cavernous, abounding with ſtone and marble, and affording ſulphur and nitre in great plenty.

It is obſerved, that Ætna, Veſuvius, Hecla, and the other volcanos, are only ſo many ſpiracles ſerving for the diſcharge of this ſubterraneous fire, when it is thus preternaturally aſſembled: that where there happens to be ſuch a ſtructure and conformation of the interior parts of the earth, as that the fire may paſs freely and without impediment from the caverns wherein it aſſembles unto thoſe ſpiracles; it then readily and eaſily gets out, from time to time, without ſhaking or diſturbing the earth; but where ſuch communication is wanting, or the paſſage is not ſufficiently large and open, ſo that it cannot come at the ſpiracles, it heaves up and ſhakes the earth with greater or leſs impetuoſity, according to the quantity of fire thus aſſembled, till it has made its way to the mouth of the volcano: that therefore there are ſcarce any countries much annoyed with *earthquakes*, which have not one of theſe fiery vents, conſtantly in flames when any *earthquake* happens, as diſgorging that fire, which, whilſt underneath, was the cauſe of the diſaſter: laſtly, that were it not for theſe diverticula, it would rage in the bowels of the earth much more furiouſly, and make greater havock than it doth.

Having thus ſhewn how fire and water contribute to the phænomena of *earthquakes*; let us next conſider the effects of air.

M. Amontons, in the Memoires de l'Acad. des Sciences, an. 1703, has an expreſs diſcourſe to prove, that on the foundation of the new experiments of the weight and ſpring of the air, a moderate degree of heat may bring the air into a condition capable of cauſing *earthquakes*. See AIR, *Elaſticity of*.

The ingenious Mr. Michell has publiſhed an elaborate paper of conjectures concerning the cauſe, and of obſervations on phenomena of the *earthquakes*. He ſuppoſes that they are occaſioned by ſubterraneous fires; which, if a large quantity of water ſhould be let out upon them ſuddenly, may produce a vapour, whoſe quantity and elaſtic force may be fully ſufficient for this purpoſe. The facts by which he ſupports this hypotheſis are the following: 1. The ſame places are ſubject to returns of *earthquakes*, not only at ſmall intervals for ſome time after any conſiderable one has happened, but alſo at greater intervals of ſome ages; and theſe, he apprehends, are very conſiſtent with the cauſe aſſigned. Since ſubterraneous fires, as well as volcanos, which they nearly reſemble, may be reaſonably ſuppoſed, and are found in fact to ſubſiſt for many ages, and may produce their effect, like the raging of volcanos, at unequal intervals, and with unequal degrees of force. 2. Thoſe places that are in the neighbourhood of burning mountains are always ſubject to frequent *earthquakes*; and the eruptions of thoſe mountains, when violent, are generally attended with them; and this is a conſideration, he ſays, which affords a ſtrong argument of their proceeding from a cauſe of the ſame kind; more eſpecially, as the earth is compoſed of ſeveral regular ſtrata, which are very extenſive, and lie more inclining from the mountainous countries than the countries themſelves. Hence he infers, that thoſe ſtrata of combuſtible materials which break out in volcanos on the tops of hills, are to be found at a conſiderable depth under-ground in the level and low countries near them; and if the ſame ſtrata ſhould be on fire in any places under ſuch countries as well as the tops of hills, all vapours of whatſoever kind, raiſed from theſe fires, muſt be pent up, unleſs ſo far as they can open for themſelves a paſſage between the ſtrata; whereas the vapours raiſed from volcanos find a vent, and are diſcharged in blaſts from the mouths of them; and yet when they find a vent, they are capable of ſhaking the country to the diſtance of ten or twenty miles round; what then may we not expect from them when they are confined? Thus Mr. Michell accounts for the fact, that the moſt extenſive *earthquakes* take their riſe from the level and low countries; and more eſpecially from the ſeas, which are waters covering ſuch countries. 3. The motion of the earth in *earthquakes* is partly tremulous and partly propagated by waves, which ſucceed one another ſometimes at larger and ſometimes at ſmaller diſtances; and this latter motion is generally propagated much farther than the former. Both theſe phænomena, it is obſerved, may be accounted for by the ſuppoſition, that *earthquakes* are cauſed by vapours raiſed from waters ſuddenly let out on ſubterraneous fires. As a ſmall quantity of vapour almoſt inſtantly generated at ſome conſiderable depth below the ſurface of the earth; ſo a very large quantity (whether generated inſtantly, or in any ſmall portion of time) will produce a wave-like motion. A large quantity of vapour may be conceived to raiſe the earth in a wave as it paſſes between the ſtrata, which it may eaſily ſeparate in an horizontal direction, there being, as it is ſuppoſed, little or no coheſion between one ſtratum and another. Thus, if a large quantity of vapour ſhould continue to be generated for ſome time, ſeveral waves might be produced by it. The vibratory motion, occaſioned by the firſt impulſe of the vapour, being propagated through the ſolid parts of the earth, will much ſooner become too weak to be perceived than the wave-like motion, occaſioned by the vapour inſinuating itſelf between the ſtrata, and capable of being propagated to very great diſtances. 4. *Earthquakes* generally come to one and the ſame place from the ſame point of the compaſs; and their velocity is much the ſame; whereas the velocity of *earthquakes* of different countries is very different; i. e. *earthquakes* derived from the ſame ſubterraneous fire muſt come to the ſame place in the ſame direction; and thoſe only which are derived from different fires will come from different points of the compaſs. 5. The great Liſbon *earthquake* has been ſucceeded by ſeveral local ones ſince, the extent of which has been much leſs: the vapour produced by one ſubterraneous fire diſtributing the materials over ſome other fire. For a more particular account of Mr. Michell's theory, and of the various facts which he alleges in illuſtration and ſupport of it, we muſt refer to Phil. Tranſ. vol. li. art. 55. p. 566—634.

EARTHQUAKES, *the theory of*, hath received conſiderable alteration and improvement from modern electrical diſcoveries. The firſt perſon who advanced the notion, that *earthquakes* were probably cauſed by electricity, was Dr. Stukeley, on occaſion of thoſe that happened in England in the years 1749 and 1750. He urges a variety of objections againſt the common hypotheſis, which aſcribes *earthquakes* to ſubterraneous winds, fires, vapours, or any thing that occaſions an exploſion, and thus heaves up the ground. He thinks there is no evidence of the cavernous ſtructure of the earth, which this hypotheſis requires; but that on the contrary, there is reaſon to believe that it is in a great meaſure ſolid. *Earthquakes* have alſo frequently happened without any eruption of fire, vapour, ſmoke, or ſmell, which he thinks is utterly inconſiſtent with the ſuppoſition of their being occaſioned by any ſubterraneous vapours; eſpecially in caſes where the ſhock is of conſiderable extent; beſides, this is a cauſe altogether inadequate to ſuch an effect; for a ſubterraneous power capable of moving a ſurface of earth only thirty miles in diameter, muſt be lodged at leaſt fifteen or twenty miles below the ſurface, and move an inverted cone of ſolid earth, whoſe baſe is thirty miles in diameter, and axis fifteen or twenty miles, which he judges to be abſolutely impoſſible; how much more inconceivable, then, that any ſuch power could produce the *earthquake* of 1755, which was felt in various parts of Europe and Africa, and the Atlantic Ocean; or that of Aſia Minor, A. D. 17, by which thirteen great cities were deſtroyed in one night, and which ſhook a maſs of earth three hundred miles in diameter, in order to which the moving power, if it had been internal fire or vapour, muſt have been lodged two hundred miles below the ſurface! Farther, in *earthquakes* the effect is inſtantaneous; whereas the operation of elaſtic vapour and the diſcharge of it muſt be gradual, and require a long ſpace of time; and if they were owing to exploſions, they muſt alter the ſurface of the country where they happened, deſtroy the fountains and ſprings, and change the courſe of its rivers, which is contradicted by hiſtory and obſervation. To all which it is added, that the ſtrokes which ſhips receive during an *earthquake* muſt be occaſioned by ſomething that could communicate motion with a much greater velocity than any heaving of the earth under the ſea by the elaſticity of generated vapours, which would only produce a gradual ſwell, and not an impulſe of the water, reſembling a thump againſt the bottom of a ſhip or ſtriking againſt a rock. Dr. Stukeley,

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Stukeley, finding the common hypotheſis inſufficient, was led to conclude, that *earthquakes* were proper electrical ſhocks; and a particular ſurvey of the phenomena that either precede or attend them, confirmed this opinion: he obſerved, that the weather was uſually dry and warm for ſome time, before an *earthquake* happened, and that the ſurface of the ground is thus previouſly diſpoſed for that kind of electrical vibration in which it conſiſts; whilſt at the ſame time, in ſome places where *earthquakes* have happened, the internal parts, at a ſmall depth below the ſurface, are moiſt and boggy; and thence he infers, that they reach very little below the ſurface. He adds, that the ſouthern regions are more ſubject to *earthquakes* than the northern, on account of the greater warmth and dryneſs of the earth and air, which are qualities ſo neceſſary to electricity. It was alſo obſerved, that before the *earthquakes* at London in 1749, all vegetables were remarkably forward, and electricity is well known to quicken vegetation. They were likewiſe preceded by frequent and ſingular appearances of the *aurora borealis*, and *auſtralis*, and by a variety of other meteors which indicate an electrical ſtate of the atmoſphere. Dr. Stukeley apprehends, that, in this ſtate of the earth and air, nothing more is neceſſary to produce an *earthquake* than the approach of a non-electric cloud to any part of the earth, when in an highly electrified ſtate, and the diſcharge of its contents upon it; and that as the diſcharge from an excited tube occaſions a commotion in the human body, ſo the ſhock, produced by the diſcharge between the cloud and many miles in compaſs of ſolid earth, muſt be an *earthquake*, and the ſnap from the contact be the noiſe attending it. He ſuppoſes, that a large black cloud which ſuddenly covered the hemiſphere a little before the *earthquake* of 1749, might have occaſioned the ſhock, by the diſcharge of a ſhower. The noiſe, it has been obſerved, uſually precedes the ſhock; whereas, if the concuſſion depended upon a ſubterraneous eruption, it muſt have been quite the contrary. The flames and ſulphureous ſmells which ſometimes attend *earthquakes*, are more eaſily accounted for, as Dr. Stukeley thinks, from the ſuppoſition of their being electrical phenomena than on any other hypotheſis. The ſudden, extenſive agitation, both of land and water, occaſioned by *earthquakes*, can only be effected by electricity. The little damage generally done by *earthquakes*, and the nature of the impulſe which they give to ſhips, already taken notice of, ſuggeſt an argument, that they are owing not to any convulſion in the bowels of the earth, but to an uniform vibration along its ſurface, occaſioned by an electrical ſnap; and that they are electrical phenomena, Dr. Stukeley farther infers, from their chiefly affecting the ſea-coaſt, places near rivers; we may add alſo, eminences; and finally from the effects which they produce on weak conſtitutions, ſuch as pains in the back, head-achs, colics, &c. ſimilar to thoſe occaſioned ſometimes by electrification. After all, he does not preſume to ſay, how the earth and atmoſphere are put into that electrical and vibratory ſtate, which prepares them to give or receive that ſnap and ſhock, which is called an *earthquake*; but this he thinks as difficult to account for as magnetiſm, gravitation, muſcular motion, and many other ſecrets in nature. Several circumſtances have been remarked by other writers, which confirm the theory that ſuppoſes *earthquakes* to be electrical phenomena. Signior Beccaria, whoſe name often occurs in the hiſtory of electricity, agrees with Dr. Stukeley, in ſuppoſing, that *earthquakes* are electrical phenomena; but he imagines, that the electric matter which occaſions them is lodged deep in the bowels of the earth; and if in this ſituation its equilibrium ſhould by any means be deſtroyed, ſo that the beſt method of reſtoring it ſhall be by the fluid's burſting its way into the air, and traverſing ſeveral miles of the atmoſphere to come to the place where it is wanted; it may eaſily be conceived, that violent concuſſions may be given to the earth, by the ſudden paſſages of this powerful agent; and that the electric fluid is ſometimes collected in the bowels of the earth, he thinks probable from the appearance of *ignes fatui* in mines, which ſometimes happens, and is very probably an electrical phenomenon. This ingenious philoſopher obſerves, that if two pieces of glaſs, incloſing a thin piece of metal, be held in the hand, while a large ſhock is ſent through them, a ſtrong concuſſion or vibration will be felt, which ſometimes breaks them to pieces. Mr. Henly, another excellent electrician, has diſcovered a method of increaſing the effect of the exploſion upon glaſs, ſo as to afford a very natural idea of an *earthquake*. Between the ends of two wires, laid on a piece of glaſs, with their extremities pointing to each other, and about an inch diſtant, through which the diſcharge is to be made, he places a thick piece of ivory upon the glaſs, and on the ivory a weight at pleaſure, from one-fourth of an ounce to ſix pounds; the glaſs is broken by an exploſion into innumerable fragments, and ſome of it is reduced into an impalpable powder: the weight is ſhook by the exploſion, and ſometimes thrown off from the ivory. In this experiment, if the glaſs is very thick, ſo that the force of the exploſion is not ſufficient to break it, it will be found marked with the moſt lively priſmatic COLOURS. The appearance of an *earthquake* may be alſo repreſented by cauſing the exploſion of a battery to paſs over the ſurface of any ſubſtances on which ſmall ſticks or cards are placed, which will never fail to be ſhook, and often be thrown down by the exploſion; or, by making a diſcharge over the ſurface of water, in which caſe the report will be much louder than when the diſcharge is made through the air; and a hand plunged deep into the water will feel the concuſſion; and we may add, that the ſpark which paſſes over the ſurface of the water in this experiment, bears a great reſemblance to thoſe balls of fire that have ſometimes been ſeen over the ſurface of the ſea or land in the time of an *earthquake*. Dr. Prieſtley contrived various methods of exhibiting the phenomena of *earthquakes*. He made the electric flaſh to paſs over wet boards ſwimming in water, over either of theſe ſeparately, or over both at once, on which pillars, &c. were erected; and thus, whilſt the board repreſented the earth, and the water the ſea, the phenomena of both during an *earthquake* were exhibited at the ſame time. Dr. Prieſtley, the ingenious hiſtorian of electricity, after having largely recited the obſervations of Dr. Stukeley and Signior Beccaria on the ſubject of *earthquakes*, of which we have given a ſummary in the foregoing part of this article, does not abſolutely decide which of theſe two philoſophers has advanced the more probable opinion concerning the ſeat of the electric matter which occaſions *earthquakes*; but he thinks a more probable general hypotheſis than either of them may be formed out of them both. Suppoſe, ſays he, the electric matter to be ſome way or other accumulated on one part of the ſurface of the earth, and, on account of the dryneſs of the ſeaſon, not eaſily to diffuſe itſelf; it may, as Signior Beccaria ſuppoſes, force itſelf a way into the higher regions of the air, forming clouds in its paſſage out of the vapours which float in the atmoſphere, and occaſion a ſudden ſhower, which may farther promote the paſſage of the fluid. The whole ſurface thus unloaded, will receive a concuſſion, like any other conducting ſubſtance, on parting with, or receiving, a quantity of the electric fluid. The ruſhing noiſe will likewiſe ſweep over the whole extent of the country. And, upon this ſuppoſition alſo, the fluid, in its diſcharge from the country, will naturally follow the courſe of the rivers, and alſo take the advantage of any eminences, to facilitate its aſcent into the higher regions of the air. See farther on this ſubject, Phil. Tranſ. vol. xli. p. 641, &c. Beccaria Lettre dell'Elettriciſmo, p. 216. 362, &c. or Prieſtley's Hiſt. of Electricity, Period. x. ſect. 12.

EARTHQUAKES, *Artificial.* Chemiſtry furniſhes us with a method of making *artificial earthquakes*, which ſhall have all the great effects of natural ones; which, as it may illuſtrate the proceſs of nature in the production of theſe terrible phenomena under-ground, we ſhall here add:

To twenty pounds of iron-filings, add as many of ſulphur; mix, work, and temper the whole together with a little water, ſo as to form a maſs of the conſiſtence of a firm paſte. This being buried three or four feet under-ground, in ſix or ſeven hours time will have a prodigious effect; the earth will begin to tremble, crack, and ſmoke, and fire and flame will burſt through.

Such is the effect even of two cold bodies in cold ground; and there only wants a ſufficient quantity of this mixture to produce a true Ætna. If it were ſuppoſed to burſt out under the ſea, it would produce a water-ſpout; and if it were in the clouds, the effect would be thunder and lightning. However, *water*-SPOUTS and LIGHTNING are without doubt electrical phenomena.

EARTHWORM, *lumbricus*, in *Zoology*, a well known inſect, belonging to the genus of *inteſtines*, containing the parts of generation of both ſexes in each individual; long, deſtitute of feet, and of a reddiſh colour; of an oblong form, conſiderably thick, rounded in ſhape, and covered with a ſoft and ſlender ſkin, marked with annular ridges and furrows. When full grown, it is often ten inches or more in length, and more than a third of an inch in diameter. Its colour is a duſky red.

It is common every where, at little depths, under the ſurface of the earth; it is not unfrequently alſo met with in the human inteſtines, as well as in thoſe of other animals, in which ſtate it has been ſuppoſed a different creature, and called by a new name.

Beſides the common *earthworm*, there is found another ſpecies of *lumbricus* in the mud about the ſea-ſhores, very large, growing very often to a foot or more in length; it entirely reſembles the other, only that it is of a paler red, and has its ſkin covered with little prominences,

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minences, which make it rough and ſcabrous to the touch.

Earthworms are by ſome eſteemed of great virtue in medicine, and are ſaid to be diuretic, diaphoretic, and anodyne; as alſo diſcutient, emollient, and openers of obſtructions; and are preſcribed in apoplexies, ſpaſms, and all nervous affections, and in the jaundice, dropſies, and colics.

EASE, in the *Sea-language*, ſignifies as much as ſlacken or let go ſlacker.

Thus they ſay, *eaſe* the bowling, *eaſe* the ſheet; that is, let them go ſlacker.

EASE *the ſhip*, in *Sea-language*, is the command given by the pilot to the ſteerſman, to put the helm cloſe to the lee-ſide; or *hard-a-lee*, when the ſhip is expected to pitch or plunge her fore-part deep in the water while cloſe-hauſed.

EASE, *Chapel of.* See CHAPEL.

EASEL-PIECES, among *Painters*, ſuch ſmaller pieces, either portraits or landſcapes which are painted on the *eaſel*, i. e. the frame whereon the canvaſs is laid.

They are thus called, to diſtinguiſh them from larger pictures drawn on walls, cielings, &c.

EASEMENT, in *Law*, a ſervice or convenience which one neighbour has of another by charter or preſcription, without profit; as a way through his ground, a ſink, or the like.

In the civil law, *eaſements* are called *ſervitus prædii.*

EAST, in *Coſmography*, one of the cardinal points of the horizon; being the point wherein the prime vertical interſects that quarter of the horizon in which the ſun riſes when in the equinoctial.

The word *eaſt* is Saxon. In Italy, and throughout the Mediterranean, the *eaſt*-wind is called the *levante.* In Greek, ανατολη and απηλιωτης, becauſe it comes from the ſide of the ſun, απ' ηλιε. In Latin, *eurus.*

To find the *eaſt* and weſt line points, &c. ſee MERIDIAN-*Line.*

EAST-*Wind*, is that which blows from the *eaſt* point. See WIND.

EAST-*Dials.* See DIAL.

EAST-*India Companies.* See COMPANY.

EAST-*India Silk.* See SILK.

EAST, *Mooring for.* See MOORING.

EASTERN. See ORIENTAL.

EASTER, a feaſt of the church, held in memory of our Saviour's reſurrection.

The Greeks and Latins call it Πασχα, *paſcha*, originally a Hebrew word, ſignifying *paſſage*, applied to the feaſt of the Paſſover which is held among the Jews much about the ſame time. In Engliſh it is called *Eaſter*, from *Eaſtre*, a goddeſs worſhipped with peculiar ceremony in the month of April.

The obſervation of this feſtival is as ancient as the time of the apoſtles; for it is certain, that the Chriſtians of the ſecond century celebrated anniverſary feſtivals in commemoration of the death and reſurrection of Chriſt, and of the effuſion of the Holy Ghoſt upon the apoſtles. The day which was obſerved as the anniverſary of Chriſt's death was called the *paſchal* day, becauſe it was conſidered as the ſame with that on which the Jews celebrated their Paſſover. But towards the cloſe of this century, a diſpute commenced about the particular time in which this feaſt was to be kept. The Aſiatic churches kept it on the 14th day of the firſt Jewiſh month, and three days after commemorated the reſurrection of the Redeemer, pleading on behalf of this practice the authority of the apoſtles Philip and John, and the example of Chriſt, who held his paſchal feaſt on the ſame day that the Jews celebrated their Paſſover. The weſtern churches celebrated their paſchal feaſt on the night that preceded the anniverſary of Chriſt's reſurrection, and thus connected the commemoration of his death, and of his reſurrection; and they pleaded the authority of the apoſtles Peter and Paul. One principal inconvenience attending the Aſiatic method was, that this great feſtival was commonly held on other days of the week than the *firſt.* Victor, biſhop of Rome, towards the cloſe of the ſecond century, attempted to force the Aſiatic churches, by the pretended authority of his laws and decrees, to follow the rule which was obſerved by the weſtern churches: they refuſed to ſubmit, and were excommunicated by Victor. However, in conſequence of the mild interpoſition of Irenæus, biſhop of Lyons, the diſputants retained their own cuſtoms till the fourth century, when the council of Nice aboliſhed that of the Aſiatics, and rendered the time of the celebration of *Eaſter* the ſame through all the Chriſtian churches.

Eaſter is one of the moſt conſiderable feſtivals in the Chriſtian calendar; being that which regulates and determines the times of all the other moveable feaſts.

The rule for the celebration of *Eaſter*, fixed by the council of Nice, in the year 325, is, that it be held on the Sunday which falls upon, or next after, the full moon next after the 21ſt of March; i. e. the Sunday which falls upon, or next after the firſt full moon after the vernal equinox.

The reaſon of which decree was, that the Chriſtians might avoid celebrating their *Eaſter* at the ſame time with the Jewiſh Paſſover, which, according to the inſtitution of Moſes, was held the very day of the full moon.

To find *Eaſter* agreeable to this rule, the method that obtained throughout the church, from the time of Dionyſius Exiguus to that of the reformation of the calendar under Pope Gregory; and which ſtill obtains in countries where the Gregorian correction is not admitted, is, by means of the golden numbers, duly diſtributed throughout the Julian calendar.

The vernal equinox, at the time of the Nicene council, happening on the 21ſt of March, has been, upon Dionyſius's authority, affixed to the ſame day of the Julian year ever ſince; ſo that in the Julian way of computing, no full moon is paſchal, but that immediately after the 21ſt of March: therefore, *Eaſter* can never happen earlier than the 22d of March. Now, by finding the full moons next after the 21ſt of March for the ſeveral golden numbers or years of the lunar cycle, we ſhall have a table for finding *Eaſter* for ever.

Such table being of conſiderable uſe in the Julian computation, we ſhall here ſubjoin it.

Gold. Numb.	Full Moons next after Ver. Equin.		Gold. Numb.	Full Moons next after Ver Equin.	
I	5 April,	D	XI	15 April,	G
II	25 March,	G	XII	4 April,	C
III	13 April,	E	XIII	24 March,	F
IV	2 April,	A	XIV	12 April,	D
V	22 March,	D	XV	1 April,	G
VI	10 April,	B	XVI	21 March,	C
VII	30 March,	E	XVII	9 April,	A
VIII	18 April,	C	XVIII	29 March,	D
IX	7 April,	F	XIX	17 April,	B
X	27 March,	B			

Now to find *Eaſter* for any given year, find the dominical letter, and the golden number of the given year, as directed under DOMINICAL *Letter* and *Golden* NUMBER.

Then in the table, ſeeking the dominical letter, with the day of the paſchal full moon, and the Sunday letter annexed thereto; compare this letter with the dominical letter of the given year, that it may appear how many days are to be added to the day of the paſchal full moon to give *Eaſter*-day.

E. gr. In the year 1715, the dominical letter is B, and the golden number VI; conſequently, the paſchal full moon is fixed, by the the table, to the 10th of April; whoſe Sunday letter being B, the dominical letter given, itſelf is a Sunday; and therefore *Eaſter* will fall on the eighth day following, viz. on the 17th of April.

But in this computation, the vernal equinox is ſuppoſed affixed to the 21ſt of March; and the cycle of nineteen years, or golden numbers, is ſuppoſed to point out the places of the new and full moons exactly; both which ſuppoſitions are erroneous. Whence it follows, that the Julian *Eaſter* never happens at its due time, unleſs by accident.

For an inſtance of the error, it may be obſerved, that in the year 1715, the vernal equinox falls on the 10th of March, eleven days before the rule ſuppoſes it; and the paſchal full moon on the 7th of April, three days earlier than was ſuppoſed. *Eaſter*-day, therefore, which is held on the 17th of April, ſhould be held on the 10th.

This error was grown to ſuch a pitch, in courſe of time, that pope Gregory XIII. thought it neceſſary to correct it; and accordingly, in the year 1582, by the advice of Aloyſius Lilius, he ordered ten days to be thrown out of October, ſo to bring back the vernal equinox to its old place, viz. the 21ſt of March: and hence the Georgian calendar, Gregorian year, &c.

This correction, however, did not entirely remove the error; for the equinoxes and ſolſtices ſtill anticipate 1 h. 53′ 20″ in every 400 Gregorian years; but the difference is ſo inconſiderable as not to amount to 24 hours, or to one whole day in leſs than 5082 Gregorian years. See BISSEXTILE.

To find *Eaſter* by the *Golden* NUMBER, ſee NUMBER *of Direction.*

In the new or Gregorian computation, in lieu of golden numbers, the time of *Eaſter* is found by means of epacts contrived for that purpoſe. See EPACT.

Having the dominical letter and the epact, *Eaſter*-day may

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may be found by the two following rules: 1. For finding *Eaſter* limit, or the day of the paſchal full moon from March the firſt incluſive; add 6 to the epact; and if this ſum exceeds 30, 30 muſt be taken from it; the remainder ſubtracted from 50 will give the limit, which is never to exceed 49, nor fall ſhort of 21. 2. From the limit and dominical letter, *Eaſter-day* may be found, by adding 4 to the number of the dominical letter, ſubtracting the ſum from the limit, and the remainder from the next higher number, which is exactly diviſible by 7; add the laſt remainder to the limit, and the ſum will give the number of days from the firſt of March to *Eaſter-day*, both incluſive. Thus for the year 1778, the epact is 1, and the dominical letter D: 6 + 1 = 7 : 50 — 7 = 43 paſchal limit; 43 — 8, the ſum of 4 and the dominical letter, = 35; and 42 — 35 = 7, which added to 43, the limit gives 50, or the number of days from March the 1ſt incluſive to *Eaſter-day*, or 19th of April.

The following table renders the finding of *Eaſter* in the Gregorian year from the year 1700 to the year 1900 very eaſy.

Epacts.	Paſchal full Moons.		Epacts.	Paſchal full Moons.	
X	13 April,	E	IX	4 April,	C
XI	2 April,	A	XX	24 March,	F
XXII	22 March,	D	I	12 April,	D
III	10 April,	B	XII	1 April,	G
XIV	30 March,	E	XXIII	21 March,	C
XXV	18 April,	C	IV	9 April,	A
VI	7 April,	F	XV	29 March,	D
XVII	27 March,	B	XXVI	17 April,	B
XXVIII	15 April,	G	VII	6 April,	E
			XVIII	26 March,	A

Now, to find *Eaſter* for any given Gregorian year, ſeek the dominical letter and the Gregorian expact, as ſhewn under EPACT, &c. Find the epact in the table, and note the paſchal full moon, with the weekly letter correſponding to the ſame. The reſt is performed, as already taught for the Julian *Eaſter*.

E. g. the dominical letter of 1778 is D, and the epact I, conſequently the paſchal full moon falls on the 12th of April D, which is therefore Sunday, and *Eaſter-day* is the 19th of April, as before.

Though the Gregorian calendar be doubtleſs preferable to the Julian, yet it alſo has its defects. It cannot, for inſtance, keep the equinox fixed on the 21ſt of March, but it will ſometimes fall on the 19th, and ſometimes on the 23d.

Add, that the full moon happening on the 20th of March, might ſometimes be paſchal; yet is it not allowed as ſuch in the Gregorian computation; as on the contrary, the full moon of the 22d of March may be allowed for paſchal, which it is not. Scaliger and Calviſius have alſo proved other inaccuracies in this calendar. See CALENDAR. See an excellent paper on this ſubject by the earl of Macclesfield, in the Phil. Tranſ. vol. xl. p. 417. See EPACT and *Golden* NUMBER.

EASTER *Term*. See TERM.

EASTERLING *Money*. See STERLING.

EASTERN *Amplitude*, *Church*, *Horizon*, *Ocean*. See the ſubſtantives.

EATUAS, in *Modern Hiſtory*, a name which the inhabitants of Otaheite in the South-ſea give to an imaginary inferior race of deities; two of whom, they ſay, at ſome remote period of time, inhabited the earth, and were the parents of the firſt man. The term is derived from *eothe*, which ſignifies *finiſhed*. Theſe ſubordinate deities are very numerous, and are of both ſexes; the male are worſhipped by the men, and the female by the women, in ſeparate MORAIS, and under the direction of diſtinct prieſts. There are alſo *Morais* common to both. Hawkeſw. Voyages, vol. ii. p. 239.

EAU *de Luce*, is a kind of volatile liquid ſoap, of a ſtrong, penetrating ſmell. The following inſtructions will ſerve for making it: take four ounces of rectified ſpirit of wine, and in it diſſolve ten or twelve grains of white ſoap; filtrate this ſolution; then diſſolve in it a dram of rectified oil of amber, and filtrate again: mix as much of this ſolution with the ſtrongeſt volatile ſpirit of ſal ammoniac, in a cryſtal glaſs bottle, as when ſufficiently ſhook, ſhall produce a beautiful milky liquor. If upon its ſurface be formed a cream, ſome more of the oily ſpirit of wine ought to be added.

EAVES, the margin or edge of the roof of a houſe, being the loweſt tiles, ſlate, or the like, which hang over the walls to throw off the waters to a diſtance from the wall.

EAVES-LATH, a thick feather-edged board, generally nailed round the *eaves* of a houſe for the lowermoſt tiles, ſlate, or ſhingles, to reſt upon.

EAVES-*Droppers*, in *Law*, are perſons who liſten under walls or windows, or the *eaves* of a houſe, to hearken after diſcourſe, and thereupon to frame ſlanderous and miſchievous tales. Theſe are a common nuiſance, and preſentable at the court-leet, or indictable at the quarter-ſeſſions, and puniſhable by fine, and finding ſureties for good behaviour.

EBBING *and* FLOWING *of the Sea*. See TIDES.

EBDOMARY, *ebdomadarius*, an officer, anciently appointed weekly in cathedral churches, to ſuperviſe the regular performance of divine ſervice, and preſcribe the particular duties of each perſon attending in the choir, as to reading, ſinging, and praying. To this purpoſe the *ebdomary*, at the beginning of his week, drew up in form, a bill or writing of the reſpective perſons, and their ſeveral offices, called *tabula*, and the perſons there entered were ſtyled *intabulati*.

EBDOME, Ἑβδόμη, in *Antiquity*, a feſtival kept on the ſeventh of every lunar month, in honour of Apollo, to whom all ſeventh days were ſacred, becauſe one of them was his birth-day; whence he was ſometimes called *Ebdomagenes*. For the ceremonies of this ſolemnity, ſee Pott. Archæol. Græc. lib. ii. cap. 20. tom. i. p. 385.

EBEREMORTH, or EBEREMORS, in our *Old Laws*, the ſame as *eberemurdrum*, or *aberemurder*. See ABEREMURDER.

EBEREMURDRUM, or ABEREMURDRUM, in our *Old Writers*. See ABEREMURDER.

EBIONITES, ancient heretics, who roſe in the church in the very firſt age thereof, and formed themſelves into a ſect in the ſecond century, denying the divinity of Jeſus Chriſt.

Origen takes them to have been ſo called from the Hebrew word *ebion*, which in that language ſignifies *poor*; becauſe, ſays he, they were poor in ſenſe, and wanted underſtanding. Euſebius, with a view to the ſame etymology, is of opinion, they were thus called, as having poor thoughts of Jeſus Chriſt, taking him for no more than a mere man.

It is more probable the Jews gave this appellation to the Chriſtians in general, out of contempt; becauſe in the firſt times there were few but poor people that embraced the Chriſtian religion. This opinion, Origen himſelf ſeems to give into, in his book againſt Celſus, where he ſays, that they called *Ebionites*, ſuch among the Jews as believed that Jeſus was truly the expected Meſſiah.

It might even be urged, with ſome probability, that the primitive Chriſtians aſſumed the name themſelves, in conformity to their profeſſion. It is certain, Epiphanius obſerves, they valued themſelves on being poor, in imitation of the apoſtles. The ſame Epiphanius, however, is of opinion, that there had been a man of the name *Ebion*, the chief and founder of the ſect of *Ebionites*, contemporary with the Nazarenes and Cerinthians. He gives a long and exact account of the origin of the *Ebionites*, contemporary with the Nazarenes and Cerinthians. He gives a long and exact account of the origin of the *Ebionites*, making them to have riſen after the deſtruction of Jeruſalem, when the firſt Chriſtians, called *Nozarenes*, went out of the ſame to live at Pella.

The *Ebionites* are little elſe than a branch of Nazarites; only that they altered and corrupted, in many things, the purity of the faith held among thoſe firſt adherents to Chriſtianity. For this reaſon, Origen diſtinguiſhes two kinds of *Ebionites*, in his anſwer to Celſus: the one believed that Jeſus Chriſt was born of a virgin; and the others, that he was born after the manner of other men.

The firſt were orthodox in every thing, except, that to the Chriſtian doctrine they joined the ceremonies of the Jewiſh law, with the Jews, Samaritans, and Nazarites; together with the traditions of the Phariſees. They differed from the Nazarites, however, in ſeveral things, chiefly as to what regards the authority of the ſacred writings; for the Nazarites received all for ſcripture contained in the Jewiſh canon; whereas the *Ebionites* rejected all the prophets, and held the very names of David, Solomon, Iſaiah, Jeremiah, and Ezekiel, in abhorrence. They alſo rejected all St Paul's Epiſtles, whom they treated with the utmoſt diſreſpect.

They received nothing of the Old Teſtament but the Pentateuch; which ſhould intimate them to have deſcended rather from the Samaritans than from the Jews. They agreed with the Nazarites in uſing the Hebrew Goſpel of St. Matthew, otherwiſe called the Goſpel of the Twelve Apoſtles; but they had corrupted their copy in abundance of places; and particularly, had left out the genealogy of our Saviour, which was preſerved entire in that of the Nazarites, and even in thoſe uſed by the Cerinthians.

Some, however, have made this goſpel canonical, and

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of greater value than our preſent Greek Goſpel of St. Matthew. See NAZARENES.

Theſe laſt, whoſe ſentiments, as to the birth of our Saviour, were the ſame with thoſe of the *Ebionites*, built their error on this very genealogy.

Beſide the Hebrew Goſpel of St. Matthew, the *Ebionites* had adopted ſeveral other books, under the names of St. James, John, and the other apoſtles: they alſo made uſe of the Travels of St. Peter, which are ſuppoſed to have been written by St. Clement, but had altered them ſo, that there was ſcarce any thing of truth left in them. They even made that ſaint tell a number of falſhoods, the better to authorize their own practices. See St. Epiphanius, who is very diffuſive on the ancient hereſy of the *Ebionites*, Hær. 30.

But his account deſerves little credit, as, by his own confeſſion, he has confounded the other ſects with the *Ebionites*, and has charged them with errors, to which the firſt adherents of this ſect were utter ſtrangers.

EBOLICS, *ebolica*. See ECBOLICS.

EBONY, *of Crete*, *Ebenus*, in *Botany*, a genus of the *diadelphia decandria* claſs. Its characters are theſe: the empalement of the flower is ſlenderly indented, and hairy; and is of the butterfly kind, having ten ſtamina. In the bottom is ſituated an oblong germen, which afterward becomes an oblong ſwelling pod, opening with two valves, and incloſing three or four kidney-ſhaped ſeeds.

There is only one ſpecies, which grows naturally in Crete, and ſome other iſlands of the Archipelago. It riſes with a ſhrubby ſtalk, three or four feet high, which puts out ſeveral ſide-branches, garniſhed with hoary leaves at each joint, compoſed of five narrow ſpear-ſhaped lobes, which join at their tails to the foot ſtalks, and ſpread out like the fingers of a hand: the branches are terminated by thick ſpikes of large purple flowers, which are of the butterfly or pea-bloom kind.

Theſe plants will not live in the open air through the winter in England; neither ſhould they be too tenderly treated.

EBONY *of the Alps*, *Cytiſus*. See *Baſe Tree*-TREFOIL.

EBONY, *Falſe*, *Poinciana*. See BARBADOES *Flower-Fence*.

EBONY, *Mountain*. See BAUHINIA.

EBONY wood is brought from the Indies, exceedingly hard and heavy, ſuſceptible of a very fine poliſh, and on that account uſed in moſaic and inlaid works, toys, &c.

There are divers kinds of *ebony*: the moſt uſual among us are black, red, and green, all of them the product of the iſland of Madagaſcar, where the natives call them, indifferently, *hazon mainthi*, q. d. *black wood*. The iſland of St. Maurice, belonging to the Dutch, likewiſe furniſhes part of the *ebonies* uſed in Europe.

Authors and travellers give very different accounts of the tree that yields the black *ebony*. By ſome of their deſcriptions, it ſhould be a ſort of palm-tree; by others, a cytiſus, &c. The moſt authentic of them is that of M. Flacourt, who reſided many years in Madagaſcar, as governor thereof; he aſſures us, that it grows very high and big, its bark being black, and its leaves reſembling thoſe of our myrtle, of a deep, duſky, green colour.

Tavernier aſſures us, that the iſlanders always take care to bury their trees, when cut down, to make them the blacker, and to prevent their ſplitting, when wrought.

F. Plumier mentions another black *ebony*-tree, diſcovered by him at St. Domingo, which he calls *ſpartium portulacæ foliis aculeatum ebeni materiæ*. Candia alſo bears a little ſhrub, known to the botaniſts under the name of *ebenus Cretica*, above deſcribed.

Pliny, and Dioſcorides ſay, the beſt *ebony* comes from Ethiopia, and the worſt from India; but Theophraſtus prefers that of India. Black *ebony* is much preferred to that of other colours. The beſt is a jet black, free of veins and rind, very maſſive, aſtringent, and of an acrid pungent taſte.

Its rind, infuſed in water, is ſaid to purge pituita, and cure venereal diſorders; whence Matthiolus took guaiacum for a ſort of *ebony*. It yields an agreeable perfume, when laid on burning coals: when green, it readily takes fire, from the abundance of its fat. If rubbed againſt a ſtone, it becomes brown. The Indians make ſtatues of their gods, and ſceptres for their princes, of this wood. It was firſt brought to Rome by Pompey, after he ſubdued Mithridates. It is now much leſs uſed among us, than anciently; ſince the diſcovery of ſo many ways of giving other hard woods a black colour.

As to the green *ebony*, beſides Madagaſcar and St. Maurice, it likewiſe grows in the Antilles, and eſpecially in the iſle of Tobago. The tree that yields it is very buſhy; its leaves are ſmooth, and of a fine green colour. Beneath its bark is a white blea, about two inches thick; all beneath which, to the very heart, is a deep green, approaching towards a black, though ſometimes ſtreaked with yellow veins. Its uſe is not confined to moſaic work: it is likewiſe good in dying, as yielding a fine green tincture.

As to red *ebony*, called alſo *grenadilla*, we know little of it more than the name.

The cabinet-makers, inlayers, &c. make pear-tree, and other woods, paſs for *ebony*, by giving them the black colour thereof. This ſome do by a few waſhes of a hot decoction of galls; and when dry, adding writing ink thereon, and poliſhing it with a ſtiff bruſh, and a little hot wax; and others heat, or burn, their wood black. See DYING.

EBRBUHARITES, a ſect, or order of religious, among the Mahomeans; thus called from their founder *Ebrbuhard*, a diſciple of Nacſchibendi.

The *Ebrbuharites*, notwithſtanding the extraordinary ſanctity they make profeſſion of, with an abſolute dereliction of all worldly things, are regarded, by the Muſſemans, as no better than heretics, becauſe they do not eſteem themſelves obliged to go in pilgrimage to Mecca. To excuſe themſelves from this labour, they urge, that the pureneſs of their ſouls, their ſublime contemplations, ecſtaſies, &c. ſhew them Mecca and Mahomet's tomb, without ſtirring out of their cells.

EBRICCATUM, a term uſed by Paracelſus, to expreſs the partial loſs, or deprivation of reaſon, as it happens during drunkenneſs; but with the addition of the epithet *cæleſte*, it ſignifies, with the ſame author, a much more exalted ſtate, a ſort of divine enthuſiaſm, or inſpiration, ſuch as the ſibyls of old boaſted of; and, among the moderns, the French prophets, and ſome other religious ſects have pretended to. Paracelſus himſelf pretended, at times, to be under ſome ſuch influence; but his mad fits ſeemed to have very little of inſpiration in them.

EBRIETAS, drunkenneſs, among the aphoriſms of Hippocrites, there is one, 5 aph. which reſpects *ebriety*, and is thus expreſſed: "If a drunken perſon loſe his voice of a "ſudden, he dies in convulſions, unleſs a fever ſeizes "him, or his voice returns at the going off of the drunken "fit."

EBRILLADE, in the the *Manege*, a check of the bridle, which the horſeman gives to the horſe by a jerk of one rein, when he refuſes to turn. An *ebrillade* differs from a *ſaccade*, the latter being made with both reins at once, and the former only with one. Moſt people confound theſe two words under the general name of a check or jerk of the bridle, called in French *coup de bride*. It is a chaſtiſement, and no aid, and is diſuſed in academies.

EBRIZIUS *color*, a term uſed by ſome of the old writers, to expreſs a very fine yellow. The word ſeems originally to have been obryzium, and was certainly derived from the *aurum obryzum*, or fine gold, of which this *ebrizius* expreſſed the colour.

EBSEMECH, in *Chemiſtry*, a word uſed by Langius, and ſome other authors, for quickſilver.

EBULLITION, in *Phyſics*, the act of emitting bubbles, by a vehement agitation of the parts of a fluid, produced by fire, or otherwiſe.

Philoſophers are diſagreed about the cauſe and manner of *ebullition*. See BOILING.

EBULLITION *of the blood*, *ebullitio ſanguinis*, in *Medicine*, a term uſed by ſome of the old writers, to expreſs what they ſuppoſed to be the occaſion of the motion of the heart, which they attributed to a ſort of *ebullition* of the blood contained there. See BLOOD.

EBULLITION, in *Chemiſtry*, &c. is uſed for a violent inteſtine motion, or colluctation, of parts, occaſioned by the mixture of ſalts of different natures.

Dr. Harris will have it properly and immediately, to ſignify that particular ſtruggle or effervescence, ariſing upon the mingling together of an acid and alcaliſate liquor.

Mr. Boyle has an experiment to ſhew, that a conſiderable *ebullition* may be produced by ſuch a mixture, without the bodies acquiring any heat; nay, that a degree of cold may be produced with it, greater than was in either of the bodies ſingly, though accompanied with a great ſtruggle, tumult, noiſe, and froth. For, having ſhook one part of oil of vitriol into twelve parts of common water, the mixture was at firſt ſenſibly warm; then the ball of a thermometer was placed in it, till the included ſpirit had gained the temperament of the mixture; but then a convenient quantity of volatile ſalt of ſal armoniac being gradually put in to ſatiate the acid ſpirits of the mixture, the ſpirit in the thermometer deſcended above an inch.

EBULUS, the *dwarf-elder*, in *Medicine*. This is a troubleſome weed in many of our fields, and called, danewort, and walwort. The leaves may be diſtinguiſhed from thoſe of the elder-tree, by their having nine, eleven, or thirteen lobes to each leaf, which are long, narrow, and very ſlightly indented on their edges; whereas the leaves of the common elder have ſeldom more than five, which are broader and ſhorter. The roots and leaves of dwarf-

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elder are ſaid to be briſk cathartics. The juice of this plant has been recommended in the dropſy, gout, and ſcorbutic diſorders. The flowers are eſteemed ſudorific; and the leaves, boiled till perfectly ſoft, make a good cataplaſm for the *ſciatica*. See ELDER.

EBUR, *foſſile*, in *Natural Hiſtory*. See *Foſſile* IVORY.

EBUR *foſſile variegatum*, in the *Natural Hiſtory* of the ancients, a name given to the ſubſtance which we now call the rough or native turquoiſe.

Foſſile ivory, and the bones of other animals, are frequently found buried at great depths in the earth, and are found to have preſerved their ſubſtance, texture, and colour in different degrees, according to the nature of the matter they happen to have lain among. Sometimes they are firm and ſolid, and ſcarce altered in colour; and ſometimes more or leſs hardened, and tinged to different colours by the different matters in which they have been depoſited.

Of this kind was the ſpotted foſſile ivory of the ancients, which was in all reſpects the ſame with our rough turquoiſes of many places, which are no other than the teeth and bones of animals accidentally lodged in the way of particles of copper. See TURCOIS.

ECACOATE, in *Zoology*, a name by which the natives of ſome parts of America call the *Rattle*-SNAKE.

ECALESIA, Εκαλησια, in *Antiquity*, a feſtival kept in honour of Jupiter, ſurnamed *Hecalus*, or *Hecaleſius*, from *Hecale*, one of the borough-towns in Attica.

ECARTELE, in *Heraldry*. See QUARTERLY.

ECASTOR, in *Antiquity*, an oath wherein Caſtor was invoked. It was a cuſtom for the men never to ſwear by Caſtor, nor the women by Pollux.

ECATESIA, Εκατησια, in *Antiquity*, an aniverſary ſolemnity, obſerved by the Stratonicenſians, in honour of Hecate.

The Athenians likewiſe had a public entertainment, or ſupper, every new moon, in honour of the ſame goddeſs. The ſupper was provided at the charge of the richer ſort; and was no ſooner brought to the accuſtomed place, but the poor people carried all off, giving out, that Hecate had devoured it. For the reſt of the ceremonies obſerved on this occaſion, ſee Pott. Arch. Græc. lib. ii. cap. 20.

ECATÆA, Εκαταια, in *Antiquity*, ſtatues erected to the goddeſs Hecate, for whom the Athenians had a great veneration, believing that ſhe was the overſeer of their families, and that ſhe protected their children. Pott. Arch. Græc. lib. ii. cap. 20. tom. i. p. 386.

ECATOMBÆON, Εκατομβαιων, in *Chronology*, the firſt month of the Athenian year. It conſiſted of thirty days, and began on the firſt new moon after the ſummer ſolſtice, and conſequently anſwered to the latter part of our June, and beginning of July. The Bœotians called it *Hippodromus*, and the Macedonians *Lous*. See MONTH.

The word is a derivative from the Greek, ἑκατομβη, *a hecatomb*, becauſe of the great number of hecatombs ſacrificed in it.

ECAVESSADE, in the *Manege*, is uſed for jerk of the caveſſon.

ECBASIS, Εκβασις, in *Rhetoric*, is uſed for a digreſſion.

ECBOLE, Εκβολη, in *Rhetoric*, is alſo uſed for a digreſſion.

ECBOLICS, *ecbolica*, from εκβαλλω, *I eject*, in the writings of the ancient phyſicians, a term uſed to expreſs ſuch medicines as were given to promote delivery in childbirth; and alſo ſuch as cauſed abortion. See DELIVERY.

ECBRASMATA, from εκβραζω, *I cauſe heats*, in the writings of ſome of the earlier phyſicians, a word uſed to expreſs eruptions, or puſtules, of a fiery and enflamed nature, appearing on different parts of the body. Virgil calls theſe *ardentes papulæ*, and ſeems to attribute them to the wearing clothes made of the wool of ſheep which had died of a murrain, which he deſcribes.

ECBRYSOMATA, from εκβρυω, *I cauſe to ſpread*, a word uſed by Galen, and the old phyſicians, for thoſe eminences or protuberances of the bones at the joints, which appear through the ſkin.

ECCANTHIS, or ENCANTHIS, in *Medicine*. See ENCANTHIS.

ECCATHARTICS, a name given by different writers in *Medicine*, to medicines of different kinds, and producing very different effects. See CATHARTICS.

ECCE-HOMO, among *Painters*, a name given to a picture, wherein our Saviour is repreſented in a purple robe, with a crown on his head, and a reed in his hand, ſuch as he was preſented before Pilate by the Jews.

The phraſe is Latin, borrowed from the words of the Jews themſelves; q. d. this is the man.

ECCENTRIC. See EXCENTRIC.

ECCENTRICITY. See EXCENTRICITY.

ECCHYMOSIS, Εκχυμωσις, the effuſion of blood from a rupture in ſome of the ſmall veins near the ſkin, cauſing a lividity or blueneſs thereof.

This is alſo called *ecchymoma*, εκχυμωμα, and ſtands diſtinguiſhed from the *enchymoſis*, where there is no extravaſation.

The *ecchymoſis* is either *ſimple*, or with *abſceſs*. The former is a mere diſeaſe of the ſkin, wherein the blood extravaſated by ſome blow, or contuſion, upon its arrival between the fleſhy or muſcular parts and the cutis, ſtops there, and turns black or livid, without any appearance of a wound. In the latter, the extravaſated blood ſuppurates, and breeds an impoſthume.

An *ecchymoſis*, or extravaſation of blood under the ſkin, is an accident too common, after bleeding in the arm. This ſometimes is ſo violent in degree, that the arm after ſwelling, and becoming black and blue, is violently inflamed, with acute pain, and either a ſuppuration or beginning mortification. This accident frequently happens from the vein's having been cut quite aſunder in the operation, but oftener by the patient's uſing the arm too ſoon after bleeding, in violent and long exerciſes, in which the contractions of the muſcles make the veins ſwell, and force their blood through the orifice into the interſtices between the fleſh and ſkin.

In ſlight accidents of this kind there is no danger, the ſtagnating blood being eaſily diſperſed by a compreſs dipped in vinegar and ſalt, or in ſpirit of wine. And ſometimes it ſuppurates, and, making its way through the integuments, becomes naturally diſcharged, and the wound will heal with a diachylon plaſter. But where the quantity of extravaſated blood is large, there is no hope of its being diſperſed ſo eaſily, but the diſorder generally terminates in an abſceſs or gangrene. To prevent theſe accidents, the ſurgeon's buſineſs is to ſcarify the livid parts, and apply warm fomentations. Heiſter's Surgery, p. 285.

ECCLESIA, a Latin, or rather Greek term, ſignifying CHURCH.

In our ancient law-books, Fitzherbert obſerves, that ECCLESIA, Εκκλησια, properly ſignifies a *parſonage*. Whence, if a preſentation were made to a chapel, as to a church, by the name of *eccleſia*, it changed the name thereof, and it preſently commenced a church.

When the queſtion was, Whether it were *eccleſia, aut capella pertinens ad eccleſiam?* the iſſue was, Whether it had *baptiſterium & ſepulturam?* For if it had the adminiſtration of the ſacraments and ſepulture, it was in law judged a church. See CHAPEL.

ECCLESIA, *Reſtitutione extracti ab*. See RESTITUTIONE.

ECCLESIÆ, *Recto de advocatione*. See RECTO.

ECCLESIÆ, *Warda*. See WARDA.

ECCLESIÆ *ſculptura*, the image or ſculpture of a church in ancient times was often cut out in plate or other metal, and preſerved as a religious treaſure or relique; and to perpetuate the memory of ſome famous churches.

ECCLESIANS, Ecclesiani, in *Church Hiſtory*. Upon any falling out, or miſunderſtanding, between the emperors and the churchmen, the adherents to the emperor called ſuch as ſtuck to the intereſts of the church and churchmen, *eccleſiani*, a term of reproach, anſwering to our high-church men.

ECCLESIASTES, one of the books of the Old Teſtament; thus called, by a Greek word, ſignifying *preacher*; becauſe the author in it declaims, or *preaches*, againſt the vices and vanities of the world.

This is Mariana's judgment: Grotius thinks otherwiſe; taking the book to derive its appellation from its being a collection of fine ſentences and reflections on the vanity of the things of our earth, &c. from the word קהל, which ſignifies to *amaſs* or *collect*, συναθροιζειν. Some Hebrew doctors, ſuppoſing the ſame etymon, will have it to have been thus called on account of its *amaſſing* a great deal of wiſdom: others, becauſe the author's aim is to *aſſemble* and *call* together, all ſuch as are willing to conſult their ſafety, and avoid the dangers of the world, which is the opinion of Gejerus. Laſtly, others, with Calovius, deduce it from his *aſſembling* them about him, as a preacher aſſembles his auditors.

There are different ſentiments as to the author of this book: the moſt common is, that it is Solomon's, who is ſuppoſed to have wrote it towards the cloſe of his life, to give tokens of his penitence to poſterity.

Grotius, indeed, takes the work to be poſterior to Solomon, and to have been wrote after his death; by ſix authors, unknown, who, to give their book the greater authority, put Solomon's name to it, and repreſented him as repentant. What he chiefly founds his opinion on, is, that we meet with words in this book, which are no where elſe ſeen, but in Daniel, Eſdras, and the Chaldee paraphraſes; but it is certain, all Hebrews, Greeks, and Latins, have always ſpoke of it as a work of Solomon. Indeed, there are authors who have attributed all the books of Solomon to Iſaiah; but theſe are only to be underſtood as if that prophet

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prophet had collected them. If it be true, that there are Chaldee words in the *Eccleſiaſtes*, it is eaſier to ſuppoſe Solomon underſtood that language, than to deny him to be the author of the book.

Calovius aſſures us, that the true reaſon why Grotius would not allow Solomon the author of the book of *Eccleſiaſtes*, is, that it ſpeaks too clearly and preciſely for his time, of the univerſal judgment, eternal life, and the pains of hell; but theſe are truths eſtabliſhed before Solomon, in the Pſalms, the Pentateuch, and Job.

There appears no reaſon, therefore, for denying this book to Solomon, but ſeveral for aſcribing it to him. As 1. The title of the book, which aſſerts its author to be the ſon of David, and king of Jeruſalem. 2. Several paſſages in the book, which agree to no body but that prince, as chap. i. ver. 12. chap. vii. ver. 25. chap. xii. ver. 9, &c. and 3. The conſtant tradition of the ancient Jews and Chriſtians.

The Talmudiſts, and other Rabbins, note, that it was ſome time before the book of *Eccleſiaſtes* was put in the canon. See the *Gemara* on the Pirke Abboth, fol. 1. col. 1. Maſſech Schabbath, cap. ii. fol. 30. col. 2. Aben Ezra on the *Eccleſiaſtes*, vii. 4. Maimonides, Moreh Nebochim, lib. iii. cap. 28. and Mercerus, Calovius, and Gejerus, on this book.

ECCLESIASTIC, or ECCLESIASTICAL, ſomething belonging to, or ſet apart for the church, in contradiſtinction to *civil* or *ſecular*, which regard the world. See CIVIL, &c. There are *eccleſiaſtical* things and perſons; *eccleſiaſtical law*, *juriſdiction*, *hiſtory*, *ceremonies*, *diſcipline*, *preferments*, &c. *Eccleſiaſtical* perſons are either *regular* or *ſecular*. See REGULAR and SECULAR. In the empire there are three *eccleſiaſtical* electors, viz. the archbiſhops of Mentz, Treves, and Cologne. In France, they have *eccleſiaſtical peers*, &c. See PEER.

ECCLESIASTIC *chambers*, *community*, *corporation*, *faith*, *patronage*, *tradition*, *courts*. See the different ſubſtantives.

ECCLESIASTICAL *State*, in *Geography*, the pope's dominions in Italy.

Theſe dominions are differently divided by geographers; but the moſt regular and convenient diviſion is into the following territories: 1. The duchy of Ferrara. 2. That of Bologna. 3. The province of Romagna. 4. The duchy of Urbino. 5. The marquiſate of Ancona. 6. The Perugiano. 7. The Orvietano. 8. The duchy of Caſtro. 9. The Patrimony of St. Peter. 10. Campania di Roma. 11. Sabina. 12. The duchy of Spoleto al Ombria. 13. The county called Citta di Caſtello. Beſide which, the pope is poſſeſſed of the following countries out of the papacy, viz. The duchy of Benevento, in the kingdom of Naples; the counties of Avignon and Venaiſin, in the Southern parts of France. He has beſides, a conſiderable number of fiefs in Italy, which hold of the papal ſee; the principal of which, are, the kingdom of Naples, and the ſtates of Parma and Placentia.

The POPE may be conſidered in two reſpects, as the ſpiritual head and monarch of the Roman church, and as a conſiderable temporal prince in Italy. In the firſt character, his ſubjects may be divided into two claſſes, viz. clergy and laity; the former may not unfitly be compared to a ſpiritual ſtanding army, whoſe buſineſs is to maintain his rights and conqueſts; and the reſt, the laity, as his tributary ſubjects, who are obliged to maintain thoſe forces at their own charge; and if one may judge of the greatneſs of their number, by what pope Paul IV. uſed to boaſt, that he had 228000 pariſhes under his juriſdiction (all of whom have at leaſt one or more prieſts, and 4400 monaſteries, it will appear no inconſiderable army. But their number has been much leſſened ſince the Reformation.

In the ſecond view, the pope may be conſidered as a potent prince in Italy, whoſe ſovereignty is chiefly ſupported by the jealouſy between Spain, France, and the Empire; though in moſt other reſpects it is not to be compared with that of other princes of Europe. What his revenues are, may be hard to determine, though they muſt be allowed to be very conſiderable, and that he is able to maintain a great military force. But this court maintains itſelf by quite different means from thoſe of temporal princes; and his holineſs maintains but very few land forces, though the arſenal at Rome is ſaid to contain, arms ſufficient, kept in good order and repair, to equip 30000 men horſe and foot. His ſea forces conſiſt of 20 gallies, which are commonly ſtationed at Civita Vecchia.

ECCLESIASTICO *primo beneficio habendo*. See PRIMO.

ECCLESIASTICUS, an apochryphal book, compoſed by Jeſus the ſon of Sirach, and admitted by the Romiſh church into the canon of the Old Teſtament.

It is frequently cited by the abbreviation, *Eccli.* to diſtinguiſh it from the *Eccleſiaſtes*, which is cited by *Eccle.* Iſidore, lib. vi. Etym. cap. ii. and among the moderns, Grotius and Druſius deny the author of *Eccleſiaſticus* to be Jeſus the ſon of Sirach, grandſon of the high-prieſt Jeſus, who returned from Babylon with Zorobabel. Genebrard aſſerts, that Jeſus the ſon of Sirach was of the race of Jeſus ſon of Joſedec; but this does not appear.

St. Jerom aſſures us, in his preface to the books of Solomon, that he had ſeen this book in Hebrew; and that the Hebrews intitled it *Parables:* from which the Jeſuit Mariana concludes, that the high-prieſt Jeſus wrote this book in Hebrew, as it appears likewiſe from the prologue to the book itſelf; and that his grandſon tranſlated it into Greek, which likewiſe appears from the prologue; that he made this tranſlation in Egypt, where the author lived in his thirty-eighth year; that it was done under the reign of Ptolemy Euergetes, ſucceſſor of Ptolemy Philadelphus, who began to reign in the year of Rome 512,240 years before Chriſt; that the grandfather had intitled it *Parables*, which the grandſon changed into *Eccleſiaſticus:* laſtly, that the book, however, is attributed to the tranſlator becauſe he changed, and added many things to the original.

Fa. Calmet takes the book of *Eccleſiaſticus* to have been compoſed under the pontificate of Onias III. ſon of Simon, and the reign of Antiochus Epiphanes, king of Syria. He adds, that neither the author of the Latin tranſlation, nor the time when it was made, is known; but being quoted regularly by all the ancient fathers, there is no doubt of its being very ancient. He takes it to have been done by the tranſlator of the book of Wiſdom.

ECCLISIS, from εκκλινω, *I decline*, a word uſed by Hippocrates, and from him by many other of the old phyſicians, for a receſſion of a bone from its proper ſituation, that is, a luxation.

ECCOPÆUS, from εκκοπτω, *I cut*, the name of an inſtrument, deſcribed by ſome of the ancient writers in *Medicine*, and uſed for the ſame purpoſes for which the modern ſurgeons employ a lenticular or raſpatory. The ancient inſtrument was a ſort of knife, with which they cut down morbid eminences of bones, or took out bones, in caſe of a fractured ſkull.

ECCOPE, Εκκοπη, in *Chirurgery*, the ſame with exciſion or amputation.

The word is formed from the Greek, εκκοπτειν, *exſcindere, to cut off.*

ECCOPE is likewiſe uſed for a kind of fracture, or ſolution of continuity, of the ſkull, by a ſimple inciſion.

ECCOPROTICS, Εκκοπρωτικα, in *Medicine*, laxative, or looſening remedies, which purge gently, by ſoftening the humours and excrements, and fitting them for expulſion.

The word is compoſed of the Greek particle εκ, and κοπρος, *excrement.*

ECCRIMOCRITICA, from εκκρισις, *excretion*, and κριτικος, in *Medicine*, ſigns to judge of a diſtemper, from particular excretions.

ECCRINOLOGICA, from εκκρινω and λογος, a term uſed, by ſome writers, for that part of medicine which relates to the doctrine of excretions, or the diſcharge of any of the excrements out of the body.

ECCRISIS, an excretion of any excrementitious or morbid matter from any of the natural emunctories, as it happens in a perfect criſis. The matter thus excreted is alſo ſometimes called by this name.

ECDICI, Εκδικοι, among the *Ancients*, patrons of cities, who defended their rights, and took care of the public money. Their office reſembled that of the modern SYNDICS.

ECDORA, from εκδερω, *I excoriate*, a word uſed, by the ancient phyſicians, to expreſs any kind of excoriation, but in a more particular manner that of the urethra.

ECDORIA, a term uſed, by the ancient writers in *Medicine*, for ſuch cauſtic or eſcharotic medicines, as have a power of taking off the ſkin.

ECDYSIA, Εκδυσια, in *Antiquity*, a feſtival obſerved by the Phœſtians in honour of Latona.

ECHAPE', in the *Manege*, is uſed to denote a horſe, got between a ſtallion and a mare, of a different breed and country.

ECHAPER, in the *Manege*, is uſed in the French academies for giving the horſe head, or putting him on full ſpeed. Hence they ſay, *laiſſez echaper de la main.*

ECHARPE. See BATTERY *en echarpe*.

ECHAUGUETTE, in the French *Military Art*, an elevated and covered place for a centinel. Richelet explains it by the Latin *ſpecula*, *excubiæ*. See GUERITE.

Some diſtinguiſh the *exchauguette* from the guerite, giving the former name to centry-boxes made of wood, and ſquare; and the latter name to thoſe made of ſtone, and round.

ECHENEIS,

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ECHENEIS, in *Ichthyology*. The ancients have uſed this as the name of the petromyza, of ſome kinds; and Appian, in particular, plainly means by it our common lamprey. See REMORA.

ECHEVIN. See ESCHEVIN.

ECHIDNA, in *Natural Hiſtory*, a name given, by ſome authors, to the ſeveral kinds of ophites, or ſerpent-ſtone, from ἐχιδνα, a *viper*, or *ſerpent*.

ECHINATE *ſeeds*, are ſuch as are prickly and rough like the coat of a cheſnut; or, as ſome ſay, like the ſkin of a hedge-hog.

ECHINI *foſſiles*. It is a very remarkable obſervation of Aguſtino Scilla, that all thoſe foſſile *echini* which he had found in the Meſſineſe and Calabrian hills, and about Malta, were, when bruiſed, as was frequently the caſe, always bruiſed by a perpendicular preſſure. See ECHINITES.

ECHINI *ſpatagi*. It is obſerved, that the foſſile *echini ſpatagi* are very frequent in the iſland of Malta, and people who are for having all foſſile ſhells to be real terreſtrial bodies, produced of ſeeds in the earth, and never to have been parts of real animals, object to theſe having ever been ſuch, their being found ſo plentifully in this foſſile ſtate, and ſo rarely in the native or recent one. This is no objection of weight; becauſe the cornua ammonis give a much ſtronger, which are a more common foſſile, and have never been found recent at all. This is no argument of weight, however, ſince it is eaſy to conceive, that the ſea, at the time of the univerſal deluge, might throw up ſhells from its deep bottom, which we never can get at in fiſhing or otherwiſe. And Scilla has proved the abſurdity of the objection, in regard to the *echini ſpatagi*, and ſhewn that thoſe people who raiſed it, have been led into it by their ignorance. For he has affirmed, that they may be picked up by hundreds at a time in the port of Meſſina, and that himſelf once took up more than a hundred recent ones in an hour.

The ſhells of this ſpecies, found foſſile in the iſland of Malta, are very frequently full of the marle, of which the upper ſtratum of that iſland conſiſts; and ſome of them are cracked, and have been depreſſed a little inwards. This is an evident proof that they once were real ſhells, having, in this caſe, given way, as far as the included marle would let them, on the preſſure of ſome external force. See *Tab. of Shells*, N° 24.

ECHINITES, or ECHINITÆ, in *Natural Hiſtory*, the name given by authors to the foſſil ſhells of the ſeveral ſpecies of *echini marini*, and to the ſtones formed in them. Of theſe there is almoſt an endleſs variety in the foſſil world. Many of thoſe which we daily find in our chalk-pits are the ſame with thoſe now known to us in their recent ſtate, or living in the ſea; but we have numbers of others, of which our imperfect knowlege of the animal world gives us no certain account, in their recent ſtate.

The ſhells of ſome of theſe are found ſcarce at all altered from their original condition. In many others we have plated ſpar filling the places of the ſhells, and retaining every lineament of them. But their moſt frequent appearance is in the form of maſſes of hard flint, or other ſtone, which have been caſt and formed in them, having been received, while in a fluid ſtate, into the hollow of the ſhell, and therefore retaining all the lineaments of the inner ſurface. And, not unfrequently, theſe alſo are coated over with a ſparry or ſtony matter, ſupplying the place of the ſhell they were formed in; and having been made, by the inſenſible depoſition of hard matter, in the place of the particles of the ſhell inſenſibly waſting away; theſe retain all the lineaments of the outer part of the ſhell, as the formed flint does of the inner one. Sometimes pure cryſtal is found in the place of flint in theſe, and often cryſtal, but lightly debaſed by earth; and theſe make very elegant ſpecimens.

The various genera of foſſil echini, or *echinitæ*, are uſually known among authors by the names of *ſpatagi*, *cordati*, *galeati*, *pileati*, *diſcoides*, *ovarii*, *pentophylloides*.

What is generally underſtood by the word *echinitæ*, is a ſort of arched ſhells, or ſtones formed in them, covered with divers eminences and cavities, ſome of which are diſpoſed into beautiful lines, diverging from the ſummit; and always having two apertures, the one for the mouth, the other for the anus of the animal. Of theſe,

The *echini cordati* are ſuch as have a remarkable furrow on one ſide, or end, which is uſually broader than any other part of the body, and by means of this furrow, repreſents, in ſome degree, the figure of a heart at cards.

The *galeati* are ſuch as have the baſis ſomewhat oblong, and the apertures one in the very margin, and the other near the margin, on the oppoſite ſide. The *pileati* and *diſcoides*, are ſubdiſtinctions of this kind.

The *pileati* are higher, and approach to a conic figure.

The *diſcoides* are flatter, and more compreſſed.

The *ovarii* have only one aperture at the baſe, and have large and unequal tubercles and papillæ.

The *pentaphylloides* have rows of ſhort lines, which are ſo diſpoſed as to repreſent a cinquefoil leaf.

The *ſpatagi* is a very comprehenſive term, taking in moſt of the others as ſubdiſtinctions. It comprehends all that have two apertures in the baſe, and that are covered with ſmall tubercles. See *Tab. of Foſſils*, *Cloſs* 9.

ECHINODERMA, in *Natural Hiſtory*, the name of the ſea animal more commonly known by the name of the *echinus marinus*, or ſea hedge-hog. Theſe are fiſh living in an arched ſhell, of various figures, according to the various ſpecies; and always, beſides a vaſt number of ſmaller protuberances and cavities, having two remarkable apertures, the one ſerving for the mouth, the other for the anus of the animal; which are variouſly placed in the different genera and ſpecies.

There are yet wanting, in natural hiſtory, the proper characters and diſtinctions of cruſtaceous and teſtaceous fiſhes, and, till theſe are fixed, there is no ſaying whether theſe creatures belong to the teſtaceous or cruſtaceous tribe.

Many affirm that the ſpines of the echini ſerve them in the place of legs; but there are many alſo who deny this; and ſome affirm, that they have, in the living fiſh, found legs in another part, affixed not to the ſhell, but to the body of the animal. Klein, Echinod. p. 4. See CENTRONIA.

As to its medical virtues, it is friendly and beneficial to the ſtomach and belly; and provokes urine. The crude ſhell toaſted, is a good ingredient in medicines for abſterging the pſora; and the aſhes of it when burnt, cleanſe foul ulcers, and repreſs proud fleſh.

ECHINOMETRA, a name given by ſome to the ſeveral depreſſed ſpecies of the *echinodermata*. See *Tab. of Teſtaceous Animals*, N° 15, 16, 17, and ECHINODERMA.

ECHINOPHORA, in *Botany*. See *Prickly* PARSNEP.

ECHINOPHORA, in *Ichthyology*, a name given by Rondeletius to a ſpecies of ſea-ſnail, of the round-mouthed kind, or claſs of the cochleæ lunares.

He calls it *echinophora*, becauſe it is all over beſet with tubercles; but this is a very ill choſen name, as it confounds it with the echini or ſea-eggs; he had much better have called it cochlea tuberculoſa. See LUNARIS *Cochlea*.

ECHINOPHTHALMIA, in the works of the ancient writers on *Medicine*, the name of a diſeaſe, which was an inflammation on that part of the eye-lids, which is beſet with hairs, or on which the eye-laſhes grow.

ECHINOPUS, in *Botany*. See *Globe* THISTLE.

ECHINUS, in *Architecture*, a member, or ornament, near the bottom of the Ionic, Corinthian, and Compoſite capitals; which, from its circular form or contour, is called by the French, *quart de rond*, and by the Engliſh, *quarter round*, or *boultin*; and from its being uſually carved, or cut with figures of eggs, &c. is called alſo by the Latins, *ovum*, by the Italians, *ovolo*, the French, *œuf*, and the Engliſh, *eggs* and *anchors*. See *Tab. Archit. fig.* 5.

Laſtly, the eggs being encompaſſed with a cover, and thus bearing ſome reſemblance to a cheſnut cut open; the Greeks have called it ἐχινος, *echinus*, a word which denotes the prickly cover of a cheſnut.

ECHINUS is alſo uſed by ſome botaniſts for the prickly head, or top, of any plant; thus called from its likeneſs to a hedge-hog, or the cover of a cheſnut.

ECHINUS, the hedge-hog, and ECHINUS *marinus*, the ſea-urchin. See HEDGE-HOG, ECHINODERMA, and CENTRONIA.

ECHIQUETE, in *Heraldry*. See CHECKY.

ECHITES, in *Botany*, a genus of the *pentandria monogynia* claſs. The characters of this genus are, that it is twiſted, that it has two long ſtrait leaves, a downy ſeed, and a funnel-ſhaped flower.

ECHIUM, in *Botany*. See VIPER'S *Bugloſs*.

ECHO, or ECCHO, a ſound reflexed, or reverberated, from a ſolid, concave body, and ſo repeated to the ear. See SOUND, and REFLEXION.

The word is formed of the Greek ἠχος, *ſound*, of the verb ἠχεω, *ſono*, *I ſound*.

The Peripatetics, who took ſound for ſpecies, or image of the ſonorous body, impreſſed on the adjoining air, account for *echo* from a reſilition of that ſpecies, occaſioned by its meeting ſome obſtacle in the way. But the moderns, who know ſound to conſiſt in a certain tremor, or vibration in the ſonorous body communicated to the contiguous air, and by that means to the ear, give a more conſiſtent account of *echo*.

For a tremulous body, ſtriking on another ſolid body, it is evident, may be repelled without deſtroying or diminiſhing its tremor; and conſequently a ſound may be redoubled by the reſilition of the tremulous body, or air.

But a ſimple reflection of the ſonorous air is not enough to ſolve the *echo*: for then every plain ſurface of a ſolid hard body, as being fit to reflect a voice or ſound, would redouble it; which we find does not hold.

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To produce an *echo*, therefore, it ſhould ſeem that a kind of concameration or vaulting were neceſſary, in order to collect, and, by collecting, to heighten and increaſe, and afterwards reflect the ſound; as we find is the caſe in reflecting the rays of light, where a concave mirror is uſed. In reality, as often as a ſound ſtrikes perpendicularly on a wall, behind which is any thing of a vault, or arch, or even another parallel wall; ſo oft will it be reverberated in the ſame line, or other adjacent ones.

For an *echo* to be heard, therefore, it is neceſſary the ear be in the line of reflection; for the perſon who made the ſound to hear its *echo*, it is neceſſary he be in a perpendicular to the place which reflects it; and for a manifold or tautological *echo*, it is neceſſary there be a number of walls and vaults, rocks, and cavities, either placed behind each other, or fronting each other.

Thoſe murmurs in the air, that are occaſioned by the diſcharge of great guns, &c. are a kind of indefinite *echoes*, and proceed from the vaporous particles ſuſpended in the atmoſphere, which reſiſt the undulations of ſound, and reverberate them to the ear.

A ſingle arch, or concavity, &c. can ſcarce ever ſtop and reflect all the ſound; but if there be a convenient diſpoſition behind it, part of the ſound, propagated thither, being collected and reflected, as before, will preſent another *echo*; or if there be another concavity, oppoſed at a due diſtance to the former, the ſound reflected from the one upon the other will be toſſed back again by this latter, &c.

Many of the phænomena of *echoes* are well conſidered by the biſhop of Leighlin and Ferns, Phil. Tranſ. abr. vol. i. p. 508, &c. who remarks, that any ſound, falling either directly, or obliquely, on any denſe body, of a ſmooth, whether plain or arched, ſuperficies, is reflected, or, in other words, it *echos* more or leſs. The ſurface, ſays he, muſt be ſmooth, otherwiſe the air, by reverberation, will be put out of its regular motion, and the ſound thereby broke and extinguiſhed. He adds, that it *echos* more or leſs, to ſhew that when all things are, as before deſcribed, there is ſtill an *echoing*, though it be not always heard; either becauſe the direct ſound is too weak to beat quite back again to him that made it, or that it does return to him, but ſo weak, that it cannot be diſcerned; or that he ſtands in a wrong place to receive the reflected ſound, which paſſes over his head, under his feet, or on one ſide of him, and which therefore may be heard by a man ſtanding in the place where the reflected ſound does come, provided no interpoſed body intercepts it; but not by him that originally made it. There can be no *echo*, unleſs the direct and reflex ſounds follow one another, at a ſufficient diſtance of time, or, in other words, unleſs the difference between the ray proceeding directly to the ear from the ſounding body, and the ſum of the incident and reflex phonic rays be ſufficiently great; for if the reflex ſound arrives at the ear before the impreſſion of the direct ſound ceaſes, the ſound will not be doubled, but only rendered more intenſe. Now if we allow, that no more than nine or ten ſyllables can be pronounced in a ſecond, in order to preſerve the ſounds articulate and diſtinct, there ſhould be about the ninth part of a ſecond between the times of their appulſe to the ear; or, as ſound moves about 1142 feet in a ſecond, the above mentioned difference ſhould be $\frac{1142}{9} = 127$ feet; and therefore every ſyllable will be reflected to the ear at the diſtance of about ſeventy feet from the reflecting body; and as in the ordinary way of ſpeaking three or four ſyllables are uttered in a ſecond, the ſpeaker, in order to have the *echo* returned as ſoon as they are expreſſed, ſhould ſtand about five hundred feet from the reflecting body; and ſo in proportion for any other number of ſyllables. Merſennus allows for a monoſyllable the diſtance of 69 feet; Morton, 90 feet; for a diſſyllable 105 feet, a triſyllable 160 feet, a tetraſyllable 182 feet, and a pentaſyllable 204 feet. Nat. Hiſt. Northampton. cap. 5. p. 358.

It is plain from the above account, that *echoes* may be applied for meaſuring inacceſſible diſtances. Thus, Dr. Derham, ſtanding upon the banks of the Thames, oppoſite to Woolwich, obſerved that the *echo* of a ſingle ſound was reflected back from the houſes in three ſeconds; conſequently the ſum of the direct and reflex rays muſt have been $1142 \times 3 = 3426$ feet, and the half of it, or 1713 feet, the breadth of the river in that place.

Echoes may be produced with different circumſtances; for,

1. A *plane* obſtacle reflects the ſound back in its due tone and loudneſs; allowance being made for the proportionable decreaſe of the ſound, according to its diſtance.

2. A *convex* obſtacle reflects the ſound ſomewhat ſmaller, and ſomewhat quicker, though weaker, than it otherwiſe would be.

3. A *concave* obſtacle *echos* back the ſound, bigger, ſlower, and alſo inverted; but never according to the order of words. Nor does it ſeem poſſible to contrive any ſingle *echo*, that ſhall invert the ſound, and repeat backwards; becauſe, in ſuch a caſe, the word laſt ſpoken, that is, which laſt occurs to the obſtacle, muſt be repelled firſt, which cannot be. For where in the mean time ſhould the firſt words hang, and be concealed; or how, after ſuch a pauſe, ſhould they be revived, and animated again into motion?

From the determinate concavity, or archedneſs of the reflecting bodies, it may happen that ſome of them ſhall only *echo* back one determinate note, and that only from one place.

4. The *echoing* body being removed farther off, it reflects more of the ſound than when nearer; which is the reaſon why ſome *echoes* repeat but one ſyllable, ſome one word, and ſome many. Of theſe ſome are tonical, which only return a voice when modulated into ſome particular muſical tone; and others polyſyllabical.

That fine *echo* in Woodſtock park, Dr. Plott aſſures us, in the day-time, will return very diſtinctly ſeventeen ſyllables, and in the night twenty. See Nat. Hiſt. Oxford. cap. 1. p. 7.

5. *Echoing* bodies may be ſo contrived, and placed, as that reflecting the ſound from one to the other, either directly and mutually, or obliquely and by ſucceſſion, out of one ſound, ſhall a *multiple echo*, or many *echoes*, ariſe.

At Roſneath, near Glaſgow, in Scotland, there is an *echo* that repeats a tune played with a trumpet three times completely and diſtinctly. See Birch's Hiſt. of the Royal Society, vol. i. p. 137.

At the ſepulchre of Metella, wife of Craſſus, there was an *echo*, which repeated what a man ſaid five times. Authors mention a tower at Cyzicus, where the *echo* repeated ſeven times. There is an *echo* at Bruſſels, which anſwers fifteen times.

One of the fineſt *echoes* we read of is that mentioned by Barthius, in his notes on Statius's Thebais, lib. vi. ver. 30. which repeated the words a man uttered ſeventeen times: this was on the banks of the Naha, between Coblents and Bingen. Barthius aſſures us, he had proved what he writes; and had counted ſeventeen repetitions. And whereas, in common *echoes*, the repetition is not heard till ſome time after hearing the word ſpoke, or the notes ſung; in this, the perſon who ſpeaks, or ſings, is ſcarce heard at all; but the repetition very clearly, and always in ſurpriſing varieties; the *echo* ſeeming ſometimes to approach nearer, and ſometimes to be farther off. Sometimes the voice is heard very diſtinctly, and ſometimes ſcarce at all. One perſon hears only one voice, and another ſeveral; one hears the *echo* on the right, and the other on the left, &c.

Addiſon, and other travellers into Italy, mention an *echo* in that country, at Simonetta palace, near Milan, ſtill more extraordinary, which will return the ſound of a piſtol fifty-ſix times, even though the air be very foggy. The *echo* is heard behind the houſe, which has two wings; the piſtol is diſcharged from a window in one of theſe wings, the ſound is returned from a dead wall in the other wing, and heard from a window in the back-front. See Addiſ. Trav. edit. 1718. p. 32. Miſſon. Voyag. d'Ital. tom. ii. p. 196. edit. 1691. Phil. Tranſ. N° 480. p. 220.

Add, that a *multiple echo* may be made, by ſo placing the *echoing* bodies, at unequal diſtances, as that they may reflect all one way, and not one on the other; by which means, a manifold ſucceſſive ſound will be heard; one clap of the hands like many; one *ha* like a laughter; one ſingle word like many of the ſame tone and accent; and ſo one muſical inſtrument like many of the ſame kinds, imitating each other.

Laſtly, *echoing* bodies may be ſo ordered, that from any one ſound given, they ſhall produce many *echos*, different both as to tone and intenſion. By which means a muſical room may be ſo contrived, that not only one inſtrument playing therein ſhall ſeem many of the ſame ſort and ſize, but even a conſort of different ones; this may be contrived by placing certain *echoing* bodies ſo, as that any note played, ſhall be returned by them in 3ds, 5ths, and 8ths.

ECHO is alſo uſed for the place where the repetition of the ſound is produced, or heard. This is either natural or artificial.

In *echoes*, the place where the ſpeaker ſtands, is called the *centrum phonicum*; and the object, or place, that returns the voice, the *centrum phonocampticum*.

ECHO, in *Architecture*, is applied to certain vaults, and arches, moſt commonly of elliptical, or parabolical figures; uſed to redouble ſounds, and produce *artificial echoes*.

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The method of making an *artificial echo* is taught by the Jeſuit Blancani, in his Echometria, at the end of his book on the ſphere.

Vitruvius tells us, that in divers parts of Greece and Italy there were brazen veſſels, artfully ranged under the ſeats of the theatres, to render the ſound of the actors voices more clear, and make a kind of *echo*; by which means, of the prodigious multitude of perſons preſent at thoſe ſpectacles, every body might hear with eaſe and pleaſure.

ECHO, in *Muſic*, pieces compoſed in imitation of *echoes*.

Sometimes alſo the word *echo* ſtands for *piano*, intimating that the inſtrument, or voice, is to play or ſing after a ſoft and ſweet manner. Organs and harpſichords have what they call an *echo* ſtop.

ECHO, in *Poetry*, denotes a kind of compoſition, wherein the laſt words, or ſyllables, of each verſe, contain ſome meaning, which being repeated apart, anſwers to ſome queſtion, or other matter, contained in the verſe.

Such is that famous *echo* of Eraſmus, *Decem annos conſumpſi in legendo Cicerone —one*, i. e. ονε, *aſine*.

The firſt *echo*, in verſe, according to Paſquier, is that in the Sylvæ of Johannes Secundus: but Paſquier is miſtaken; for the ancient Greek and Latin poets have wrote *echoes*. This, Martial intimates plainly enough; when, laughing at ſuch ſorts of baubles, he ſays, there is nothing like them among his poems. *Nuſquam Græcula quod recantat echo:* by which, on the one ſide, he ſhews there were Latin poets, in his time, who made *echoes*; and, on the other, that the invention came from the Greeks.

Ariſtophanes, in his comedy intituled Θεσμοφοριαζουσαι, introduces Euripides in the perſon of *echo*; and Callimachus, in the epigram, Εκθαιρω το ποιημα το κυκλικον, ſeems to have intended a kind of *echo*.

There is a humorous ſpecimen of this kind of poetry in Hudibras.

ECHOMETER, in *Muſic*, a kind of ſcale, or rule, with ſeveral lines divided thereon, ſerving to meaſure the duration, or length, of ſounds, and to find their intervals and ratios.

The word is formed of the Greek ηχος, *ſound*, and μετρον, *meaſure*.

ECHOS, Ηχος, a *ſound*, in *Phyſic*. In Hippocrates this frequently imports what the Latins call *tinnitus aurium*, and the Engliſh a ringing of the ears; a ſymptom very frequent in acute diſtempers.

ECHPHYAS, from εκ and φυω, *I produce*, an excreſcence, or appendix, a word uſed by many of the ancient writers in medicine. The appendicula vermiformis is thus called by many authors.

ECHTHELYNSIS, from εκθηλυνω, of θηλυς, *feminine*, *I render effeminate*, a term uſed by the ancient phyſicians for a laxneſs, or flabby ſoftneſs, of the fleſh of the legs, or any other part of the body. Some have alſo uſed the word to expreſs a fault in bandages, when too looſe.

ECLAMPSIS, from λαμπω, *I ſhine*, a word uſed by Hippocrates in deſcribing the epilepſy, and, by moſt people, ſuppoſed, by a forced explanation, to mean the change which children undergo at the age of puberty, a time of great conſequence in this diſeaſe, at which nature ſhines forth in new luſtre, by the increaſe both of ſtrength and underſtanding. But the more natural and obvious ſenſe of the word ſeems to be the expreſſing thoſe reſplendent flaſhings and ſparklings of light which ſtrike the eyes of perſons ſubject to this diſtemper, and which are called by Cælius Aurelianus *ſcintillarum micæ*, and *circuli ignei*. And the ſame author, in deſcribing one of his epileptic caſes, particularly mentions the flaſhings of lightning, as it were, which were frequent before his eyes. It is not to be omitted that Hippocrates and Galen have both alſo uſed this word in another ſenſe, to expreſs the higheſt degree of a fever, juſt before and at the criſis, when it is in its utmoſt degree of heat, and exerts itſelf with its utmoſt violence.

ECLECTIC, Eclectici, a name given to ſome ancient philoſophers, who, without attaching themſelves to any particular ſect, took what they judged good, and ſolid, from each.

Hence their denomination; which, in the original Greek, ſignifies, *that may be choſen*, or *that chooſes*; of the verb εκλεγω, *I chooſe*.

Laertius notes, that they were alſo, for the ſame reaſon, denominated *analogetici*; but that they call themſelves *Philalethes*, i. e. lovers of truth.

The chief, or founder, of the *eclectici*, was one Potamon, of Alexandria, who lived under Auguſtus and Tiberius; and who, weary of doubting of all things with the Sceptics and Pyrrhonians, formed the *eclectic* ſect; which Voſſius calls the *eclective*.

Towards the cloſe of the ſecond century a ſect aroſe in the Chriſtian church under the denomination of *Eclectics*, or modern *Platonics*. They profeſſed to make truth the only object of their enquiry, and to be ready to adopt, from all the different ſyſtems and ſects, ſuch tenets as they thought agreeable to it. However, they preferred Plato to the other philoſophers, and looked upon his opinions concerning God, the human ſoul, and things inviſible, as conformable to the ſpirit and genius of the Chriſtian doctrine. One of the principal patrons of this ſyſtem was Ammonius Saccas, who at this time laid the foundation of that ſect, afterwards diſtinguiſhed by the name of the new *Platonics*, in the Alexandrian ſchool. This philoſopher was born of Chriſtian parents, and educated in the Chriſtian faith, and probably never deſerted the outward profeſſion of this religion; though Porphyry maintains, in oppoſition to the teſtimony of Euſebius, that in maturer life he became a pagan; and Fabricius, who is followed by Dr. Lardner, alleges that there were two perſons of the ſame name, the one a heathen philoſopher, and the other a Chriſtian writer. Thoſe who are deſirous of acquainting themſelves with the grounds of theſe oppoſite opinions, may conſult Fabricius's Bibl. Græc. lib. iv. cap. 26. p. 159. Lardner's Collection of Jewiſh and Heathen Teſtimonies, vol. iii. p. 195, &c. and Moſheim, De Rebus Chriſtianorum ante Conſt. Mag. p. 281, &c.

It was evidently the deſign of Ammonius to reconcile and unite all ſects, philoſophical and religious, and to inculcate a doctrine that ſhould comprehend all, the Chriſtians not excepted, in one common profeſſion. For this purpoſe he maintained, that the great principles of all philoſophical and religious truth were to be found, equally, in all ſects; that they differed from each other, only in their method of expreſſing them, and in ſome opinions of little or no importance; and that, by a proper interpretation of their reſpective ſentiments, they might eaſily be united into one body. Accordingly, all the gentile religions, and even the Chriſtian, were to be illuſtrated and explained by the principles of this univerſal philoſophy; and the fables of the prieſts were to be removed from paganiſm, and the comments and interpretations of the diſciples of Jeſus from Chriſtianity. In conformity to this plan he inſiſted, that all the religious ſyſtems of all nations ſhould be reſtored to their original purity, and reduced to their primitive ſtandard, viz. the ancient philoſophy of the Eaſt, preſerved uncorrupted by Plato; and he affirmed that this project was agreeable to the intentions of Jeſus Chriſt, whoſe ſole view, in deſcending upon earth, was to ſet bounds to the reigning ſuperſtition, to remove the errors that had blended themſelves with the religions of all nations, but not to aboliſh the ancient theology from which they were derived. He therefore adopted the doctrines which were received in Egypt concerning the univerſe, and the Deity, conſidered as conſtituting one great *whole*, concerning the eternity of the world, the nature of ſouls, the empire of Providence, and the government of the world by dæmons. He alſo eſtabliſhed a ſyſtem of moral diſcipline, which allowed the people in general to live according to the laws of their country, and the dictates of nature, but required the wiſe to exalt their minds by contemplation, and to mortify the body, ſo that they might be capable of enjoying the preſence and aſſiſtance of the dæmons, and of aſcending after death to the preſence of the Supreme Parent. In order to reconcile the popular religions, and particularly the Chriſtian, with this new ſyſtem, he made the whole hiſtory of the heathen gods an allegory, maintaining that they were only celeſtial miniſters, entitled to an inferior kind of worſhip; and he acknowleged that Jeſus Chriſt was an excellent man, and the friend of God, but alleged that it was not his deſign entirely to aboliſh the worſhip of dæmons, and that his only intention was to purify the ancient religion. This ſyſtem, ſo plauſible in its firſt riſe, but ſo comprehenſive and complying in its progreſs, has been the ſource of innumerable errors and corruptions in the Chriſtian church. At its firſt eſtabliſhment it is ſaid to have had the approbation of Athenagoras, Pantænus, and Clemens the Alexandrian, and of all who had the care of the public ſchool belonging to the Chriſtians at Alexandria. It was afterwards adopted by Longinus, the celebrated author of the treatiſe on the Sublime, Plotinus, Herennius, Origen, Porphyry, Jamblichus the diſciple of Porphyry, Sopater, Ediſius, Euſtathius, Maximus of Epheſus, Priſcus, Chryſanthius the maſter of Julian, Julian the Apoſtate, Hierocles, Proclus, and many others, both pagans and Chriſtians. Moſheim's Eccl. Hiſt. vol. i. p. 136, &c. &c. See Platonism.

Eclectics were alſo a certain ſet of phyſicians among the ancients, of whom Archigenes, under Trajan, was the chief, who ſelected from the opinions of all the other ſects, that which appeared to them beſt, and moſt rational;

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tional; hence they were called *eclectics*, and their preſcriptions *medicina eclectica*.

ECLEGMA, or ECLIGMA, Εκλειγμα, or ECLECTOS, in *Medicine*, a pectoral remedy, of the conſiſtence of a thick ſyrup; called, alſo, *lohoch*, *linctus*, and *lambative*.

The word is Greek; formed of εκ, and λειχειν, *to lick*; becauſe the patient is to take it by licking it off the end of a liquorice ſtick dipt therein; in order that, being taken thus by little and little, it may remain the longer in the paſſage, and moiſten the breaſt the better.

There are *eclegmas* of the ſyrups of poppy, others of lentils, others of ſquills, &c. Their intention is to heal or eaſe the lungs, in coughs, peripneumonies, &c. They are uſually compoſed of oils, incorporated with ſyrups.

ECLIPSAREON, in *Aſtronomy*, is an inſtrument invented by Mr. Ferguſon for exhibiting the time, quantity, duration, and progreſs, of ſolar eclipſes, at all parts of the earth. This machine conſiſts of a terreſtrial globe A (*Tab.* II. *Aſtronomy*, *fig.* 70.) turned, by a winch M, round its axis B, inclining $23\frac{1}{2}°$, and carrying an index round the hour-circle D; a circular plate E, on which the months and days of the year are inſerted, and which ſupports the globe in ſuch a manner, that when the given day of the month is turned to the annual index G, the axis has the ſame poſition with the earth's axis at that time; a crooked wire F, which points to the middle of the earth's enlightened diſc, and ſhews to what place of the earth the ſun is vertical at any given time; a penumbra, or thin circular plate of braſs I, divided into 12 digits by 12 concentric circles, and ſo proportioned to the ſize of the globe, that its ſhadow, formed by the ſun, or a candle placed at a convenient diſtance, with its rays tranſmitted through a convex lens, to make them fall parallel on the globe, may cover thoſe parts of the globe, which the ſhadow and penumbra of the moon cover on the earth; an upright frame HHHH, on the ſides of which are ſcales of the moon's latitude, with two ſliders K and K fitted to them, by means of which the center of the penumbra may be always adjuſted to the moon's latitude; a ſolar horizon C, dividing the enlightened from the darkened hemiſphere, and ſhewing the places where the general eclipſe begins and ends with the riſing or ſetting ſun; and a handle M, which turns the globe round its axis by wheel work, and moves the penumbra acroſs the frame by threads over the pulleys L, L, L, with a velocity duly proportioned to that of the moon's ſhadow over the earth, as the earth turns round its axis.

If the moon's latitude at any conjunction exceeds the number of diviſions on the ſcales, there can be no eclipſe; if not, the ſun will be eclipſed to ſome parts of the earth; the appearances of which may be repreſented by the machine, either with the light of the ſun, or of a candle. For this purpoſe, let the indexes of the ſliders KK point to the moon's latitude, the plate E be turned till the day of the given new moon comes to G, and the penumbra be moved till its center comes to the perpendicular thread in the middle of the frame, which thread repreſents the axis of the ecliptic; then turn the handle till the meridian of London on the globe comes under the point of the wire F, and turn the hour-circle D, till XII at noon comes to its index; and turn the handle, till the hour-index points to the time of new moon in the circle D, and then ſcrew faſt the collar N. Laſtly, elevate the machine, till the ſun ſhines through the ſight-holes in the ſmall upright plates O, O, on the pedeſtal; or, place a candle before the machine, at the diſtance of about four yards, ſo that the ſhadow of the interſection of the croſs threads in the middle of the frame may fall preciſely on that part of the globe to which the wire F points; with a pair of compaſſes take the diſtance between the center of the penumbra, and the interſection of the threads, and ſet the candle higher or lower, according to that diſtance; and place a large convex lens between the machine and candle, ſo that the candle may be in the focus of the lens; and thus the machine is rectified for uſe.

Let the handle be turned backward, till the penumbra almoſt touches the ſide HF of the frame, and then, turning it forward, the following phenomena may be obſerved. 1. Where the eaſtern edge of the ſhadow of the penumbral plate, I, firſt touches the globe at the ſolar horizon, thoſe who inhabit the correſponding part of the earth ſee the eclipſe begin on the uppermoſt edge of the ſun, juſt at the time of its riſing. 2. In that place where the penumbra's center firſt touches the globe, the inhabitants have the ſun riſing upon them centrally eclipſed. 3. When the whole penumbra juſt falls upon the globe, its weſtern edge at the ſolar horizon touches and leaves the place where the eclipſe ends at ſun-riſe on his lowermoſt edge. 4. By continued turning, the croſs lines in the center of the penumbra will go over all thoſe places on the globe where the ſun is centrally eclipſed. 5. When the eaſtern edge of the ſhadow touches any place of the globe, the eclipſe begins there; when the vertical line in the penumbra comes to any place, then is the greateſt obſcuration at that place; and when the weſtern edge of the penumbra leaves the place, the eclipſe ends there, and the times are ſhewn on the hour-circle; and from the beginning to the end, the ſhadows of the concentric penumbral circles ſhew the number of digits eclipſed at all the intermediate times. 6. When the eaſtern edge of the penumbra leaves the globe at the ſolar horizon C, the inhabitants ſee the ſun beginning to be eclipſed on his lowermoſt edge at its ſetting. 7. Where the penumbra's center leaves the globe, the inhabitants ſee the ſun centrally eclipſed; and laſtly, where the penumbra is wholly departing from the globe, the inhabitants ſee the eclipſe ending on the uppermoſt part of the ſun's edge, at the time of its diſappearing in the horizon.

This inſtrument will likewiſe ſerve for exhibiting the times of ſun riſing and ſetting, and of morning and evening twilight, as well as the places to which the ſun is vertical on any day, by ſetting the day on the plate E to the index G, turning the handle till the meridian of the place comes under the point of the crooked wire F, and bringing XII on the hour-circle D to the index: then if the globe be turned, till the place touches the eaſtern edge of the horizon C, the index ſhews the time of ſun-ſetting; and when the place comes out from below the other edge of C, the index ſhews the time when evening twilight ends; and morning twilight and ſun-riſing are ſhewn in the ſame manner on the other ſide of the globe. And the places under the point of the wire F are thoſe to which the ſun paſſes vertically on that day. Ferguſon's Aſtronomy, p. 298, &c. 4to edit. or Phil. Tranſ. vol. xlviii. p. 520.

ECLIPSE, from εκλειψις, of εκλειπω, *deficio*, *I fail*, in *Aſtronomy*, a privation of the light of one of the luminaries, by the interpoſition of ſome opake body, either between it and the eye, or between it and the ſun.

The ancients had frightful ideas of *eclipſes*; ſuppoſing them preſages of the moſt diſmal events. Plutarch aſſures us, that, at Rome, it was not allowed to talk publicly of any natural cauſes of *eclipſes*. They made a great noiſe with brazen inſtruments, and raiſed loud ſhouts, during *eclipſes* of the moon; as thinking, thereby, to eaſe her in labour: whence Juvenal, ſpeaking of a talkative woman, ſays, *Una laboranti poterit ſuccurrere lunæ*. Others attributed the *eclipſe* of the moon to the arts of magicians, who, by their enchantments, plucked her out of heaven, and made her ſkim over the graſs. The natives of Mexico keep faſt, during *eclipſes*; and particularly their women, who beat and abuſe themſelves; drawing blood from their arms, &c. They imagine the moon has been wounded by the ſun, in ſome quarrel between them.

The Chineſe fancy that *eclipſes* are occaſioned by great dragons, who are ready to devour the ſun and moon, and therefore, when they perceive an *eclipſe*, they rattle drums and braſs kettles, till the monſter, terrified by the noiſe, lets go his prey. The ſuperſtitious notions entertained of *eclipſes* were once of conſiderable advantage to Chriſtopher Columbus, when, in 1493, he was driven on the iſland of Jamaica, and diſtreſſed for want of proviſions, was refuſed relief; but having threatened them with a plague, and foretelling an *eclipſe*, as a token of it, which happened according to his prediction, the barbarians were ſo terrified, that they ſtrove who ſhould be the firſt in bringing him ſupplies, throwing them at his feet, and imploring forgiveneſs. Ricciolus's Almag. vol. i. lib. v. cap. 2. § 14. or p. 291.

ECLIPSE, *the duration of an*, is the time between the immerſion and emerſion.

ECLIPSE, *immerſion, or incidence, of an*, is the moment when part of the ſun, planet, or moon's diſk, firſt begins to be hidden. See IMMERSION.

ECLIPSE, *emerſion, or expurgation, of an*, is the time when the *eclipſed* luminary begins to re-appear, or emerge out of the ſhadow.

To determine the duration of *eclipſes*, they uſually divide the diameter of the luminary *eclipſed* into 12 equal parts, called *digits*, or *digiti ecliptici*.

Eclipſes are divided, with reſpect to the luminary *eclipſed*, into *eclipſes of the ſun*, *of the moon*, and of the *ſatellites*; and, with reſpect to the circumſtances, into *total*, *partial*, *annular*, &c. *eclipſes*.

ECLIPSE *of the moon*, is a deficiency of light in the moon, occaſioned by a diametrical oppoſition of the earth between the ſun and moon.

The manner of this *eclipſe* is exhibited in *Tab. Aſtronomy*, *fig.* 34. where A repreſents the earth, and B, or C, the moon.

When

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When all the light of the moon is intercepted, i. e. when her whole disk is covered, the *eclipse* is said to be *total*; when only part, *partial*; when the *total eclipse* lasts for some time, it is said to be *totalis cum mora, total with continuance*; when only instantaneous, *totalis sine mora, total without continuance.*

Eclipses of the moon only happen in the time of full moon; because it is only then the earth is between the sun and moon: nor do they happen every full moon, by reason of the obliquity of the moon's way with respect to the sun's; but only in those full moons which happen either in the nodes, or very near them, where the aggregate of the apparent semidiameters of the moon and the earth's shadow is greater than the latitude of the moon, or the distance between their centers.

The most considerable circumstances in the eclipses *of the moon* are, 1. That as the sum of the semidiameters of the moon and earth's shadow is greater than the aggregate of the semidiameters of the sun and moon (that, when least, being $5\frac{1}{3}$; and this, when greatest, scarce 3); it is evident, *lunar eclipses* may happen in a greater latitude of the moon, and at a greater distance from the nodes, and, consequently, are more often observed, in any one part of the earth, than *solar* ones; though, with respect to the whole earth, the latter are more frequent than the former, because the sun's ecliptic limits are greater than the moon's.

2. *Total eclipses*, and those of the longest duration, happen in the very nodes of the ecliptic; because the section of the earth's shadow, then falling on the moon, is considerably greater than her disc. There may likewise be *total eclipses* within a little distance of the nodes; but the farther, the less their duration; farther off still, there are only partial ones, and, at length, none at all; as the latitude and the semidiameter of the moon, together, are either less, equal, or greater than the semidiameter of the shadow.

3. All *lunar eclipses* are universal, i. e. are visible in all parts of the globe which have the moon above their horizon; and are every where of the same magnitude, and begin and end together.

4. In all *lunar eclipses*, the eastern side is what first immerges, and also emerges; so that though, at first, the moon be more westerly than the earth's shadow, yet her proper motion being swifter than the same, she overtakes and outgoes it.

5. The moon, even in the middle of an *eclipse*, has usually a faint appearance of light, resembling tarnished copper; which Gassendus, Ricciolus, Kepler, &c. attribute to the light of the sun, refracted by the earth's atmosphere, and transmitted thither.

Lastly, she grows sensibly paler, and dimmer, before she enters within the earth's shadow; which is attributed to the earth's PENUMBRA.

Astronomy of lunar ECLIPSES, *or the method of calculating their times, places, magnitudes, and other phenomena.* Preliminary 1. To find the length of the earth's shadowy cone. Find the sun's distance from the earth for the given time. See SUN, and DISTANCE. Then, as the sun's diameter is known in semidiameters of the earth, the length of the cone will be found from the rules given under SHADOW. Suppose, e. gr. the distance of the sun from the earth to be 95,000000 miles, and the eccentricity of the orbit 1,377000 miles, then will the greatest distance be 96,377000, or 24094 semidiameters of the earth; and the sun's semidiameter to that of the earth as 112 to 1, then will the length of the shadowy cone be 217 diameters of the earth.

Or, in the triangle *a b c* (*Tab.* II. *Astronomy, fig.* 71.) let *a b* represent the semidiameter of the sun, which at his greatest distance from the earth, whose semidiameter is *c d*, appears under the angle *a c b* equal to 15′ 44″; let the sun's parallax, or the angle *c b d*, for the sake of avoiding fractions, be 9″; then will the angle *d e c*, or the semi-angle of the conical shadow, be 15′ 35″; whence in the triangle *d c e*, we shall have, by trigonometry, the tangent of 15′ 35″ to radius as *c d*, or 1 semidiameter of the earth to *c e*: i. e. by Gardiner's Logarithmic Tables, 7,6563832 : 10,00, &c. :: 0,000, &c. : 2,3436168, which is the logarithm of the number 220,6 nearly; and therefore the length of the shadow is thus found to be above 220 semidiameters of the earth. But if the parallax be neglected, and the semi-angle of the cone supposed to be 15′ 50″, the height of the shadow will be only somewhat more than 217 semidiameters of the earth. And if we suppose the moon's shadow to be similar to that of the earth, and the proportion of their semidiameters as 28 to 100, we shall have the height of the moon's shadow in the same circumstances, above 61 semidiameters of the earth.

Hence, as the moon's least distance from the earth is scarce 56 semidiameters, and the greatest not more than 64;

the moon, when in opposition to the sun, in or near the nodes, will fall into the earth's shadow, though the sun and moon be in their apogees; and much more, if they be in or near their perigees; because the shadow is then longer, and the moon nearer the base of the cone.

2. To find the apparent semidiameter of the earth's shadow, in the place of the moon's passage, for any given time. Find the sun and moon's distance from the earth, and thence their horizontal parallaxes; add the parallaxes together, and from the sum subtract the apparent semidiameter of the sun; the remainder is the apparent semidiameter of the shadow.

Thus, suppose the moon's horizontal parallax 57′ 18″, the sun's 9″; the sum is 57 27″: from which if the sun's apparent semidiameter 16′ 5″ be subtracted, we shall have 41′ 22″ for the semidiameter of the shadow.

Note, M. De la Hire omits the sun's parallax, as of no consideration; but increases the apparent semidiameter of the shadow by a whole minute, for the shadow of the atmosphere; which would give the semidiameter of the shadow, in our instance, 42′ 13″.

3. The moon's latitude, AL, at the time of her opposition, together with the angle at the node B, being given; to find the arch between the centers AI, and the arch IL. (*fig.* 35.) Since in the spherical triangle AIL, rectangular at I, the side AL is given; as also the angle ALI, which is the complement of LAI, or B, to a right angle; the arch between the centers, AI, is found by spherical trigonometry; and since the angle LAI is equal to B, each of them, with IAB, making a right angle; and the moon's latitude AL is given; the arch LI will likewise be found by spherical trigonometry. See SPHERICAL *triangle.*

ECLIPSE *of the moon, to determine the bounds of an.* Since there is no *eclipse* possible, but when the aggregate of the semidiameters of the shadow and the moon is greater than the moon's latitude (for, without this, the moon will not come in the shadow) add the apparent semidiameters of the moon in perigæo, and of the shadow, supposing the sun in apogæo; by which you will have the side MO, (*fig.* 36). Then, in the spherical triangle MNO, having given the angle at the node, whose quantity is the moon's greatest latitude in the conjunctions; the right angle M, and the leg MO; find the moon's distance from the node NO; which is the utmost bound, beyond which the *eclipse* cannot reach. After the same manner, adding the apparent semidiameters of the moon in apogæo, and of the shadow of the earth when the sun is in perigæo, for the sake of having the side LH in the triangle NLH; the distance of the moon, from the ascending node HN, will be found by spherical trigonometry; which is the bound within which the moon will necessarily be *eclipsed.*

Thus, e. gr. the semidiameter of the shadow, when the sun is in apogæo, and the moon in perigæo, according to Kepler, is 49′ 40″. And the apparent semidiameter of the moon in perigæo 16′ 22″. Consequently MO is 66′, or 1° 6′; and therefore there will be no *eclipse* at all, if the moon's latitude be greater than 1° 6′. Now, as the same angle N is supposed by Kepler to be 5° 18′,

Log. sin. N	89655337
Sin. MO	12832433
Whole sine	100000000

Log. of sine ON 93177096

The number corresponding to which in the tables is 11° 59′ 50″. If, therefore, the moon's distance from either of the nodes be greater than 12°, no *eclipse* will generally happen. And, in like manner, the semidiameter of the shadow in the sun's perigee, and the moon's apogee, is 43′ 50″, and the moon's semidiameter in her apogee 15′. Consequently LH is 58′ 50″. And therefore there will be an *eclipse*, if the moon's latitude doth not exceed 58′ 50″. This, however, admits of some variation; for when the full moon is in her apogee, she will be *eclipsed*, if she be within $10\frac{1}{2}$ degrees of the node; and when she is full in her perigee, she will be *eclipsed*, if she be within $12\frac{1}{30}$ of the node.

To determine the quantity of an eclipse, *or the number of digits* eclipsed.—Add the moon's semidiameter IK (*fig.* 35.) to the semidiameter of the shadow AM; then will AM + IK = AI + IM + IK = AI + MK. From this sum, therefore, subtract the arch between the centers AI, the remainder gives the scruples or parts of the diameter *eclipsed* MK. Say, therefore, as the moon's diameter KH is to the scruples or parts thereof *eclipsed*, MK; so is 12 to the digits *eclipsed.*

To find the scruples of half duration of an eclipse, *or the arch of the lunar orbit, which her center describes from the beginning of the* eclipse *to the middle thereof.* Add the semidiameters of the shadow AP, and the moon PN together; the

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ſum gives AN. From the ſquare of AN ſubtract the ſquare of AI; the remainder is the ſquare of IN. And the ſquare root of this reſidue is the arch IN required.

To find the ſcruples of half duration of total darkneſs in a total eclipſe. Subtract the moon's ſemidiameter SV (*fig.* 37.) from the ſemidiameter of the ſhadow AV; the remainder is AS: in the triangular AIS, which is rectangular at I, therefore, we have the arch AS given by the laſt method; and the arch between the centers AI; where the arch IS is found, as in the laſt problem.

To find the beginning, middle, and end, of a lunar eclipſe. Say, as the moon's horary motion from the ſun is to 3600 horary ſeconds; ſo are the ſeconds of the arch LI (*fig.* 35.) to the horary ſeconds equivalent thereto. Subtract theſe ſcruples, or ſeconds, in the firſt and third quadrant of the anomaly, from the time of full moon, and add it to the ſame in the ſecond and fourth; the reſult is the time of the middle of the *eclipſe*. Then ſay, as the moon's horary motion from the ſun is to 3600 ſcruples, or ſeconds, ſo are the ſeconds of half duration IN to the time of half duration; the double of which gives the whole duration. Laſtly, ſubtract the time of half duration from the time of the middle of the *eclipſe*, the remainder will be the beginning of the *eclipſe*. And add the ſame to the ſame, the ſum will be its end.

A lunar *eclipſe*, that is both total and central, laſts 3 hours 57 minutes 6 ſeconds, from the beginning to the end, when the moon is in her apogee; and 3 hours 37 minutes 26 ſeconds, when in perigee; her horary motion being floweſt in the former caſe, and quickeſt in the latter.

To calculate an eclipſe *of the moon.* 1. For the given time of the mean full moon, compute the moon's diſtance from the node, to find whether there be an *eclipſe* or not; as taught in the firſt problem.

2. Compute the time of the true full moon, with the ſun and moon's true place reduced to the ecliptic.

3. For the time of the true full moon, compute the moon's true latitude, and the diſtance of each luminary from the earth, with the horizontal parallaxes, and apparent ſemidiameters.

4. For the ſame time, find the ſun and moon's true horary motion.

5. Find the apparent ſemidiameter of the ſhadow. And,

6. The arch between the centers AI, with the arch LI.

7. Compute the ſcruples of half duration IN. And thence,

8. Determine the beginning, middle, and end, of the *eclipſe*.

Laſtly, Find the ſcruples *eclipſed*, and thence the quantity of the *eclipſe*; as taught under the preceding problems.

To draw a type, or figure, of a lunar eclipſe *on a plane.* 1. Let CD (*fig.* 38.) repreſent the ecliptic; and let the center of the ſhadow be in A; through which draw a right line GQ perpendicular to DC; and ſuppoſe D the eaſt, C the weſt, Q the ſouth, and G the north.

2. From A, with the interval of the aggregate AN, of the ſemidiameter of the ſhadow AP, and of the moon PN, deſcribe a circle DGCQ; and with the interval of the ſemidiameter of the ſhadow AP, draw another concentric circle EF, which will exhibit the ſection of the ſhadow in the paſſage of the moon.

3. Let AL be equal to the latitude of the moon at the beginning of the *eclipſe*; and in L erect a perpendicular LN, meeting the greater circle in N, towards the weſt. Then will the center of the moon, at the beginning of the *eclipſe*, be in N.

4. After like manner, make AS equal to the latitude of the moon at the end of the *eclipſe*; and in S erect a perpendicular OS, parallel to DC; then will the center of the moon be in O, at the end of the *eclipſe*.

5. Connect the points O and N by a right line; ON will be the arch of the orbit, which the center of the moon deſcribes during the *eclipſe*.

6. From O and N, with the interval of the moon's ſemidiameter, deſcribe circles PV and TX, which will exhibit the moon at the beginning and end of the *eclipſe*.

7. Then, from A, letting fall a perpendicular AI to ON; the center of the moon will be in I, in the middle of the darkneſs.

Wherefore, laſtly, from I, with the interval of the moon's ſemidiameter, deſcribe a circle HK: this will repreſent the moon in the greateſt darkneſs, and at the ſame time the quantity of the *eclipſe*.

ECLIPSE *of the ſun*, is an occultation of the ſun's body, occaſioned by an interpoſition of the moon between the ſun and the earth.

It is diſtinguiſhed, like that of the moon, into *total* and *partial*, &c. to which muſt be added a third ſpecies called *annular*.

Eclipſes of the ſun, ſome authors obſerve, ſhould in propriety be called *eclipſes of the earth.*

As the moon is found to have a parallax of latitude, *eclipſes* of the ſun only happen when the latitude of the moon, viewed from the earth, is leſs than the aggregate of the apparent ſemidiameter of the ſun and moon. *Solar eclipſes*, therefore, happen when the moon is in conjunction with the ſun, in or near the nodes, i. e. at the new moons. Conſequently, the memorable *eclipſe of the ſun*, at our Saviour's paſſion, happening at the time of full moon, when the ſun and moon are in oppoſition, was preternatural. Beſides, the darkneſs in total *eclipſes* of the ſun never laſts above four minutes in one place; whereas the darkneſs of the crucifixion laſted three hours, Matt. xxviii. 15. and overſpread, at leaſt, all the land of Judæa.

Though the new moon cover the ſun from the earth, yet is not there an *eclipſe* every moon; becauſe the moon's way is not preciſely under the ecliptic, but is placed obliquely thereto; only interſecting it twice in every period. So that *eclipſes* can only be occaſioned in ſuch new moons, as happen in theſe interſections or nodes, or very near them.

In the nodes, when the moon has no viſible latitude, the occultation is total; and with ſome continuance, when the diſc of the moon, in perigæo, appears greater than that of the ſun in apogæo, and its ſhadow is extended beyond the ſurface of the earth; and, without continuance, at moderate diſtances, when the cuſp, or point of the moon's ſhadow, barely touches the earth. Laſtly, out of the nodes, but near them, the *eclipſes* are partial.

The other circumſtances of *ſolar eclipſes* are, 1. That none of them are univerſal; that is, none of them are ſeen throughout the whole hemiſphere, which the ſun is then above; the moon's diſc being much too little, and much too near the earth, to hide the ſun from the diſc of the earth.

The moon's dark ſhadow covers only a ſpot on the earth's ſurface, about 180 Engliſh miles broad, when the ſun's diſtance is greateſt, and the moon's leaſt; and thus far only can the total darkneſs extend. In this caſe, if L (*Tab.* II. *Aſtronomy*, *fig.* 72.) repreſent the moon, T the center of the earth, LT the diſtance of the moon equal to 56 ſemidiameters of the earth, LM the height of the ſhadow of the moon, equal to 60: then will TB be to TM as 1 to 4, and as the ſine of the angle TMB = 15′ 50″ to the ſine of the angle TBM; i. e. 0,00, &c. : 0,60205999 :: 7,6632969 : 8,2653568, the ſine of 63′ 20″; therefore the arc AB, or the angle ATB = TMB + TBM = 15′ 50″ + 63′ 20″ = 79′ 10″; and the arc BC = 158′ 20″ = 183 miles. But her partial ſhadow, or penumbra, may then cover a circular ſpace 4900 miles in diameter, within which the ſun is more or leſs *eclipſed*, as the places are leſs or more diſtant from the center of the PENUMBRA. In this caſe the axis of the ſhade is ſuppoſed to paſs through the center of the earth, or the moon is ſuppoſed to change exactly in the node; and then the ſection of the ſhadow will be evidently circular; but in every other caſe the conical ſhadow is cut obliquely, and the ſection will be an ellipſe.

2. Nor does the *eclipſe* appear the ſame in all parts of the earth, where it is ſeen; but when in one place it is total, in another it is only partial.

Farther, when the moon, being in her apogee, appears much leſs than the ſun, as happens moſt ſenſibly, when he is in perigæo; the cuſp of the lunar ſhadow not reaching the earth, ſhe becomes in a central conjunction with the ſun, yet not able to cover his diſc, but lets his whole limb appear like a lucid ring or bracelet; this is hence called an *annular eclipſe*.

3. It does not happen at the ſame time in all places where it is ſeen; but appears more early to the weſtern parts, and later to the eaſtern.

4. In moſt *ſolar eclipſes* the moon's diſc is covered with a faint, dawning light; which is attributed to the reflexion of the light from the illuminated part of the earth.

Laſtly, in total *eclipſes* of the ſun, the moon's limb is ſeen ſurrounded by a pale circle of light; which ſome aſtronomers take for a manifeſt indication of a lunar atmoſphere; but which is probably the atmoſphere of the ſun; becauſe it has been obſerved to move equally with the ſun, and not with the moon; and beſides, the moon is now generally believed to have no ATMOSPHERE.

ECLIPSES *of the ſun, the aſtronomy of.* To determine the bounds of a *ſolar eclipſe.*

If the moon's parallax were inſenſible, the bounds of a *ſolar eclipſe* would be determined after the ſame manner as thoſe of a *lunar*; but becauſe here is a ſenſible parallax, we muſt alter our meaſures a little, viz.

1. Add the apparent ſemidiameters of the luminaries both in apogæo and perigæo together.

2. Since the parallax diminiſhes the northern latitude, to the former ſum add the greateſt parallax of latitude poſſible; and ſince the parallax augments the ſouthern latitude,

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tude, from the ſame ſum ſubtract the greateſt parallax of latitude. Thus, in each caſe, will you have the true latitude, beyond which there can be no *eclipſe*.

This latitude given, the moon's diſtance from the nodes, beyond which *eclipſes* cannot happen, is found, as already directed for *lunar eclipſes*.

As different authors follow very different hypotheſes, with regard to the apparent diameters of the luminaries, and the greateſt parallax of latitude, they differ much in aſſigning the bounds at which *ſolar eclipſes* happen. Ptolemy makes the utmoſt bound of *eclipſes* at 19° 25′ diſtance from the node; Copernicus, at 19° 12′; Tycho, at 18° 25′; Kepler, at 17° 16′; Ricciolus, at 18° 49′. Though Ptolemy, in other places, judges 16° 42 minutes diſtance from the node, neceſſary; Copernicus, 16° 25′; Tycho, 17° 9′; Kepler, 15° 55′; and Ricciolus, 15° 58′.

Aſtronomers have generally aſſigned 17° as the limit of ſolar *eclipſes*; but this admits of ſome variation; for in apogeal *eclipſes*, the ſolar limit is but 16½ degrees, and in perigeal *eclipſes* it is 18⅓°.

To find the digits eclipſed. Add the apparent ſemidiameters of the luminaries into one ſum; from which ſubtract the moon's apparent latitude, the remainder is the ſcruples, or parts of the diameter *eclipſed*. Then ſay, as the ſemidiameter of the ſun is to the ſcruples *eclipſed*; ſo are 6 digits reduced into ſcruples, or 360 ſcruples, to the digits *eclipſed*.

To find the ſcruples of half duration, or the line of immerſion. The method is the ſame as that delivered for *lunar eclipſes*.

To determine the duration of a ſolar eclipſe. Find the horary motion of the moon from the ſun, for one hour before the conjunction, and another hour after: then ſay, as the former horary motion is to the ſeconds in an hour, ſo are the ſcruples of half duration to the time of immerſion; and as the latter horary motion is to the ſame ſeconds, ſo are the ſame ſcruples of half duration to the time of immerſion. Laſtly, adding the time of immerſion to that of emerſion, the aggregate is the total duration.

The moon's apparent diameter when largeſt, exceeds the ſun's when leaſt, only 1 minute 38 ſeconds of a degree; and in the greateſt ſolar *eclipſe* that can happen at any time and place, the total darkneſs can continue no longer than whilſt the moon is moving through 1′ 38″ from the ſun in her orbit, which is about 3 minutes 13 ſeconds of an hour: for the motion of the ſhadow on the earth's diſk is equal to the moon's motion from the ſun, which, on account of the earth's revolution on its axis towards the ſame way, or eaſtward, is about 30½ minutes of a degree every hour, at a mean rate; but ſo much of the moon's orbit is equal to 30½° of a great circle on the earth, becauſe the circumference of the moon's orbit is 60 times that of the earth; and therefore the moon's ſhadow goes 30½ degrees, or 1830 geographical miles in an hour, or 30½ miles in a minute.

To determine the beginning, middle, and end, of a ſolar eclipſe. From the moon's latitude, for the time of conjunction, find the arch IL (*fig.* 35.) or the diſtance of the greateſt obſcurity. Then ſay, as the horary motion of the moon from the ſun, before the conjunction, is to 3600 ſeconds of an hour; ſo is the diſtance of the greateſt darkneſs, to the interval of time between the greateſt darkneſs and the conjunction.

Subtract this interval, in the firſt and third quarter of the anomaly, from the time of the conjunction; and in the other quarters, add it to the ſame; the reſult is the time of the greateſt darkneſs. Laſtly, from the time of the greateſt darkneſs, ſubtract the time of incidence, and add it to the time of emerſion; the difference, in the firſt caſe, will be the beginning; and the ſum, in the latter caſe, the end of the *eclipſe*.

Indeed, as the interval between the conjunction, and the greateſt obſcurity, is very ſmall, and exceedingly precarious, it is not neceſſary to be ſo very preciſe; and accordingly, many authors uſe the time of the apparent conjunction for that of the greateſt darkneſs.

Or if you would determine it with more accuracy, ſubtract about two minutes for the diſtance between the conjunction ſeen, and the time of the greateſt obſcurity.

To find the moon's apparent latitude at the beginning and end of an eclipſe. From the argument of the moon's latitude, computed for the time of the apparent conjunction, ſubtract the ſcruples of half duration, together with the motion of the ſun, anſwering to the time of incidence; the remainder is the argument of latitude, at the beginning of the *eclipſe*.

To the ſame ſum add the ſame ſcruples, together with the ſun's motion anſwering to the time of emergence; the aggregate is the argument of latitude, at the end of the *eclipſe*. The argument of the latitude given, the moon's true latitude is found after the common manner. See LATITUDE. And from the latitude, is ſoon found the apparent one.

The apparent latitude of the moon, at the beginning and end of a ſolar eclipſe, *given; to draw a type or figure thereof.* This is performed, as already taught for *eclipſes* of the moon.

ECLIPSE *of the ſun, to calculate an.* 1. Find the mean new moon, and thence the true one; together with the place of the luminaries for the apparent time of the true one.

2. For the apparent time of the true new moon, compute the apparent time of the new moon obſerved.

3. For the apparent time of the new moon ſeen, compute the latitude ſeen.

4. Thence determine the digits *eclipſed.*

5. Find the times of the greateſt darkneſs, immerſion, and emerſion.

6. Thence determine the beginning, and ending, of the *eclipſe.*

From the preceding problems, it is evident, that all the trouble and fatigue of the calculus ariſes from the parallaxes of longitude and latitude; without which, the calculation of *ſolar eclipſes* would be the ſame with that of *lunar* ones. But after all that is here ſaid, it will be found impoſſible to calculate any *eclipſe*, either of the ſun or moon, without having a book of the tables for that purpoſe, and precepts ſhewing how to compute by them. See ſuch tables and precepts in Ferguſon's Aſtronomy, chap. xix.

In the Philoſophical Tranſactions, N° 461. ſect. 9. we have a contrivance to repreſent *ſolar eclipſes*, by means of the terreſtrial globe, by M. Seguer, profeſſor of mathematics at Gottingen. And Mr. Ferguſon has fitted a terreſtrial globe, ſo as to ſhew the time, quantity, duration, and progreſs of *ſolar eclipſes*, at any place of the earth where they are viſible. This he calls the ECLIPSAREON. He has alſo given a large catalogue of ancient and modern *eclipſes*, including thoſe recorded in hiſtory, from 721 years before Chriſt, to A. D. 1485; computed *eclipſes* from 1485 to 1700, and all the *eclipſes* viſible in Europe from 1700 to 1800. Aſtron. p. 175, &c.

ECLIPSES, *the number of*, of both luminaries, in any year, cannot be leſs than two, nor more than ſeven; the moſt uſual number is four, and it is rare to have more than ſix. The reaſon is obvious; becauſe the ſun paſſes by both the nodes but once in a year, unleſs he paſſes by one of them in the beginning of the year; in which caſe he will paſs by the ſame again a little before the year be finiſhed; becauſe the nodes move backwards 19⅓° every year, and therefore the ſun will come to either of them 173 days after the other. And if either node is within 17° of the ſun at the time of new moon, the ſun will be *eclipſed*; and at the ſubſequent oppoſition, the moon will be *eclipſed* in the other node, and come round to the next conjunction before the former node is 17° beyond the ſun, and *eclipſe* him again. When three *eclipſes* happen about either node, the like number generally happen about the oppoſite; as the ſun comes to it in 173 days afterwards, and ſix lunations contain only four days more. Thus there may be two *eclipſes* of the ſun, and one of the moon, about each of the nodes. But if the moon changes in either of the nodes, ſhe cannot be near enough the other node at the next full, to be *eclipſed*; and in ſix lunar months afterward ſhe will change near the other node; in which caſe there can be only two *eclipſes* in a year, both of the ſun.

ECLIPSES, *period of*, is that ſpace of time in which the ſame *eclipſes* return again; and, as the nodes move backward 19⅓° every year, they would ſhift through all the ſigns and degrees of the ecliptic in 18 years and 225 days; this would be the regular period of their return, if any complete number of lunations were finiſhed without a fraction; but this is not the caſe. However, in 223 mean lunations, after the ſun, moon, and nodes, have been once in a line of conjunction, they return ſo nearly to the ſame ſtate again, as that the ſame node, which was in conjunction with the ſun and moon at the beginning of the firſt of theſe lunations, will be within 28′ 12″ of a degree of a line of conjunction with the ſun and moon again, when the laſt of theſe lunations is completed; and in this period there will be a regular return of *eclipſes* for many ages. By adding to the mean time of any ſolar or lunar *eclipſe* this period, or 18 Julian years 11 days 7 hours 43 minutes 20 ſeconds, when the laſt day of February in leap-years is four times included, or a day leſs, when it occurs five times, we ſhall have the mean time of the return of the ſame *eclipſe*. In an interval of 6890 mean lunations, containing 557 years 21 days 18 hours 30 minutes 11 ſeconds, the ſun and node meet ſo nearly, as to be diſtant only 11 ſeconds.

ECLIPSES, *uſe of*. In *Aſtronomy*, *eclipſes* of the moon determine the ſpherical figure of the EARTH, and alſo that the ſun is bigger than the earth, and the earth than the moon.

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moon. *Eclipſes* alſo, that are ſimilar in all circumſtances, and that happen at conſiderable intervals of time, ſeem to aſcertain the periods of the moon's motion. In *Geography*, *eclipſes* diſcover the LONGITUDES of different places; for which purpoſe thoſe of the moon are the moſt uſeful, becauſe they are more frequently viſible, and the ſame lunar *eclipſe* is of equal magnitude and duration at all places where it is ſeen. In *Chronology*, both ſolar and lunar *eclipſes* ſerve to determine exactly the time of any paſt event.

ECLIPSES *of the ſatellites*. See SATELLITES *of Jupiter*.

The chief circumſtances here obſerved are, 1. That the ſatellites of Jupiter undergo two or three kinds of *eclipſes*; whereof, the firſt are proper, being ſuch as happen when Jupiter's body is directly interpoſed between them and the ſun; theſe happen almoſt every day. Mr. Flamſteed, and Caſſini, give us tables, wherein immerſions into Jupiter's ſhadow, and emerſions again, are computed to hours and minutes.

The ſecond are occultations, rather than obſcurations; wherein the ſame ſatellites, coming too near to Jupiter's body, are loſt in his light; which Ricciolus calls *occidere zeuſiace*, *ſetting jovially*. In which caſe, Jupiter's neareſt ſatellite exhibits a third kind of *eclipſe*; being obſerved like a macula, or dark round ſpot, tranſiting Jupiter's diſc, with a motion contrary to that of the ſatellite; juſt as the moon's ſhadow projected on the earth, will appear to do, to the lunar inhabitants.

The *eclipſes* of Jupiter's ſatellites furniſh the beſt means of finding the longitude at ſea. Thoſe, particularly, of the firſt ſatellite, are much ſurer than the *eclipſes* of the moon, and they alſo happen much oftener; beſide that, the manner of applying them is very eaſy. See LONGITUDE.

ECLIPTIC, ECLIPTICUS, ſomething belonging to eclipſes.

All new and full moons are not *ecliptic*, i. e. eclipſes do not happen every new and full moon, though there be then an interpoſition, either of the earth between the ſun and moon, or of the moon between the ſun and earth. The reaſon is, that the interpoſition is only as to longitude, and not as to latitude. The ſun is always in the *ecliptic*, but the moon is not; ſhe deviates from it above five degrees, and $\frac{1}{3}$, ſometimes on the north ſide, and ſometimes on the ſouth. But every five months, or thereabouts, ſhe cuts the *ecliptic*; and it is only about thoſe times, that there can be eclipſes either of the moon or ſun.

The places wherein ſhe cuts the *ecliptic*, are called the *nodes* of the moon.

ECLIPTIC *bounds*, or *limits*, are the greateſt diſtances from the nodes at which the ſun or moon can be eclipſed; namely, between 17 and 18 degrees for the ſun, and 12 for the moon.

ECLIPTIC *digits*, *digiti ecliptici*. See DIGITS.

ECLIPTIC is more particularly uſed for a line, or circle, in the ſphere of the ſtars, under which the center of the ſun apparently proceeds in its proper motion; or a line, which the ſun's center deſcribes in his annual progreſs.

It has its name *ecliptic*, becauſe all eclipſes happen when the two planets are in or near the nodes, or interſections of the *ecliptic*.

It is alſo called the *ſun's orbit*, and *ſun's way*, becauſe the ſun never deviates from it, in his apparent annual motion from weſt to eaſt.

The north, or aſcending node of the *ecliptic*, is called the *dragon's head*; and the ſouth, or deſcending node, the *dragon's tail*.

The *ecliptic* is placed obliquely with reſpect to the equator, and cuts it in two points, viz. the beginning of Aries and Libra, which are directly oppoſite to each other; and, accordingly, we find the ſun twice every year in the equator; and all the reſt of the year, either on the north or ſouth ſide thereof.

The *ecliptic* is a great circle of the ſphere, biſected by the horizon; conſequently, the arch of the *ecliptic*, intercepted between the horizon and the meridian, is a quadrant. And again, the ſolſtitial points of the *ecliptic*, i. e. thoſe moſt remote from the equator, are a quadrant diſtant from the equinoctial points. Laſtly, as the point of the *ecliptic*, which has the greateſt declination, with reſpect to the equator, is diſtant by a quadrant from the equinoctial points; the diſtance of this point from the equator will be the meaſure, or quantity, of the obliquity of the *ecliptic*, i. e. of the angle, formed by the interſection of the equator with the *ecliptic*.

The obliquity of the ecliptic, or the angle it makes with the equator, is about 23° 28′; which, therefore, is the greateſt declination of any point of the *ecliptic* from the equator; the points of which greateſt declination on each ſide, are called the *ſolſtitial points*; through which are drawn the two tropics, parallel to the equator.

The method of obſerving the greateſt declination of the *ecliptic* is thus: about the time of the ſummer ſolſtice obſerve the ſun's meridian altitude with the utmoſt care, for ſeveral days ſucceſſively: from the greateſt altitude obſerved, ſubtract the height of the equator; and the remainder is the greateſt declination, which is the ſolſtitial point.

Or, it may be found by obſerving the meridian altitude of the ſun's center on the days of the ſummer and winter ſolſtice; the difference of thoſe altitudes will be the diſtance of the tropics; and half that diſtance will be the obliquity of the *ecliptic*.

Ricciolus, e. gr. at Bologna, in the year 1646, obſerved the ſun's meridian altitude, on the 20th of June, to be 68° 59′ 55″; on the 21ſt, 69° 0′ 10″; and on the 22d, 68° 59′ 55″. The greateſt then was, 69° 0′ 10″; from which the altitude of the equator, 45° 29′ 50″, being ſubtracted, left 23° 30′ 20″ for the greateſt declination.

It has been matter of great diſpute among the late aſtronomers, whether the *obliquity of the ecliptic* be fixed or variable. To determine the point, the obſervations of the aſtronomers of all ages have been collected together, the chief of which may be ſeen in the following table.

Author's Names	Years before Chriſt	Obliquity		
		°	′	″
Pytheas	324	23	49	23
Eratoſthenes and Hipparchus	230 and 140 after Chriſt	23	51	20
Ptolemy	140	23	48	45
Almacmon	832	23	35	
Albategnius	880	23	35	
Thebat	911	23	33	30
Abul Waſi and Hamed	999	23	35	
Perſian Tables in Chryſococca	1004	23	35	
Albatrunius	1007	23	35	
Arzachel	1104	23	33	30
Almæon	1140	23	33	30
Choja Naſſir Oddin	1290	23	30	
Prophatius the Jew	1300	23	32	
Ebn Shattir	1363	23	31	
Purbachius and Regiomontanus	1460	23	30	
Ulugh Beigh	1463	23	30	17
Waltherus	1476	23	30	
Corrected by refraction, &c.	——	23	29	8
Wernerus	1510	23	28	30
Copernicus	1525	23	28	24
Egnatio Danti	1570	23	29	
Prince of Heſſe	1570	23	31	
Rothmannus and Byrgius	1570	23	30	20
Tycho Brahe	1584	23	31	30
Corrected	——	23	29	
Wright	1594	23	30	
Kepler	1627	23	30	30
Gaſſendus	1630	23	31	
Ricciolus	1646	23	30	
Corrected	1655	23	29	
Hevelius	1653	23	30	20
Corrected	1661	23	28	51½
Caſſini	1655	23	29	15
Mouton's, corrected, &c.	1660	23	29	3
Richer, corrected	1672	23	28	51½
De la Hire	1686	23	29	
Corrected	——	23	29	28
Flamſteed	1690	23	29	
Bianchini	1703	23	28	25
Roemer	1706	23	28	41
Louville	1715	23	28	24
Godin	1730	23	28	20
Bradley	1750	23	28	18
Mayer	1756	23	28	16
Hornſby	1772	23	28	8
Nautical Almanac	1779	23	28	7

Riccioli Alm. vol. i. lib. iii. cap. 27. Ptolem. Alm. lib. i. cap. 10. Flamſteed Proleg. Hiſt. Cœl. vol. iii. Phil. Tranſ. N° 163. Ib. vol. lxiii. part i. p. 125. Naut. Alm. 1779. Long's Aſtr. vol. i. cap. 16.

Upon the whole, as the oldeſt obſervations make the obliquity the greateſt, it appears to be mutable, and in a conſtant decreaſing ſtate. The chevalier de Louville, who has examined the merits of the cauſe with great attention, and made allowances for refraction and ſun's parallax, is of the ſame opinion. He gives us the reſult of his reſearches in the Memoirs of the Royal Academy, for the year 1716, viz. that the obliquity of the *ecliptic* diminiſhes at the rate of a minute in 100 years. His diſſertation is publiſhed in Latin in the Acta Erud. Lipſiæ, A. D. 1719.

According to an ancient tradition of the Egyptians, men-

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tioned by Herodotus, the *ecliptic* had formerly been perpendicular to the equator: this notion they were led into, by obſerving, for a long ſeries of years, that the obliquity was continually diminiſhing; or, which amounts to the ſame, that the *ecliptic* was continually approaching to the equator. From hence they took occaſion to ſuſpect, that thoſe two circles, in the beginning, had been as far off each other as poſſible. Diod. Siculus relates, that the Chaldeans reckoned 403000 years from their firſt obſervations, to the time of Alexander's entering Babylon. This enormous account may have ſome foundation, ſuppoſing the Chaldeans to have built on the diminution of the obliquity of the *ecliptic* of a minute in 100 years. M. de Louville, taking the obliquity ſuch as it muſt have been at the time of Alexander's entrance into Babylon, and going back to the time when the *ecliptic*, at that rate, muſt have been perpendicular to the equator, actually finds 402942 Egyptian, or Chaldean years, which is only 58 years ſhort of the former epocha. In the general, there is no way of accounting for the fabulous antiquity of the Egyptians, Chaldeans, &c. ſo probable, as from the ſuppoſition of long periods of very ſlow celeſtial motions, whereof they had obſerved a little part, and thence calculated the beginning of the period; making the world and their own nation to commence together. If M. de Louville's ſyſtem be true, in 140000 years more the *ecliptic* and equator muſt coincide.

Godin, in the Memoirs of the Royal Academy for 1734, rejects the concluſions deduced by Louville from the obſervations of ancient aſtronomers, and, by comparing thoſe of Caſſini in 1655, which give the obliquity of the *ecliptic* 23° 29′ 15″, with others made at Paris, and elſewhere, ſince the year 1730, which make the obliquity no more than 23° 28′ 20″, he infers, that it diminiſhes at the rate of 55″ in 80 years, or nearly, at the rate of 1′ in 90 years.

Mr. Hornſby, comparing the reſult of his own obſervations, which gives the mean obliquity in 1772, 23° 28′ 8″, with the mean obliquity aſſigned by Mr. Flamſteed in 1690, viz. 23° 28′ 55,3″, concludes, that the obliquity has diminiſhed 47″ in 81 years, or at the rate of 58″ in 100 years; which, he obſerves, will be found nearly to correſpond with the mean of the computations framed by Mr. Euler, and Mr. de la Lande, upon the principles of attraction. Other writers have made it ſtill leſs. Phil. Tranſ. vol. lxiii. part i. p. 125.

However, M. Caſſini, and M. le Monnier, are of opinion, that the obliquity of the *ecliptic* hath no other variation than what the mutation of the earth's axis will occaſion. Mem. R. Acad. 1762, & 1767.

But there is reaſon to believe, by comparing the more accurate obſervations in the preceding table, e. gr. thoſe of Ptolemy, Tycho, Flamſteed, Mayer and Bradley, that the obliquity of the *ecliptic* does gradually decreaſe, and probably at the rate of about half a ſecond in a year. And if we conſider, that the earth is not a perfect ſphere, but an oblate ſpheroid, having its axis ſhorter than its equatorial diameter; and that the ſun and moon are conſtantly acting obliquely upon the greater quantity of matter about the equator, drawing it, as it were, to a nearer and nearer coincidence with the *ecliptic*; it will not appear improbable that theſe actions ſhould gradually leſſen the angle between the planes of theſe circles. Nor is it leſs probable, that the mutual attraction of all the planets ſhould have a tendency to bring their orbits to a coincidence, though the change, being very ſmall, is not ſenſible for many ages. See NUTATION, PRECESSION, and STAR.

The *ecliptic* is divided into twelve parts, called *ſigns*. See SIGN.

ECLIPTIC, *poles of the*. See POLE.

ECLIPTIC, *reduction to the*. See REDUCTION.

ECLIPTIC, in *Geography*, &c. is a great circle of the globe, cutting the equator under an angle of 23° 28′. See GLOBE.

The *terreſtrial ecliptic*, therefore, is in the plane of the *celeſtial ecliptic*; like which it has its equinoctial and ſolſtitial points, and is bounded by tropics.

ECLOGARII, among the *Ancients*, were perſons who ſelected the beſt pieces of the books they read, which, for that reaſon, were called *eclogues*, or ſelect pieces. See ECLOGUE.

ECLOGUE, Εκλογη, in *Poetry*, a kind of paſtoral compoſition, wherein ſhepherds are introduced converſing together. The *eclogue* is properly an image of the paſtoral life.

The beauty of the *eclogue*, M. Fontenelle obſerves, is not attached to what is rural, but rather to what is calm and eaſy in the rural life.

Yet there are *eclogues* in Theocritus of a lofty character; and Virgil has ſome in the ſublime ſtyle: the *eclogue*, therefore, occaſionally raiſes its voice. Yet M. Fontenelle eſteems it a fault in ſome modern poets, to have put matters of high concern in their *eclogues*, and to have made their ſhepherds ſing the praiſes of kings and heroes. Roſnard, in particular, has made himſelf ridiculous, by giving the *eloge* of Budæus and Vatable in his firſt *eclogue*, from the ſhepherd Margot. Such perſons ſhould have been above the knowlege of the ſimple Margot. The ſentiments in *eclogues*, the ſame author obſerves, ſhould be finer and more delicate than thoſe of real ſhepherds; only their form ſhould be as ſimple and rural as can be. But this ſimplicity excludes none beſides glaring and exceſſive ornaments.

Since the eſtabliſhment of the academy, or aſſembly of Arcadians at Rome, about the year 1690, the taſte for *eclogues* has been greatly improved among the Italians. Thoſe gentlemen, who are the flower of the wits of Italy, take the name of the ſhepherds of Arcadia. and will not allow their aſſembly to be treated as an academy. They have each of them a poetical name, which is always that of ſome ſhepherd; and apply themſelves particularly to *eclogues*, as pieces moſt proper to their profeſſion. See ACADEMY.

The word *eclogue* is formed from the Greek εκλογη, *choice*. So that, according to the etymology of the word, *eclogue* ſhould be no more than a ſelect or choice piece; but cuſtom has determined it to a farther ſignification, viz. a little elegant compoſition in a ſimple natural ſtyle and manner.

Idyllion and *eclogue*, in their primary intention, are the ſame thing: thus the Idyllia, Ειδυλλια, of Theocritus, are pieces written perfectly in the ſame vein with the *Eclogæ* of Virgil.

But cuſtom has made a difference between them, and appropriated the name *eclogue* to pieces wherein ſhepherds are introduced ſpeaking; idyllion, to thoſe written like the *eclogue*, in a ſimple natural ſtyle, but without any ſhepherds in them. Some imagine the name *eclogue* to have been originally attributed to ſuch poems as were written in imitation of others; ſuch as the *Eclogues* of Virgil, which are only imitations of Theocritus.

Others are of opinion, the word was firſt formed from αιξ, αιγος, *goat*, and λογος, *diſcourſe*, q. d. a converſation or diſcourſe of goats, or goatherds. But Ruæus, in his notes on Virgil, thinks they would then have made it Αιγολογια, *ægology*, rather than *eclogue*; or, at leaſt, the word would have been written in Greek with αι, and in Latin by æ, not *e*.

Barthius advances another opinion; viz. that the name *eclogue* was given to all poetical compoſitions that were of a moderate length, though too ſhort to give them the name of books; and that hence it is that Statius, in the epiſtle at the head of the third book of his Sylvæ, and in the preface to his fourth book, calls his poems *Eclogues*; though he had not called them ſo in the title.

Auſonius, in the preface to his Cupid crucified, calls alſo his idylls *eclogues*. Add, that Cruquius, in his comment on Horace, declares that he had ſeen very ancient manuſcripts, wherein the ſatires of the poet are called *eclogues*; in which he is ſeconded by our learned countryman, Mr. Baxter.

ECLOGUE is alſo applied to certain compoſitions in proſe. Thus we read of the *eclogues* of Diodorus, of Polybius, of Cteſias, Theophraſtus, Strabo, &c. In which ſenſe the word only ſignifies *extract*, or *collection*.

ECLYSIS, from εκλυω, *I faint*, a word uſed, by the ancient phyſicians, for a general faintneſs and feebleneſs of all parts of the body. Hippocrates uſes it for a loſs of voice, with a general decay of ſtrength, and, in ſome other places, for a great weakening of the body, by violent diſcharges by ſtool.

ECMARTYRIA, Εκμαρτυρια, in *Antiquity*, a kind of ſecond-hand evidence, admitted in the Athenian courts. It was not founded on the knowlege of the witneſs himſelf, but on that of another perſon, who had been an eye-witneſs of the fact in queſtion, but was at this time either dead, or in a foreign country, or detained by ſickneſs; for, except in ſuch caſes, the allegations of abſent perſons were never taken for lawful evidence. Pott. Archæol. Græc. lib. i. cap. 21. tom. i. p. 117.

ECNEPHIAS, from εκ and νεφος, a *cloud*, a word uſed, by Galen, to expreſs a peculiar ſort of fever, which, he ſays, was at once hot and humid, and which he therefore reſembles, by the name, to the ſun breaking out from a watery cloud.

ECOUTE', in the *Manège*, is uſed for a pace, or motion of a horſe, when he rides well upon the hand and the heels, is compactly put upon his haunches, and hears, or liſtens, to the heels or ſpurs; and continues duly balanced between the heels, without throwing to either ſide. This happens when a horſe has a fine ſenſe of the aids of the hand and heel.

ECPHONESIS, Εκφωνησις, in *Rhetoric*, the ſame with EXCLAMATION.

ECPHORA, from εκ, *out*, and φερω, *I bear*, *Projecture*, in *Archi-*

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Architecture, uſually denotes the line, or diſtance, between the extremity of a member, or moulding, and the naked of the column, or other part it projects from.

Some authors, however, account the *ecphora*, or projecture, from the axis of the column; and define it to be the right line intercepted between the axis and the outermoſt ſurface of a member or moulding. See PROJECTURE.

ECPHRACTICS, Εκφρακτικα, in *Medicine*, ſuch remedies as have a faculty of opening and unſtopping the veſſels through which the humours are to paſs; or which incide and attenuate tough viſcid humours, and thereby promote their diſcharge. They are the ſame with *aperients* and *deobſtruents*.

The word is formed from the Greek εκφρασσειν, *to free from obſtructions*; of εκ and φρασσω, *obſtruo, ſepio*.

The chief ſimple *ecphractics*, are the little centaury, wormwood, agrimony, hyſſop, chamædrys, bark of tamariſk, roots of capers, ſcolopendrium, &c.

ECPHRAXIS, in *Medicine*, is taking away obſtructions in any part. Blancard.

ECPHYSESIS, from εκ and φυσαω, *I breathe*, in *Medicine*, is a diſeaſe in which the patient breathes thick.

ECPHYSIS, of εκ and φυω, *I produce*, in *Anatomy*, is any proceſs that coheres with, or adheres to a bone.

ECPIESMA, Εκπιεσμα, from εκ and πιεζω, *I preſs*, in *Chirurgery*, a kind of fracture of the ſkull, &c. wherein there are ſeveral ſplinters, that preſs and diſorder the inner membranes. See FRACTURE.

ECPIESMUS, Εκπιεσμος, in the ancient writers of *Medicine*, a word uſed to expreſs a diſtemperature of the eye, which conſiſts in a very great prominence of the entire globe of the eye, which is, as it were, thruſt out of its ſocket, or orbit, by a great flux of humours, or an inflammation.

ECPLEROMA, of εκ and πληροω, *I fill*, in the writings of the *Ancient Phyſicians*, the name given to a kind of cuſhion of leather, ſtuffed with ſome firm ſubſtance, and fitted to the cavities of the arm-pits, uſed in reducing luxations of the humerus.

ECPLEXIS, from εκπλησσω, *I am diſturbed*, in the writings of the *Ancient Phyſicians*, a word uſed to expreſs a tranſport of mind, proceeding from ſome ſudden perturbation. Hippocrates and Galen uſe the word to ſignify a ſtupor, or ſtupefaction, in which the patient lies without motion, without ſpeaking, or ſtirring, and with his eyes open.

ECPNEUMATOSIS, in *Medicine*, the ſame with expiration.

ECPNOE, from εκ and πνεω, *I breathe*, a word uſed by medical writers, to expreſs that part of reſpiration, in which the breath is expelled out of the lungs.

ECPTOMA, from εκπιπτω, *I fall out*, a word uſed, by the ancient phyſicians, in three or four different ſenſes. It is ſometimes made to expreſs a luxation, or diſlocation of a bone. Sometimes it is uſed for the falling off of any corrupted part, ſometimes for the excluſion of the ſecundines after child-birth, and ſometimes for a falling down of the womb, or a deſcent of the omentum or the inteſtine into the ſcrotum.

ECPTOSIS, in *Surgery*, the ſame with luxation.

ECPUCTICA, from εκπυεω, *I ſuppurate*, in the *Materia Medica*, are condenſing medicines.

ECREGMA, from εκρηγνυμι, *I break off*, properly the name of a part, piece, or ſegment of any thing; but Hippocrates has, in ſome places, uſed it as the name of an eruption.

ECRITHMUS, from εκ, *without*, and ῥιθμος, *number*, in *Medicine*, an irregular pulſe, which obſerves no method, nor number, incident to any age. Blancard.

ECSTASIS *cutis*, from εξιστημι, *I extend*, an extenſion of the ſkin, a term uſed by the ancients, as the oppoſite to corrugatio, or wrinkling.

ECSTATICI, Εκστατικοι, from εξιστημι, *I am entranced*, in *Antiquity*, a kind of diviners, who were caſt into trances or ecſtaſies, in which they lay like dead men, or aſleep, deprived of all ſenſe and motion; but, after ſome time, returning to themſelves, gave ſtrange relations of what they had ſeen and heard. Pott. Archæol. Græc. lib. ii. cap. 12. tom. i. p. 302.

ECSTROPHIUS, from εκστρεφω, *I turn out*, a name given by the ancient writers in medicine, to any thing that threw out the internal tumors of the piles, ſo that external remedies might be applied to them.

ECTHESIS, in *Church Hiſtory*, a name which the emperor Heraclius gave to a confeſſion of faith publiſhed by him in 639.

The word is Greek, εκθεσις, and ſignifies *expoſition*.

The *ecthesis* favoured the error of the Monothelites, and eſtabliſhed only one will and one operation in Jeſus Chriſt. Heraclius publiſhed it at the inſtigation of Athanaſius, chief of the Jacobites, Cyrus patriarch of Alexandria, and Sergius patriarch of Conſtantinople; but the Roman church eſteemed it heretical, rejected it in a council held at Rome, A. D. 639, under the pontiff John IV. though Honorius, in ſpite of his infallibility, had approved it; and another edict was iſſued, ſuppreſſing the *ecthesis*, called the TYPE, which ſoon after ſhared the ſame fate.

ECTHLIMA, from εκθλιβω, *I preſs out*, an ulceration ariſing from a violent compreſſion in the ſurface of the ſkin.

ECTHLIPSIS, in the *Latin Proſody*, a figure whereby an *m* is retrenched, or cut off, chiefly at the end of a word, when the following word begins with a vowel, or an *h*.

The word is Greek, εκθλιψις, which ſignifies *eliſion*.

Thus, in *multum ille, & terris jactatus & alto*. Virg. In ſcanning the verſe, we drop the *m* at the end of *multum*, and only make three ſyllables in the two firſt words, *mult-il-le*.

Some account the *ecthlipſis* a poetical licence in the Latin verſification; but, in reality, the eliſion of an *m* final, when the following word in the ſame verſe begins with a vowel, is a matter of neceſſity, not of licence.

Anciently, the *s* was likewiſe retrenched before a conſonant; as *facundu ſuoque*, for *facundus*, &c. In reality, the *m* and *s* were peculiarly rough and harſh in the Latin pronunciation; as appears from Quintilian; and it was this that led the poets to retrench them at the ends of their words; as the like cauſe induced the French to drop their *e* feminine before a word beginning with a vowel, to avoid the hiatus, or concourſe of vowels.

ECTHYMA, from εκθυω, *I break out*, a name given by Hippocrates to any puſtule, or cutaneous eruption.

ECTHYMOSIS, of εκ, *ex*, and θυμος, *animus, mind*, in *Medicine*, a vehement agitation and dilatation of the blood and ſpirits; ſuch as happens in extraordinary emotions of joy.

ECTOMIAS, from εκτεμνω, *I cut off*, a name uſed by the ancient phyſicians, to expreſs a caſtrated animal.

ECTRIMMA, from εκτριβω, *I rub off*, excoriation or galling. Hippocrates has uſed the word particularly to expreſs exulcerations of the ſkin about the os ſacrum, contracted by lying long in one poſture, in caſes of fractures of the thigh, or in lingering illneſſes, in which the patient is confined to his bed for a long time.

ECTROPIUM, from εκτρεπω, *I turn out*, in *Surgery*, that diſtemperature of the eye-lids, in which they are everted or retracted, ſo as to ſhew their internal or red ſurface, and cannot ſufficiently cover the eye. Sometimes this is a ſimple and original diſorder, and ſometimes it is only a ſymptom of ſome other, as of an inflammation, ſarcoma, tumor, or the like. This ſometimes owes its original to the contraction of the ſkin of the eye-lids, by the ſcar of a wound, ulcer, burn, &c. or to the induration and contraction of the ſkin, after an inflammation, and ſometimes it in a great meaſure proceeds from the injudicious uſe of aſtringent collyriums, or eye-waters.

When this diſorder is become inveterate, it is not eaſily cured; while recent, it is to be attempted by relaxing and elongating the ſkin of the eye-lid, by the application of emollients, ſuch as the vapours of hot milk, or water, oil of almonds, mucilage of quince-ſeed, and ointment of marſhmallows. Theſe muſt be repeated every day, the ſkin of the eye-lid drawn frequently towards its right poſition, and when the patient goes to bed, the eye-lids ſhould be brought together, and reſtrained in their proper poſture by a plaſter, compreſs, and bandage. But if all this fail, and the caſe yet appear not incurable, manual operation muſt take place.

The operation is performed in the following manner: firſt a ſemilunar inciſion is to be made in the external ſkin of the eye-lid, next its tarſus, or cartilaginous margin, making the angles of the inciſion, downward in the upper lid, and upward in the under, that by this means the ſkin may be elongated. If it does not appear ſufficiently let out by one inciſion, two or three more may be made, running parallel with the firſt, and at the diſtance of a ſmall packthread. When the eye-lid is thus ſufficiently elongated, the inciſions muſt be dreſſed firſt with dry lint ſtuffed into them, and afterwards with lint, armed with ſome vulnerary unguent, which will prevent the ſkin from growing together again, and will occaſion new fleſh to be formed in the place, which will elongate the ſkin. Laſtly, to forward the extenſion and cure, a piece of ſticking plaſter ſhould be faſtened to the eye-lid, to keep it extended, and this muſt be continued till the eye will ſhut cloſe. When this caſe has continued from the patient's birth, the cure is very difficult, and it is a yet more hopeleſs caſe, when it happens to old people, from a weakneſs of the orbicular muſcle. Heiſter's Surgery, p. 372.

ECTROTICA, from εκτιτρωσκω, *I cauſe to miſcarry*, a name given, by the ancient phyſicians, to ſuch medicines as have a power to occaſion abortion.

ECTY-

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ECTYLOTICS, Εκτυλωτικα, from εκ, and τυλος, *callus*, remedies proper to conſume and eat off calluſes, warts, and other excreſcences, formed on the fleſh.

ECTYPE, Εκτυπον, among *Medalliſts*, an emboſſed figure, or impreſſion of a ſeal, ring, or medal; or a figured copy of an inſcription, or other ancient monument.

The word is Greek: αρχετυπον denotes the *original*, or *model*; ετυπον, the *copy*, or *image*, moulded or ſtruck in *creux*; and εκτυπον, *ectypon*, the image in *relievo*, or *emboſſed*.

ECTYPE *Craticular*. See ANAMORPHOSIS.

ECU, or ESCU, the French crown. See CROWN, ESCU, and COIN.

ECU *ancient*, in *Heraldry*, a term ſignifying the ancient ſhield. By this they mean the antique triangular-ſhaped ſhield, on which the arms of the noble families of France have been painted. This ſhield is to be ſeen on old gems, and ſome ruins; but the modern ſhield, which is ſquare, and rounded and pointed at the bottom, has baniſhed the uſe of this.

ECURIE, in the *Manege*, the covert-place for the lodging or houſing of horſes. The word is French. We uſe *ſtable* in common diſcourſe.

ECURY. See EQUERY.

ECUSSON, in *Heraldry*, an ineſcutcheon, or little eſcutcheon. See ESCUTCHEON.

ECUYER, in the French *Manege*, is uſed for the riding-maſter. Sometimes it denotes certain officers in the king of France's houſhold, who help the king in mounting his horſe and alighting, and follow him on horſeback, and carry his ſword. Theſe are called *ecuyers de quartier*.

Gentlemen-uſhers to the queen of France, and the maſters of the horſe to princes, and perſons of quality, are alſo called *ecuyers*. Beſides theſe, there are others called *ecuyers cavalcadours*. See CAVALCADOUR.

ECZEMA, from εκζεω, *I am externally hot*, a name given, by the ancient phyſicians, to any fiery puſtule on the ſkin.

EDDA, in *Antiquities*, is a ſyſtem of the ancient Icelandic, or Runic mythology, containing many curious particulars of the theology, philoſophy, and manners, of the northern nations of Europe; or of the Scandinavians, who had migrated from Aſia, and from whom our Saxon anceſtors were deſcended. Mr. Mallet apprehends that it was originally compiled, ſoon after the Pagan religion was aboliſhed, as a courſe of poetical lectures, for the uſe of ſuch young Icelanders as devoted themſelves to the profeſſion of a *ſcald* or poet. It conſiſts of two principal parts; the *firſt* containing a brief ſyſtem of mythology, properly called the *Edda*; and the *ſecond* being a kind of art of poetry, and called *Scalda*, or *Poetics*. The moſt ancient *Edda* was compiled by Soemund Sigfuſſon, ſurnamed the *Learned*, who was born in Iceland about the year 1057. This was abridged, and rendered more eaſy and intelligible, about a hundred and twenty years afterwards, by Snorro Sturleſon, who was ſupreme judge of Iceland in the years 1215 and 1222; and it was publiſhed in the form of a dialogue. He added alſo the ſecond part in the form of a dialogue, being a detail of different events tranſacted among the divinities. The only three pieces that are known to remain of the more ancient *Edda* of Soemund, are the Voluſpa, the Havamaal, and the Runic chapter. The Voluſpa, or prophecy of Vola or Fola, appears to be the text, on which the *Edda* is the comment. It contains in two or three hundred lines the whole ſyſtem of mythology, diſcloſed in the *Edda*, and may be compared to the Sibylline verſes, on account of its laconic yet bold ſtyle, and its imagery and obſcurity. It is profeſſedly a revelation of the decrees of the Father of nature, and the actions and operations of the gods. It deſcribes the chaos, the formations of the world, with its various inhabitants, the function of the gods, their moſt ſignal adventures, their quarrels with Loke, their great adverſary, and the vengeance that enſued; and concludes with a long deſcription of the final ſtate of the univerſe, its diſſolution and conflagration, the battle of the inferior deities, and the evil beings, the renovation of the world, the happy lot of the good, and the puniſhment of the wicked. The Havamaal, or *Sublime Diſcourſe*, is attributed to the god Odin, who is ſuppoſed to have given theſe precepts of wiſdom to mankind; it is comprized in about a hundred and twenty ſtanzas, and reſembles the book of Proverbs. Mr. Mallet has given ſeveral extracts of this treatiſe on the Scandinavian ethics. The Runic chapter contains a ſhort ſyſtem of ancient magic, and eſpecially of the enchantments wrought by the operation of Runic characters, of which Mr. Mallet has alſo given a ſpecimen. A manuſcript copy of the *Edda* of Snorro is preſerved in the library of the univerſity of Upſal; the firſt part of which hath been publiſhed with a Swediſh and Latin verſion, by M. Goranſon. The Latin verſion is printed as a ſupplement to Mr. Mallet's Northern Antiquities. The firſt edition of the *Edda* was publiſhed by Reſenius, profeſſor at Copenhagen, in a large quarto volume, in the year 1665; containing the text of the *Edda*, a Latin tranſlation by an Icelandic prieſt, a Daniſh verſion, and various readings from different MSS. Mr. Mallet has alſo given an Engliſh tranſlation of the firſt part, accompanied with remarks; from which we learn, that the *Edda* teaches the doctrine of the Supreme, called the Univerſal Father, and Odin, who lives for ever, governs all his kingdom, and directs the great things as well as the ſmall; who formed the heaven, earth, and air; made man, and gave him a ſpirit or ſoul, which ſhall live, after the body ſhall have mouldered away; and then all the juſt ſhall dwell with him in a place called *Gimle* or *Vingolf*, the palace of friendſhip; but wicked men ſhall go to *Hela*, or death, and from thence to *Niſlheim*, or the abode of the wicked, which is below in the ninth world. It inculcates alſo the belief of ſeveral inferior gods and of goddeſſes, the chief of whom is Frigga, or Frea, i. e. *lady*, meaning hereby the earth, who was the ſpouſe of Odin, or the Supreme God; whence we may infer that, according to the opinion of theſe ancient philoſophers, this Odin was the active principle or ſoul of the world, which uniting itſelf with matter, had thereby put it into a condition to produce the intelligences, or inferior gods, and men, and all other creatures. The *Edda* likewiſe teaches the exiſtence of an evil being, called Loke, the calumniator of the gods, the artificer of fraud, who ſurpaſſes all other beings in cunning and perfidy. It teaches the creation of all things out of an abyſs or chaos; the final deſtruction of the world by fire; the abſorption of the inferior divinites, both good and bad, into the boſom of the grand divinity, from whom all things proceeded, as emanations of his eſſence, and who will ſurvive all things; and the renovation of the earth in an improved ſtate. Fables 1, 2. 10. 16. 33. For a farther account of the *Edda*, ſee Mallet's Northern Antiquities, vol. ii. 1770, paſſim.

EDDISH, or EADISH, the latter paſture, or graſs, which comes after mowing, or reaping; otherwiſe called *eargraſs*, *eartſh*, and *etch*.

EDDY, Sax. of *ed*, *backward*, and *ea*, *water*, in *Sea Language*, is when the water, at any place, runs back, contrary to the tide, or ſtream, and ſo falls into the current again.

The ſeamen call that *eddy water* which falls back, as it were, on the rudder of a ſhip under ſail, the *dead water*. An *eddy wind* is that which returns, or is beat back, from any ſail, &c.

EDELING. See EDHILING, and ATHELING.

EDESSENUM, the name of a famous collyrium, reckoned among the number of the *monohemera*, or ſuch as cured certain diſorders of the eyes, in one day. It is ſuppoſed to have had its name *Edeſſenum* from the city of Edeſſa, where it was firſt invented, and in great uſe. Its compoſition was this: take gum arabic, tragacanth, ſarcocolla, acacia, and ſtarch, of each two drams; opium, four drams; ceruſe, eight drams; cadmia, ſixteen drams; theſe were all to be reduced to a fine powder, and afterwards mixed with a ſufficient quantity of water, to be uſed to waſh the eyes.

EDGE *in with a ſhip*, in the *Sea Language*, is ſaid of a chace, that is making up to it.

EDGE *away*, is to decline gradually from the ſhore, or from the line of the courſe which the ſhip formerly ſteered, when ſhe ſails nearer the direction of the wind, or *larger* before the wind.

EDGINGS, in *Gardening*, rows of ſhrubs, herbs, or flowers, placed by way of borders around beds, compartiments, &c. For the *edgings* of compartiments, box ſeems the moſt proper. See BOX.

EDHILING, EDHILINGUS, an ancient appellation of the nobility among the Anglo-Saxons.

The Saxon nation, ſays Nithard, Hiſt. lib. iv. is divided into three orders, or claſſes of people; the *edhilingi*, the *friilingi*, and the *lazzi*; which ſignify the nobility, the freemen, and the vaſſals or ſlaves.

Inſtead of *edhiling*, we ſometimes meet with *atheling*, or *ætheling*; which appellation was likewiſe given to the king's ſon, and the preſumptive heir of the crown. See ATHELING.

EDICT, an inſtrument, ſigned and ſealed by a prince, to ſerve as a law to his ſubjects.

Edicts have no room in England, where the enacting of laws is not lodged in the king, but in the parliament.

In the Roman law we find frequent mention of the *edict of the prætor*, *quod prætor edixit*, which was a phraſe appropriated to the ordinances of the prætor; though it was ſometimes alſo uſed on other occaſions.

In the French law, *edicts*, *edits*, make a great figure; they are of various kinds; ſome importing a new law, or regulation,

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gulation, as the *edict* of duels, that of second marriages, &c. Others the erection of new offices, establishment of duties, rents, &c. Sometimes articles of pacification, as the *edict* of Nantz, passed by Henry IV. in 1598, and revoked by Louis XIV. in 1685, &c.—*Edicts* are all sealed with green wax, to shew that they are perpetual and irrevocable.

Edicts with them are much the same as proclamations with us; but with this difference, that the former have the authority of a law in themselves, from the power which issues forth; whereas the latter are only declarations of a law, to which they refer, and have no power in themselves.

EDICT, *chamber of the.* See CHAMBER.

EDIFICE, ÆDIFICIUM, a building. See BUILDING.

The word is formed of the Latin, *ædes* and *facio, I make.*

EDILE, or rather ÆDILE. See ÆDILE.

EDITOR, of *edo, I publish,* in the commonwealth of learning, a person who takes care of publishing the work of another author, usually an ancient author.

Erasmus was a great *editor* of ancient writings; the Louvain doctors, Scaliger, Petavius, Fa. Sirmond, bishop Walton, Mr. Hearn, &c. are learned *editors*; the Benedictines of the Fathers, the Dauphins of the Classics, Hardouin of the Councils, &c.

EDUCATION, the art of bringing up, forming, and instructing children.

The follies of a too delicate *education* are well expressed in that device of an ape; which, by over caressing and hugging its young ones, strangles them; with this motto, *complectando necat.* Octavius Ferrarius has a very good Latin treatise on the subject of *education,* intitled *Chiron*; the name of the centaur, who was Achilles's tutor.

Mr. Locke's excellent treatise of *Education* is known to every body. Quintilian employs the second chapter of his first book in enquiring whether a domestic, or a college *education* be preferable, i. e. whether it be better to bring up one's children at home, or send them to the colleges and public schools. After urging all that can be said on either side, he concludes for a college or school *education.*

The plan of *education,* whether it be domestic or collegiate, should be suited to the station and views of parents, and to the genius of their children; and it is also right to consult their constitution and inclination. It is of great importance, that those who are destined to occupy superior stations in society, should enjoy the benefits of an enlarged and liberal *education*; that they should be furnished with every substantial and ornamental accomplishment; and those that are intended for any particular profession or employment, should be principally directed to those studies which are appropriated to their respective views; and in every rank of life, an attention to the morals of youth should be a primary object. Though the municipal laws of most countries have made no provision for constraining a parent to bestow a proper *education* on his children; yet in the case of religion they are under peculiar restrictions in our own country. Some of these restrictions, as they affect protestants who dissent from the religion of the state, may be thought both impolitic and injurious, and have, therefore, lately been considerably relaxed; but those which are designed to prevent the progress of popery, are prudent and necessary. Thus, if any person sends a child under his care beyond the seas, to be instructed in any popish college, &c. in the principles of the popish religion, or shall contribute towards his maintenance, he shall forfeit one hundred pounds, besides the disabilities incurred by the child so sent. 1 Jac. I. cap. 4. and 3 Jac. I. cap. 5. 11 and 12 W. III. cap. 4. and both shall be incapable of suing in law or equity, of being executor or administrator, of enjoying any legacy or deed of gift, or of bearing any office in the realm; and he shall forfeit all his goods and chattels, and likewise all his real estate for life. 3 Car. I. cap. 2.

EDULCORATION, of *edulco, I sweeten,* in *Pharmacy,* is the dulcifying or sweetening of any food, or remedy, by means of honey, sugar, or syrups.

EDULCORATION, in *Chemistry,* denotes the freshening or purging any thing of its salts, by repeated lotions, or washings in cold water.

Such is the dulcifying of the precipitates of mercury, metals, &c. by washing away those sharp salts, by whose means they had been dissolved, or which had been mingled with them, to effect a dissolution. See ABLUTION.

EDULCORATION, in *Metallurgy,* is the separating, by a solution in water, the salts that have been left adhering to a body after any operation. This is properly a kind of moist solution, the saline parts adhering to bodies, not soluble in water, being by that menstruum taken up, and eaten off from the body, and the solution afterwards separated from the remaining solid, either by subsidence or filtration.

It is proper, in this situation, to enlarge the surface of the body to be edulcorated, by pounding it in a mortar, that the solution may have the speedier success; and for this purpose, it should also be kept continually stirring with a stick, while the water is on it, that all the parts of the body to be edulcorated which otherwise would some of them sink to the bottom, and remain applied against the bottom of the vessel it is performed in, may be made equally at one time or other contiguous to the particles of the edulcorating fluid, by which all solutions are indeed greatly facilitated. Boiling water is also, in some cases, requisite, for the heat of that, by the inward motion and rarefaction it occasions, promotes, in an extraordinary manner, saline solutions.

A perfect ablution from the salt, however, is not always obtained by this method; for as every part of the menstruum contains in it a proportionable quantity of the matter dissolved; and there remains always some part of the menstruum thus impregnated in the body to be edulcorated, it is evident that there also remains in it the proportionable quantity of salt for that menstruum. Let us take, for instance, the alkaline salt in wood-ashes, pour hot water on such ashes, and let them boil together for some time; then by decantation, or otherwise, separate the lye or water impregnated with the salt of the ashes, from the ashes themselves; there will remain, after all you can do to pour it off, at least one-fourth part of the lye among the ashes, and of course a proportionable part of the dissolved salt. Pour more water on this, and decant it off again, a quantity of salt, though much less than the former, will again remain; and so on, if the operation be repeated ever so often; only the salt will be in less and less quantity every time. Very frequent repetitions of this operation are therefore always necessary; and even where the operator has tired himself with them, a nice experimenter will always find some small portion of the salt remaining.

To this remaining of the saline particles, in some degree, after ever so often repeated washings, is owing the great loss artificers usually find in reducing the calxes of gold and silver, made with acids. For the small remainder of the acids which yet adhere, being agitated by an impetuous, and especially by an open fire, carry off in their evaporation a great many particles of the metals with them, not even excepting aqua fortis itself, which is said to be, nay, and really is, of a fixing nature, but that only in a certain degree. Cramer, Art. of Ass. 196.

EDYSTONE *light-house,* lying off Plymouth harbour, was first erected by the corporation of the Trinity-house in 1696; in consideration of which, the masters, &c. of English shipping agreed to pay one penny a ton outwards and inwards. It was demolished by the storm of 1703, and re-erected by act of parliament in the 4th of queen Anne, and the same duty on tonnage of ships granted for its support, which law was enforced in the 8th of Anne. It has been since destroyed and rebuilt.

EEL, *Anguilla,* in *Ichthyology,* a species of the MURÆNA.

The common *eel* is the simple coloured *muræna,* with the lowest jaw longest: it has three fins, viz. two pectoral, standing on each side, and a single low back-fin, which beginning at some distance from the head, runs along the back to the tail, and returns again underneath as far as the *anus.* The extremity of this fin, which forms what may be called the tail, is neither round nor square, but subacute. *Eels* vary much in their colour, from a sooty hue to a light olive-green; and those which are called silver *eels,* have their bellies white, and throughout a remarkable clearness. See GRIGS.

The *eel* is common in all our fresh waters, ponds, ditches, and rivers; and is generally about two feet in length, though some are often caught much larger.

The fat of *eels* is accounted vulnerary, and good in an *alopecia,* cases of deafness, and the hæmorrhoids. The dried livers and galls of *eels,* are recommended by Mr. Boyle, to assist women in hard labour. Boyle's Works, Obs. vol. i. p. 93.

Eel-fishing is of divers kinds, as snigling, bobbing, &c. See FISHING.

There is scarce any animal, the generation of which has so much perplexed and puzzled the thoughts of the learned and curious as this. Aristotle first gave birth to an opinion, that *eels* were of no sex, nor did propagate their species like other animals, but were equivocally gendered of the mud; and as wild and absurd a system as this is, there have not been wanting many, even in these later and more enlightened times, who have given into it. The present age has been so well instructed in the system of animal generation, by the works of Swammerdam, Lewenhoeck, Malpighi, Redi, Ray, and a great number

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ber of other writers, of the ſame valuable kind, that there is left no room to doubt but all animals are produced by the copulation of parents like themſelves; and the oddity of *eels* being found in new ponds, is eaſily accounted for, when we know that Dr. Plot, and many others, have given accounts of whole droves of them leaving one ditch or pond, and croſſing the meadows together to go to another. We know that the *eel*, of all the fiſhes, lives the longeſt out of water; and it is not difficult to conceive, that it may, without any inconvenience, ſpend ſo much time out of that element as is neceſſary for the paſſing from one water to another; and when a number of theſe fiſhes have found a new pond, it is no wonder that they continue in it, ſince they feed on worms and other inſects of the earth; and there is probability that theſe may be found in peculiarly great abundance in the pace where the earth has been newly diſturbed, and where they have not been preyed upon.

Though the learned world at this time generally allows, that *eels* are produced like other animals, by parents of their own kind, yet there remain many doubts about the manner in which this is performed; ſome allowing the *eels* to be like the generality of other animals, of different ſexes in the different individuals; and others affirming that they are all hermaphrodites, each having the parts of generation of both ſexes. Rondeletius affirms, they are of different ſexes; and Mr. Allen, who has given a very curious paper concerning them, in our Philoſophical Tranſactions, is of the ſame opinion; and both ſay, that the parts of the ſexes may be diſcovered, on a careful inſpection, and ſome found to be males, and others females: but theſe parts are, in both ſexes, they ſay, buried in a large quantity of fat; and they are of opinion, that hence proceeded the miſtake of Ariſtotle and his followers, who, not being able to find theſe parts, concluded that they did not exiſt at all.

Among thoſe who allow the *eel* to be produced like other animals, from animal parents, which have the ſexes, ſome are of opinion that they are viviparous; and others, that they are oviparous: but a gentleman of our nation, Mr. Chartwynd, ſeems to have determined this great controverſy, by obſerving, that if the aperture under the belly of the *eel*, which looks red in the month of May, be cut at that time, the young *eels* will be ſeen to come forth alive, after the operation. Mr. Lewenhoeck ſays, that he found an uterus in every *eel* he examined; and therefore concludes, that they are hermaphrodites; and he ſuppoſes that they have no male parts of generation, like thoſe of other animals, but that the office of theſe is performed by a liquor analogous to the male ſeed of animals, which is contained in certain glands, ſituated on the inſide of the uterus itſelf.

The conger, or ſea-*eel*, uſually grows to a very great bigneſs; but the common freſh-water *eel* ſeems intended to have been limited to a certain ſmall ſize; yet, at times, there have been caught ſome which have greatly exceeded this their ſeemingly ſtated limit. The common ſize of the CONGER, or ſea-*eel*, ſee *Tab. Fiſh. fig.* 11. at full growth, is the length of nine or ten foot, and the thickneſs of a man's thigh; and, when of this ſize, they will weigh from thirty to forty, or fifty pounds; though Salvian ſays, they uſually do not exceed thirty. Strabo tells us of ſome of them growing to eighty pound weight; but, by what we ſee of them, there is reaſon to believe, that between twenty-five and thirty pounds weight ſeems their natural ſtint, at full growth; and that thoſe which ſo exceed it, are like the monſtrous common *eels*, accidentally increaſed to a preternatural bulk. Pliny and Solinus talk of *eels* of thirty foot long; but the largeſt we find, even of our monſtrous ones, come greatly ſhort of that. The conger always has a ſort of barbs; and an *eel* that has not thoſe, may always be aſſuredly known by that character alone, to be a true freſh-water *eel*, though ever ſo large. Of this kind, the Thames, and ſome other rivers about London, ſeem to have furniſhed the largeſt of any part of Europe. Mr. Dale commemorates the taking of two of theſe, in the Philoſophical Tranſactions; the one near Crickſea in Eſſex, was five foot five inches long, and meaſured twenty-two inches round. The weight of this was about twenty pounds, which is the ſtint that Aldrovand gives to the freſh-water *eel*, ſaying, that they ſometimes, though very rarely, do come up to this, but that they never exceed it. The other was caught near Maldon, and was ſeven feet long, twenty-ſeven inches in circumference, and its weight was thirty pounds. Out of its back and belly there were taken five pounds of fat. This creature ſeemed to have been brought down the river by the violence of ſome land-flood, and was in a wounded condition when taken by the fiſhermen, having a hurt upon its back, which it ſeemed to have got in paſſing through ſome mill. Both this and the other were evidently freſh-river *eels*: and long ſince theſe, ſo lately, indeed, as in the year 1748, one of theſe large *eels* was taken at Limehouſe, where it was left on ſhore by the tide; it was five foot ſix inches long, and as thick as a man's thigh; its weight was twenty-ſeven pounds.

EEL, *Electrical.* See GYMNOTUS.

EEL, *Indian*, *anguilla Indica*, in *Zoology*, the name of the Eaſt-Indian *eel*, of which there are two kinds, the one all over ſpotted with brown, and the other of a fine yellow colour, ſtreaked with red. The fleſh of this is not accounted wholeſome.

EEL, *Sea*, *anguilla marina*, a fiſh common under holes of rocks, about the ſhores in many parts of the Eaſt-Indies. It is of a duſky brown colour, variegated with rhomboidal ſpots, not unlike thoſe on the ſkins of ſnakes. The anterior part of its body is thin and ſlender, the hinder part very thick; its noſe is long, its mouth large, and commonly gaping open, and its teeth very ſharp, but very ſmall. It grows extremely fat, and is very wholeſome and well taſted; yet thoſe who kill a number of them are ſaid to be affected with tremors, and ſometimes with a drowſineſs, which however goes off without farther miſchief.

EELS, *microſcopic, in ſour paſte.* The long-bodied animalcules, diſcovered by the microſcope in vinegar, ſour paſte, and many other ſubjects, have, from their figure, been generally diſtinguiſhed from the reſt of the microſcopic animalcules, by the name of *eels*. Theſe, and the other kinds, have been, by the moſt judicious naturaliſts, ſuppoſed to be produced of the eggs of other animalcules of the fly kind, floating in the air. But thoſe in paſte are diſcovered to be viviparous animals, producing living creatures of their own ſhape. In order to be always furniſhed with theſe minute *eels* ready for the microſcope, take ſuch paſte as bookbinders commonly uſe, of a moderate conſiſtence, and expoſe it to the air in an open veſſel, and prevent its becoming hard or mouldy, by occaſionally ſtirring it. After ſome days it will turn ſour; and, if examined attentively, you may diſcern multitudes of exceedingly ſmall, long, ſlender, wriggling animalcules, which grow larger daily, till you will be able to ſee them with the naked eye. In order to promote their coming forward, pour now and then a drop of vinegar on the paſte, and then they may be preſerved all the year: the continual motion of theſe animalcules will contribute to prevent any mouldineſs in the paſte, which is beſt kept in ſome glaſs veſſel. Apply them to the microſcope on a ſingle talc or iſinglaſs, after having firſt put upon it a ſmall ſpot of water for them to ſwim about in, the internal motion of their bowels may be plainly perceived; and when the water is almoſt dried away, and they are nearly expiring, their mouths may be ſeen opening to a conſiderable width. On cutting one of theſe paſte-*eels* in two acroſs the middle, a long and ſlender tube is ſeen to ſhoot out from each of the divided ends, and a number of ſeeming ova iſſue from this; but theſe examined ſtrictly, appear to be living *eels* of different growths, and all included in their proper membranes; ſome move themſelves but ſlowly, while others coil and uncoil themſelves pretty briſkly; and the moſt mature are ſeen to make ſtrong efforts towards the diſengaging themſelves of their enveloping membranes, and at length ſucceed, and ſwim at liberty, like their parent animal. The tube thruſt out each way, on dividing the body, is properly the uterus of the animal, which in the larger *eels* is ſeen to be full of dark ſpots, and are the embryo *eels*; and theſe dark ſpots are alſo to be obſerved in the young ones, as ſoon as produced. Phil. Tranſ. N° 478. § 13. and vol. xliv. p. 67. and Baker's Microſ. 1743, p. 81, &c. See ANIMALCULE.

EELS *in vinegar*. See VINEGAR.

EEL-*fares*, is uſed for the fry or brood of *eels*. Stat. 25. Hen. VIII.

EEL-*pout*, in *Ichthyology*, the Engliſh name of the muſtela fluviatilis, a fiſh of the gadus kind, according to Artedi, and diſtinguiſhed from the others by the name of the bearded gadus, with two fins on the back, and with both jaws of the ſame length. See GADUS.

This fiſh is caught in the Trent, and many other of our rivers, and in ſome places called a burbot, and is a very delicate fiſh for the table.

The name is derived from the German *aelput*, which is in that language the name of the ſame fiſh, and is compounded of the words *ael*, *an eel*, and *puit* or *pudd*, *a frog*; ſo that the Engliſh word ſhould properly be the *eel-frog*. It is commonly, when full grown, about fourteen inches long, and is ſlender in proportion to its length, and ſomething of the *eel*-ſhape, but too ſhort for its thickneſs, to be truly ſo. It is very ſoft and ſlippery to the touch, like the *eel*, and is covered either merely with a ſlimy matter, or elſe with extremely minute ſcales. It is of the colour of a tench; its head is large and flat, its noſtrils ſmall and round, and its jaws beſet with very

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ſmall teeth, which make them feel rough like a file; and there is, beſide theſe, a ſemicircular ſpot in the palate, rough in the ſame manner. There are two fins on the back, and one on the belly, reaching from the anus to the tail; and it has a little beard from the extremity of the lower jaw, and between the noſtrils and end of the ſnout, two others, and ſeven gills. Willughby's Hiſt. Piſc. p. 125. There is another variety of *eel-pout*, which Linnæus has made a ſpecies of BLENNIUS: theſe are viviparous, and bring forth two or three hundred young at a time, a little after the depth of winter. They are common in the Eſk, at Whitby in Yorkſhire, and are a coarſe fiſh.

EEL-*ſpear*, a forked inſtrument with three or four jagged teeth, uſed for catching *eels*; that with four teeth is the beſt. This is ſtruck into the mud at the bottom of the river; where, if it ſtrikes againſt *eels*, it is ſure to bring them up.

EEL-*backed*, a term uſed by the dealers in horſes, for ſuch as have black liſts along their back.

EFFARE, or EFFRAYE, *in Heraldry*, a term applied to a beaſt, when rearing on its hind legs, as if it were affrighted.

EFFECT, the reſult or conſequence of the application of a cauſe, or agent, on ſome ſubject.

It is one of the great axioms of philoſophy, that full or adequate *effects* are always proportionable to the powers of their cauſes.

EFFECT is alſo of ſome farther import in the arts; as when we ſay in *Painting* and *Architecture*, that ſuch a contraſt, or ſuch a drapery, or ſuch an attitude, have a fine or an ill *effect*, i. e. are beautiful, noble, or the contrary. Too many breaks, and little enrichments, in a building, have a pitiful *effect*, i. e. they give it a mean aſpect.

EFFECT, in the *Manege*, is applied to the motions of the hand which direct the horſe.

They diſtinguiſh four *effects* of the hand, viz. in uſing the bridle to put a horſe forwards, draw him backwards, and ſhifting it out of the right hand into the left, or *vice verſa*.

EFFECTS, in *Commerce*, &c. the goods poſſeſſed by any perſon, whether moveable or immoveable; particularly thoſe which merchants and dealers acquire by trade. See CHATTELS.

The *effects* of merchants are uſually diſtinguiſhed into three claſſes, good, bad, and doubtful. By an ordonnance of the French court in 1673, every merchant is obliged to take an inventory or review every year, of all his *effects* of every kind.

EFFECTS, *Vacant*. See VACANT.

EFFECTIONS, in *Geometry*, the geometrical conſtructions of propoſitions.

The term is alſo uſed in reference to problems and practices; which, when they are deducible from, or founded upon ſome general propoſitions, are called the *geometrical effections* thereof.

EFFECTIVE *men*, in *Military-language*, are ſoldiers fit for ſervice.

EFFEMINATE, *effeminati*, according to the vulgate, are mentioned in ſeveral places of ſcripture. The word is there uſed to ſignify ſuch as were conſecrated to ſome profane god, and proſtituted themſelves in honour of him.

The Hebrew word, *kadeſh*, tranſlated *effeminatus*, properly ſignifies *conſecrated*, and hence was attributed to thoſe of either ſex, who publicly proſtituted themſelves in honour of Baal and Aſtarte.

Moſes expreſsly forbids theſe irregularities among the Iſraelites; but the hiſtory of the Jews ſhews, that they were notwithſtanding frequently practiſed. Levit. xxiii. 18. Calmet. Dict. Bibl. in voc.

EFFENDI, in the *Turkiſh language*, ſignifies *maſter*: and accordingly it is a title very extenſively applied; as to the mufti and emirs; to the prieſts of moſques, to men of learning, and of the law. The grand chancellor of the empire is called *rei-effendi*.

EFFERVESCENCE, is popularly uſed for a light ebullition, or a briſk inteſtine motion, produced in a liquor by the firſt action of heat, without any notable ſeparation of its parts.

EFFERVESCENCE, in *Chemiſtry*, is not applied to all ebullitions or motions produced by fire, but only to thoſe reſulting from the mixture of bodies of different natures; which, by their acting on one another, occaſion a heat, reſembling the ebullition or boiling produced by fire.

The two moſt common oppoſites, acids and alcalies, on being mixed, cauſe a great ebullition or frothing, but no great heat; but the ſolutions of ſome metals in aqua fortis, cauſe intenſe heat, and emit flame. Aromatic oils mixed with acid mineral ſpirits, actually kindle and burn with violent exploſions; and ſome vegetable ſubſtances, putrefying with moiſture, will ſometimes heat ſo as to kindle what lies dry about that part of the heap where the putrefaction happens. Thus heaps of dung will grow hot, and haycocks often kindle into actual fire. Phil. Tranſ. N° 476. p. 475.

Chauvin defines *effervеſcence* more ſcientifically to be a violent expulſion of the air, out of the pores of the particles of one body, by the intruſion of the particles of another body mixed therewith into thoſe pores before poſſeſſed by air.

In order for *effervеſcence* to take place, the particles of the latter body muſt be ſuppoſed conformable, both in bulk and figure, to the pores of the other, ſo that they may enter and fill the ſame like wedges; and beſide, there muſt be a ſtrong degree of attraction between the particles of the two bodies, ſtronger than the attraction or force of coheſion between the particles of either of the bodies alone.

Hence it ſhould ſeem, that *effervеſcence* only differs from fermentation in the degree of exploſion; which in *effervеſcences*, occaſioned by the greater purity and freedom of the acid and alkali, is greater than in fermentations; but FERMENTATION is now uſed in a more reſtricted ſenſe.

Of *effervеſcences*, ſome are *hot*, and others *cold*. Of the firſt kind are thoſe produced by mixture of oil of tartar *per deliquium*, with ſpirit of vitriol; quicklime, with cold water; all acid ſpirits, with alkaline or earthy bodies; aqua fortis, ſpirit of vitriol, ſpirit of nitre, aqua regia, &c. with metallic bodies, marcaſites, and minerals; coral, with lemon or orange-juice; marble, with ſpirit of ſalt; chalk, crabs eyes, mother of pearl, and all ſhells, with acids. In all which, the *effervеſcences* are attended with a more or leſs intenſe heat.

The principal bodies in which *effervеſcences* happen, are, 1. Native vegetable acids, as moſt juices of trees, ſhrubs, and plants, that run in the ſpring; moſt juices of unripe ſummer fruits; particular juices, when ripe, as thoſe of oranges, lemons, citrons, tamarinds, ſorrel, wood-ſorrel, and crabs; fermented vegetables, as the meals when they turn ſour, Rheniſh and Moſelle wine, and tartar; vegetables twice fermented, native and diſtilled vinegars; the acids of animals, from tartiſh or acid vegetable aliment, as in the chyle, ſour milk, whey, butter-milk, and the whey thereof. 2. The native foſſile acids, as the acid of ſulphur, alum, or vitriol; or theſe acids, as they lie concealed in ſulphur or vitriol ſtones; or as thence extracted by a violent fire, or a ſtronger acid, as in the ſpirit of nitre, ſalt, alum, vitriol, or ſulphur. 3. True fixed alcalies, made of any vegetable matter by burning; the more volatile alcalies, whether ſpontaneous, as in garlic, onions, ſcurvy-graſs, muſtard, &c. produced by putrefaction from animal or vegetable ſubjects, or procured from the ſame by diſtillation and burning. 4. Certain bodies, improperly called alcalies, only on account of their agreeing with genuine alcalies, in fermenting with acids; theſe are many of the boles, and other earths, bones, chalk, corals, crabs-eyes, horns, hoofs, and nails of animals, pearls, ſhells of fiſh, &c. ſtones, and teeth. 5. The ſeven metals. 6. The ſemimetals, antimony, biſmuth, lapis calaminaris, hæmatites, lime, and the like.

Hence we have four general rules: 1. That the bodies of the firſt claſs almoſt conſtantly make an *effervеſcence* with thoſe of the third and fourth, either ſooner or later, and with more or leſs ſtrength, as they are in themſelves weaker or ſtronger: this *effervеſcence* continues till the point of ſaturation is obtained, and then ceaſes; and at that time uſually the acrimony both of the one and the other of the ſubſtances is ſoftened. 2. The bodies of the firſt claſs make an *effervеſcence* with thoſe of the fifth, though only ſome with others, and not univerſally: ſome do this with more, and others with leſs ſtrength; and at the end, vitriols are uſually produced. 3. The bodies of the firſt claſs act in the ſame manner with thoſe of the ſixth. 4. The bodies of the third, fourth, fifth, and ſixth claſſes, being mixed together, are ſcarce found to make any *effervеſcence*; hence acids are found to have this effect in particular along with the reſt, though here it is limited. The beſt ſpirit of vinegar, poured upon oil of tartar *per deliquium*, makes no *effervеſcence* at firſt, but it does afterwards, and in doing it, weakens the alkali.

Pure volatile alkali, when freed from its oil, makes an *effervеſcence* with diſtilled vinegar; but much more cold than heat ariſes in the ebullitions of this kind; whereas, the generality of other *effervеſcences* produce heat in various degrees, from the leaſt ſenſible warmth up to actual flame. A dram of oil of cloves, mixed with two drams of Glauber's ſpirit of nitre, raiſes a thick ſmoak, and in the midſt of it a ſtrong red flame, and the matter is reduced to a dry ſpungy maſs: in this caſe the *effervеſcence* is not made with acid and alkali, but with acid, and a very rich oil. There are alſo two hard and cold bodies,

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viz. iron and ſulphur, which being ground together, and made into a paſte with water, make a ſpontaneous *effervescence*, and will even produce actual fire and flame. Boerh. Chem. part ii. p. 340.

Oil of vitriol, and oil of turpentine, mixed together, produce ſuch a vehement heat, that unleſs they be mixed drop by drop, they are apt to burſt forth into a flame, and break the phial.

Generally the ſubſtances which contain a ſenſible quantity of the inflammable principle, are thoſe which in ſimilar circumſtances produce the greateſt heat in *effervescing* with acids; and of all acids, the nitrous produces the greateſt heat, when it diſſolves theſe bodies.

Powdered coral, mixed with diſtilled vinegar, produces a cold *effervescence*, which has been accounted for hence, that the pores of the coral being very great, it may be eaſily diſſolved in the acid ſpirit, without any great friction or colliſion of the parts, ſuch as would be neceſſary to generate any conſiderable heat.

An *effervescence* may alſo be produced by the mixture of many other cold liquors. See DISSOLUTION.

EFFERVESCENCE, in *Vintage*, a term appropriated by Portzius and others, to ſignify that working of wine, which is by ſome, though improperly, called fermentation, thereby confounding two very different things. Fermentation, according to theſe authors, is nothing elſe but the action and re-action of the internal parts of the acid and alkali of the fluids, by which the ſpirits are ſeparated without precipitation; whereas, they ſay, by *effervescence*, there are no ſpirits ſeparated, ſo that all fermentation is done by means of *effervescence*; but all *effervescence* does not amount to fermentation. Fermentations are properly the mutual ſtrugglings between contrary principles, as between acid and alkali, or the like; but *effervescences* will happen between principles of the ſame kind, provided one be much ſtronger than the other. Thus a ſtronger acid poured upon a weaker, will raiſe an *effervescence*, but no fermentation. The *effervescence* of wine is not, however, of this kind, but the acid and alkali which are in them muſt raiſe this by their action upon one another, the alkaliſate parts combating with the acid ones, till they have wholly ſated them, and then the *effervescence* ceaſeth.

It has been obſerved by many, that wine in the caſks will always *effervesce* more or leſs ſtrongly, at the time of the bloſſoming of the vines. This has been ſuppoſed by the vulgar to be owing to ſomething of ſympathy, or ſuch hidden cauſes; but it is only owing to the heats of that ſeaſon, which ſet the two ſalts at work upon one another. Portzius de Vin. Rhenan.

EFFICACIOUS, EFFECTUAL, in *Theology*. Within theſe 150 years there have been great diſputes on the ſubject of *efficacious* grace. Grace is uſually divided into ſufficient and *efficacious*; though the Janſeniſts hold, that there is no grace ſufficient but what is *efficacious*, i. e. but what effectually determines the will to act.

Efficacious grace is that which enlightens the mind, and touches the heart, in ſuch manner, as always to produce its effect, however it be oppoſed or reſiſted by the will. See GRACE.

Some divines maintain, that *efficacious* grace is *efficacious* of itſelf. *Efficacious* grace of itſelf, if there be any ſuch thing, is that which produces its effect merely of itſelf, and not in virtue of any conſent of the will. Calvin is the firſt that uſed the term, *gratia efficax per ſe, grace efficacious of itſelf.*

A late divine holds the *efficacy* of grace in itſelf to conſiſt in this: that *efficacious* grace is always joined with a moral neceſſity of doing the thing it inclines to; and ſufficient grace, joined with a moral impotence of doing it. The Arminian and Popiſh way of conceiving the neceſſity of *efficacious* grace, is, that this grace is never wanting, at leaſt to the righteous, except through their own default; that they always ſtand in need of other inner graces truly and properly ſufficient, in order to draw down this *efficacious* grace; and that theſe do infallibly draw it down, when they are not rejected, though they often remain without effect, becauſe men reſiſt, inſtead of yielding their conſent thereto.

F. Malebranche maintains, that the mutual commerce between ſoul and body, i. e. life, has no other vinculum or principle but the *efficacy* of God's decrees; and that ſecond cauſes have no proper *efficacy*, &c.

EFFICIENT, in *Philoſophy*. An EFFICIENT *cauſe* is that which produces an effect. See CAUSE and EFFECT.

Philoſophers uſually diſtinguiſh four kinds of cauſes in nature; the *efficient*, *final*, *formal*, and *material*. See each under its proper article.

The ſchool-philoſophers are exceedingly divided as to the nature and eſſence of an *efficient* cauſe. Ariſtotle defines it, *id unde*, *that from which*; or the firſt principle of change and reſt, i. e. of production and conſervation.

The *efficient* is called *id unde*, *that from which*; as the end or final cauſe, is that, *propter quod*, *for which*; the exemplar, *ad quod*, *that to which*; the matter, *ex quo*, *that out of which*; and the form, *per quod*, *that by which*.

Others of the ſchoolmen define *efficient* to be *principium per ſe influens in aliud ſine mutatione ſui*. The Ramiſts, after Plato and Cicero, define an *efficient* to be that, *a qua res eſt*, *from which a thing is*; to which a great author objecting, that a thing may be alſo from its end, adds, that an *efficient* is that, *a qua res vera cauſalitate proficiſcitur*.

Others define *efficient* to be, *quæ per actionem cauſat*, *that which cauſes by acting*; for to effect, every body knows, is to act; and hence neither a procatarctic, nor an exemplary cauſe, are properly *efficient*, though uſually ranked among them.

Laſtly, others define an *efficient* to be a cauſe, *a qua aliud producatur*, *from which ſomething is produced*; conſequently, what ariſes from ſuch a cauſe is called an *effect*; and thus God is the *efficient* cauſe of the world, and the world the effect of God: to which definition of an *efficient*, all the former definitions are reducible.

An *efficient cauſe*, then, is either phyſical, as the fire is the *efficient* cauſe of heat; or moral, as an adviſer is the cauſe of a murder; or univerſal, which in various circumſtances produces various effects, as God and the ſun; or particular, as a horſe which produces a horſe; or univocal, which produces an effect like itſelf, as a horſe begets a horſe; or equivocal, according to the old doctrine, as the ſun producing a frog; or natural, which acts not only without precept in oppoſition to artificial, but alſo from within, and according to its own inclination, in oppoſition to violent, as fire acts when it warms; or ſpontaneous, as a dog eating; or voluntary and free.

Others conſider *efficient* cauſes, either as principal, or as inſtrumental; others, either as next or remote, or as mediate or immediate; others, in fine, divide *efficient* cauſes among all the kinds of beings, natural and ſupernatural, ſpiritual and corporeal, ſubſtantial and accidental, vital and not vital, &c.

But the moſt celebrated diviſion of *efficients* is that into *firſt* and *ſecond*.

A *firſt efficient* cauſe is that between which and the effect there is ſome neceſſary connection: of which kind there is none but God alone.

A *ſecond efficient* cauſe is that from which an effect follows in conſequence of the will or conſtitution of the Creator, and which the Carteſians call an *occaſional cauſe*.

But theſe precarious or occaſional cauſes are, in reality, no cauſes at all, but only antecedent effects. This is eaſily ſhewn: for, 1. All action, at leaſt all corporeal action, is contained in motion; but motion can only reſult from the firſt cauſe, it being an allowed principle, that body of itſelf is inert and inactive. The true cauſe of motion, therefore, is a ſpiritual, not a corporeal nature. 2. But neither can a finite ſpiritual nature be the chief cauſe of motion; for there is no neceſſary connection between the will, e. gr. of an angel and the motion of a body, nor between that of any other being, except God. Thus, when an angel wills, a ſtone moves, becauſe God has conſtituted ſuch a law between the will of the angel and the motion of the ſtone: and thus we move our hands when we pleaſe; not that the ſoul is the principal cauſe of ſuch motion, but only the occaſional cauſe. See CAUSE.

EFFICIENTS, in *Arithmetic*, the numbers given for an operation of multiplication, called alſo the *factors*. See FACTOR and COEFFICIENT.

The *efficients* are the multiplicand and multiplier.

EFFIGY, EFFIGIES, a portrait, or repreſentation of a perſon to the life. See PORTRAIT.

EFFIGY, is alſo uſed for the print or impreſſion of a coin, repreſenting the prince's head who ſtruck it.

EFFIGY, *to execute or degrade in*, denotes the execution or degradation of a condemned, contumacious criminal, who cannot be apprehended or ſeized.

In France, they hang a picture on a gallows or gibbet, wherein is repreſented the criminal, with the quality or manner of the puniſhment: at the bottom is written the ſentence or condemnation. Such perſons as are ſentenced to death are executed in *effigy*.

EFFLORESCENCE, of *ex*, *out*, and *flos*, *flower*, in *Botany*, denotes the blooming of a flower.

EFFLORESCENCE, in *Chemiſtry*, denotes an operation which certain bodies undergo, when a kind of meal or powder is formed on their ſurfaces; and this may happen either by decompoſition or drying; as to cobalt in the firſt caſe, and to the cryſtals of marine alkali, Glauber's ſalt, alum, &c. in the ſecond.

EFFLORESCENCE, in *Medicine*, a breaking out of humours in the ſkin; as in the meaſles, or the like. See EXANTHEMA.

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EFFLUENT *fever*, is ſometimes uſed for an inflammatory fever.

Dr. Morgan propoſes to cure ſuch by ſweats raiſed by low cooling drinks.

EFFLUVIUM, a flux, or exhalation of minute particles from any body; or an emanation of ſubtile corpuſcles from a mixed, ſenſible body, by a kind of motion of tranſpiration.

Odoriferous bodies, every one knows, are continually emitting ſubſtantial *effluvia*, by means whereof it is, that they excite in us the ſenſe of ſmelling. Theſe minute *effluvia* are ſometimes perceived by the eye, in form of fumes and vapours.

Some bodies are found to emit *effluvia* for a great number of years, without any conſiderable loſs, either as to bulk or weight; as divers odorous bodies, the tenuity of whoſe emanant corpuſcles is incredible; not but that the loſs they ſuſtain by the continual emiſſion of *effluvia* may be made up to them by the reception of other ſimilar *effluvia* of the ſame kind of bodies diffuſed through the air.

It is added, that theſe *effluvia* are emitted in manner of *radii*, rays, *in orbem*; and the circumference or bound of the activity of the radiation exhibits the ſame figure as is that of the radiant. This the aſtronomers ſufficiently prove, from the ratio of the refraction of the atmoſphere. For the law of the emiſſion of theſe *effluvia*, ſee QUALITY.

That *effluvia* may conſiderably operate upon, and have great effects on bodies within the ſphere of their activity, is proved by Mr. Boyle, in an expreſs Treatiſe on the Subtilty of *Effluvia*; where he ſhews, 1. That the number of corpuſcles emitted by way of *effluvia*, is immenſely great. 2. That they are of a very penetrating nature. 3. That they move with vaſt celerity, and in all manner of directions. 4. That there is frequently a very wonderful congruity, or incongruity, in the bulk and ſhape of theſe *effluvia*, compared with the pores of the bodies they penetrate into and act upon. 5. That in animal and organical bodies, particularly, theſe *effluvia* may excite great motions of one part of the frame upon another, and thereby produce very conſiderable changes in the œconomy. Laſtly, that they have ſometimes a power of procuring aſſiſtance in their operations from the more catholic agents of the univerſe, ſuch as gravity, light, magnetiſm, the preſſure of the atmoſphere, &c.

That *effluvia* are emitted to very great diſtances, we have a notable proof in odoriferous *effluvia* being in many caſes perceived at the diſtance of many leagues. Again, that the generality of *effluvia* retain the proper colour, ſmell, taſte, and other properties and effects of the bodies whence they proceeded, and this even after they have paſſed through the pores of other ſolid bodies, we have abundant proof. And the ſame we ſee confirmed in ſympathetic inks and powders, and in the ſagacity of blood-hounds, &c.

The wonderful extenſion of *effluvia*, and the ſmall diminution of the body they iſſue from, is one of the ſtrangeſt problems in phyſics.

The determinate natures of *effluvia*, according to the principal inſtances we have of them, are reducible to theſe three heads: 1. That theſe *effluvia* being, by condenſation, or otherwiſe, reunited, they appear to be of the ſame nature with the body that emitted them. 2. Their determinate nature may be ſometimes diſcovered by the difference that may be obſerved in their ſenſible qualities; foraſmuch as thoſe *effluvia* which are endowed with them proceed from the ſame ſort of bodies, and yet thoſe afforded by one kind of bodies being in many caſes manifeſtly different from thoſe which fly off from another, this evident diſparity in their exhalation argues, that they retain diſtinct natures, according to the nature of each body from which they proceed. 3. We may diſcover this different nature of *effluvia* from their effects upon other bodies than the organs of our ſenſes; conſidering that the effects which certain bodies produce on others by their *effluviums*, being conſtant and determinate, and always different from thoſe which other agents produce by their emiſſions on the ſame or other ſubjects, the diſtinct nature of the corpuſcles, emitted on this occaſion, may be ſufficiently judged of, were it only from this. Boyle on Effluvia.

EFFLUVIA, in *Medicine*, are aſſigned as the cauſe of various diſorders, eſpecially of the contagious kind. Thus, when a conſiderable quantity of putrid *effluvia* has been admitted into the blood, beſides acting thereupon ſlowly, by way of inquinamentum, or ferment, they ſeem immediately to affect the nerves, and thereby to bring on ſome extraordinary diſorder of the whole frame. Hence ariſe ſpaſms, obſtructions, palpitations, a high degree of fever, or a languid circulation, chilneſs, or intenſe heat, and a variety of contrary ſymptoms, according to the different affection of the nerves. To putrid *effluvia* is likewiſe owing the jail-diſtemper, which is the ſame with the hoſpital-fever. See HOSPITAL-*fever*.

Effluvia iſſuing from corrupted ſubſtances chiefly conſiſt of the phlogiſton or ſulphur principle, ſince they ſo readily unite with, and volatilize acids, as appears from the increaſe and particular change of the ſmell. But it is proper to remark, that from a ſimple putrid ſubſtance the phlogiſton does not ariſe alone, but combined with the ſaline parts of the body; for this principle, when ſingle, is perhaps imperceptible to the ſmell; and, when diveſted of theſe ſalts, is never, ſo far as is known, peſtilential; ſo that the deleterious particles of rotten ſubſtances ſeem to conſiſt of a certain combination of the ſulphureous with the ſaline principle, which united, not only become the moſt irritating ſtimuli to the nerves, but act upon the humours as a putrid ferment in promoting their corruption. Pringle's Obſ. on Diſeaſes of the Army, p. 186. 385, &c. See AIR *fixed* and MALIGNANT.

Dr. White, availing himſelf of the diſcoveries of Dr. Prieſtley, has applied *nitrous* AIR in the manner propoſed by him for aſcertaining the ſalubrity of different ſpecimens of air, and the effects of various kinds of *effluvia* upon it. The apparatus employed by him for this purpoſe conſiſted of a barometer tube, graduated by inches and decimals, and of ſuch a bore, that an ounce phial of the air to be examined, being thrown into it through a ſmall glaſs funnel (after it had been filled with water and inverted into a veſſel of the ſame fluid) occupied about 134 decimal parts of an inch, or nearly 13½ inches. On adding half an ounce of nitrous air, the mixture generally occupied, at firſt, about 205 decimal parts; and in half an hour, when the whole diminution may be ſuppoſed to have taken place, Dr. White obſerved the ſpace or number of decimal parts then occupied by the two airs; and ſubſtracting it from 205, conſidered the remainder as the number indicating the ſtate of purity in the particular air he had occaſion to examine. When he mixed the air in his garden with nitrous air in the abovementioned proportion, the ſpace occupied by the mixture in half an hour was 145; and this ſubtracted from 205, gives 60 for the ſtate of the common atmoſpherical air in that place, and at that time. But had he uſed the ſame quantity of perfectly noxious air inſtead of the air in the garden, there would have been no diminution, and the mixture would have ſtood at 205, ſo that 0 would expreſs the condition of that particular air; and therefore he marked the extent of his ſcale from 0, indicating the moſt noxious or mortal air to 60° or 61°, which was found to be the mean ſtate of the atmoſphere in more than 200 experiments. With this apparatus Dr. White found the difference between the air in the city of York and that of the country, not far from the city walls, to be 3°, the former being 59° and the latter 62°. The air of his bed, on entering it at night, was 62°, but reduced by the next morning to 58°, the bed curtains being open, and the room large and airy. By breathing the ſame air as long as he could without inconvenience, he reduced it from 62° to 40°. The air in an eight-ounce phial, which had contained a ſmall piece of freſh veal forty-eight hours, was reduced from 64° to 10°, and yet the fleſh was not putrid. Two ounces of black mud, taken from a ſtinking moraſs at York, being put into an eight-ounce phial of air, reduced it in twelve hours from about 60° or 62° to 34° or 36°. When this mud became perfectly dry, ſo as to be pulverized, the diminution it occaſioned was only from 62° to 60°: but when this powder was again reduced to mud, by the addition of a little water, and incloſed in a phial as before, it affected the air ſo as to reduce the diminution from 62° to 49°; and on ſtanding longer, from 62° to 29°. When more water was added, ſo as to ſwim at ſome height above the powder, which had ſubſided, the air again, tried by the teſt, never produced a greater reduction of the diminution than from 62° to 56°. Theſe experiments confirm the obſervations of Sir John Pringle and other medical writers, who have remarked, that the diſeaſes peculiar to low marſhy ſituations ſeldom begin to appear till the water is ſo far evaporated as to leave a black and ſlimy mud; that they ceaſe when the bogs and marſhy ground have been drained and become perfectly dry; and that, on the other hand, the danger ariſing from marſhes and bogs is, in a great meaſure, obviated, on their being laid wholly under water; or in the words of this ingenious writer, the putrid fermentation is either prevented by too much mixture, or the *effluvia* are abſorbed in paſſing through the ſuperincumbent bed of water. Phil. Tranſ. vol. lxviii. part i. art. 13.

The earth ſends forth *effluvia* and ſteams in great abundance, and many things attributed to other agents, are really

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really performed by them. Dr. Woodward has very juſtly attributed great effects to them on foſſils of many kinds; and it is poſſible many more of the preſent appearances of ſubterranean bodies may be owing to them than are at preſent imagined. The figures and delineations on ſtones, in form of trees and ſhrubs, have often their origin from theſe *effluvia*, getting into the cracks of them; and it is poſſible, that the ſtalactitæ, which we find on the roofs of caverns, may be in great part alſo formed by their means. Phil. Tranſ. N° 169. p. 920.

As for the *effluvia* proceeding from ſtagnant waters, mines, &c. ſee AIR *Mephitic* and DAMP.

EFFLUXION, a flowing out, from *ex*, *out of*, and *fluere*, *to flow*.

EFFRACTURA, a word uſed by Ambroſe Parey for a peculiar ſpecies of fracture of the ſkull, in which the bone is at once broken and depreſſed.

EFFRONTES, in *Church Hiſtory*, a ſect of heretics, in 1534, who ſcraped their forehead with a knife till it bled, and then poured oil into the wound. This ceremony ſerved them inſtead of baptiſm. See BAPTISM.

They are likewiſe ſaid to have denied the divinity of the Holy Spirit.

EFFUSION, the pouring out of any liquid thing with ſome degree of force.

In the ancient heathen ſacrifices there were divers *effuſions* of wine, and other liquors, called *libations*.

EFFUSION, or FUSION, in *Aſtronomy*, denotes that part of the ſign Aquarius, repreſented on celeſtial globes and planiſpheres, by the water iſſuing out of the urn of the water-bearer. See AQUARIUS.

EFFUSION *of blood*, *effuſio ſanguinis*, in our *Old Writers*, is uſed for the mulct, fine, or penalty, impoſed for the ſhedding of blood. This the king uſed frequently to grant to lords of manors. Among others, it was granted to the abbot of Glaſtenbury.

EFT, or EFF, in *Zoology*, the name of a creature very common in all parts of England, and called alſo *newt*, and the *ſwift*, and by others the *common lizard*, *lacertus vulgaris*.

The beak or ſnout of this creature is oval and obtuſe; its back of a ruſty iron-colour; its feet have each five toes, and are armed with very ſharp though ſmall claws. That toe which is in the place of the fore-finger with us is the longeſt of all; and that which anſwers to our thumb is placed lower. Ray's Syn. Quad. p. 264.

We have ſeveral ſpecies of this animal with us. 1. The common land *eft*, with the black ſpotted belly. 2. The ſnake-like *eft*, which is frequent in our heaths. 3. The ſmall brown land *eft*. This is very ſcarce. 4. The yellow ſcaly land *eft*, deſcribed by Plot in his Hiſtory of Staffordſhire. And, 5. The brown and black ſpotted water *eft*. Plot's Staff. p. 252.

The land *eft*, or as the naturaliſts often call it, the land *ſalamander*, has ſomething very remarkable in its outer coat. Its ſkin often appears dry, like that of the lizard kind, but often alſo it appears wetted, and as if covered with a fine ſhining varniſh: the change from one to the other of theſe ſtates is uſually performed in an inſtant, and it frequently becomes immediately wet all over on touching it. It alſo contains, under the ſkin, a ſort of milky liquor, which ſpurts out to a diſtance on preſſing the body of the animal.

The paſſages for this milk are a vaſt number of pores or holes, many of which are plainly viſible to the naked eye; and very probably the firſt-mentioned liquor, which covers the ſkin in manner of a varniſh, may be the ſame with this, its white colour not being diſtinguiſhable when it is ſpread ſo thin over the ſurface of the animal. This milk reſembles very much the milky juice which the tithymals, and many other of the ſucculent plants afford on being cut or broken. It is of an inſupportably acrid and ſtyptic taſte; and though the tongue receives no injury from touching it, yet the ſenſation is ſo violent, that one is apt to imagine there muſt be a wound made in it. This animal, when bruiſed, yields alſo a very diſagreeable ſmell.

It has generally been ſuppoſed, that this animal is of a poiſonous nature; and the famous ſalamander of the old writers ſeems to be of the ſame genus, if not the ſame animal. Mr. Maupertuis, determined to inform the world of the truth in regard to theſe remarkable particulars, cauſed a large number of theſe animals to be brought to him, which the country people, who had caught them about the bottom of old walls, brought to him with as much caution as if they had been vipers.

From his trials, it appeared very evident, that the ſtories of this creature's being poiſonous, are as idle and groundleſs as thoſe of its living in the fire.

One thing remarkable this gentleman obſerved in his diſſections of the animal, which was, that he found in ſeveral of the females, at once cluſters of eggs, and living young ones. The eggs formed cluſters reſembling thoſe of the ovaries of birds, and the young ones were contained in two tubes, or long pipes, the coats of which were perfectly tranſparent, and the young ones were eaſily diſtinguiſhed through them; and there were counted in one female fifty-four of theſe, all living and vigorous. Mem. Acad. Par. 1727.

The water *eft* affords an excellent opportunity of ſeeing the circulation of the blood by means of the microſcope, particularly of the ſolar one. By this apparatus the veſſels are ſeen beautifully delineated on the ſkin; and the tide of blood, in the large ones, is equal to that of the ſtream of water which is ſhewn in hydroſtatical experiments thrown out of a veſſel by condenſed air. In either of theſe caſes, you can ſee no appearance of ſeparate drops of globules, but the whole forms one continued body. In the leſſer veſſels the globules are ſeen paſſing along very ſwiftly, yet evidently ſeparate one from another.

It is remarkable, that in the tail of this animal there ſeem a greater number of veſſels than are immediately neceſſary to the circulation of the blood; for, when thus examined, there will be often ſeen two parallel veſſels, in one of which only the circulation is performed, and this ſucceſſively in one and the other of the veſſels, the tide often leaving the one wholly empty, which had juſt before been full and circulating in the other. Phil. Tranſ. N° 460. p. 728.

EFT-*ſtones*, in the *Materia Medica* of the American Indians, a name given to certain ſtones, ſaid to be found in the ſtomach of a certain ſpecies of water newt, or *eft*, in the manner of the bezoars in other animals. The waters of Braſil, Cuba, and Mexico, abound with this ſpecies of *eft*; but it does not ſeem well atteſted, that this ſort of ſtone was ever found in any of them by thoſe who have diſſected numbers of them, on purpoſe to ſearch for it. We have in Europe ſwallow-ſtones, and other ſuch things, whoſe names, and their fabulous hiſtories, would import their being produced in animals. As many ſwallows have been deſtroyed in England in looking for theſe ſtones, as newts in Mexico in looking for thoſe; and by the appearance of the American as well as the European ſtones, they both ſeem to be dug out of the earth, and to have been once the teeth or other parts of fiſhes. Redi, Experim.

The virtues of the *eft-ſtone* of Mexico are celebrated by Ximenes, and all others who have been upon the ſpot. It is ſaid to be a certain remedy for the gravel, and all other nephritic complaints, and even to break and diſſolve the ſtone when already concreted in the bladder. But this account of its virtues ſeems as improbable as that of its origin. Redi tried theſe and many other ſtones of famous character among writers, and found no effect in any of them. Theſe *eft-ſtones* never produced any viſible effect in his trials, in nephritic complaints, nor the eagle-ſtone in women's labour, nor the ſtones ſwallowed by Caymans in quartans, though Menardes looks on theſe laſt as infallible in this caſe.

EGERMINATE, of *ex*, *out*, and *germen*, *bud*, in *Botany*, ſignifies to bud or ſpring out.

EGESTION, from *egero*, *I caſt out*, in *Medicine*, the ſame with dejection.

EGG, in *Natural Hiſtory*, a part formed in the females of certain animals; which, under a ſhell or cortex, includes an embryo or fœtus of the ſame ſpecies; the parts whereof are afterwards diſplayed and dilated, either by incubation, or by the acceſſion of a nutritious juice.

The ſpecies of animals that lay *eggs* are particularly denominated *oviparous*; and the part wherein the *egg* is formed, the *ovary*.

Of the various kinds of *eggs*, thoſe of hens or pullets being the moſt uſual, and which have been the moſt obſerved, we ſhall ſay ſomething of the ſtructure thereof, and the generation of the chick therein.

The exterior part, then, of a hen's *egg* is the ſhell, a white, thin, friable cortex, including all the other parts, and defending them from injuries. The matter of this ſhell is a fine, abſorbent earth, ſoluble in acids, and calcareous or convertible into quicklime. See *Animal* EARTH.

Eggs with double ſhells are no unuſual phenomenon. Harvey, is very diffuſe on the rationale of theſe appearances in his treatiſe De Generat. Animal.

Immediately under the ſhell lies the membrana communis, which lines the whole cavity of the ſhell, adhering pretty cloſely to it, except at the bigger end, where a little cavity is left between them, containing a ſmall quantity of air, which with age grows bigger. Under this membrane are contained two albumina, or whites, each wrapped up in its own membrane. In the middle of the inner white, is the vitellus, or yolk, incloſed likewiſe in its ſeparate involucrum or cover. The outer albumen

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albumen is oblong or oval, accommodated to the figure of the ſhell: the inner is ſpherical, and of a more craſs or viſcid ſubſtance, and the yolk is of the ſame figure.

The albumen is miſcible with water; and when expoſed to a gentle heat, as that of a healthy man's body, it grows continually more and more liquid, till at length loſing all its conſiſtence, it diſſolves into a liquor reſembling urine; and at the ſame time it waſtes ſenſibly, and at laſt leaves nothing but a thin pellicle reſembling paper. It is, in reality, a matter entirely of the nature of animal jellies, but of that kind which is coagulable by heat: for the albumen, if applied to a degree of heat ſomething greater, inſpiſſates, and hardens into a whitiſh, concrete, flaky ſubſtance, with the loſs of ſome of its finer fluid part, which eſcapes in form of a fume.

In effect, if an *egg* be laid on coals not the moſt intenſely hot, the ſame finer fluid will be found ſenſibly to tranſude the pores of the ſhell. Add, that if ſpirit of wine be poured on the freſh albumen of a new-laid *egg*, a coagulation is immediately produced as if by fire; and this the more perfectly, as the ſpirit and the albumen are more intimately mixed. By this means, the white of an *egg* is defended from all putrefaction.

Diſtilling the albumen by a retort in a ſand heat till it be brought to a dryneſs, it yields an incredible quantity of water, which has moſt of the properties of the whole maſs.

The white of an *egg* makes an extraordinary menſtruum. Being boiled hard in the ſhell, and afterwards ſuſpended in the air by a thread, it reſolves and drops down into an inſipid ſcentleſs liquor, which appears to be that anomalous unaccountable menſtruum ſo much uſed by Paracelſus; and will, though it contain nothing ſharp, oleaginous, or ſaponaceous, make a thorough ſolution of myrrh, which is more than either water, oil, ſpirits, or even fire itſelf, can effect. Boerhaave, New Meth. Chem. part ii. p. 358. ſeq. See MYRRH.

The origination of the albumen is ſomewhat obſcure. It is matter of common obſervation, that *eggs*, while in the ovaries of their birds, e. gr. of hens, conſiſt only of a yolk, without any albumen; and in *eggs*, when boiled, it is apparent, there is only a contiguity, but no connection between the two parts, ſince they are eaſily ſeparated, without a rupture of any thing, except in the places where the chalazæ are found. The reſult of the lateſt obſervations on this ſubject is, that the vitellus being deſcended into the ovary, the cavity of the ovary diſtils the matter of the albumen, and glues, or annexes it to the ſurface of the yolk. Harv. de Generat. Anim. exerc. xiv. p. 57. Bellin. de Mot. Cord. p. 40. Burggr. Lex. Med in voc.

The yolk of the *egg* is alſo compoſed of a gelatinous matter like the white, which coagulates and hardens with heat, and contains a conſiderable quanity of mild fat oil, that may be ſeparated from it by expreſſion.

The albumen is the nutritious juice, whereby the *egg* is diſtended and nouriſhed till it becomes big; and the yolk ſerves it for food after it is well grown, and partly alſo after it is hatched; for a good part of the yolk remains after excluſion, being received into the chicken's belly, as a ſtore-houſe, and conveyed thence by the appendicula, or ductus inteſtinalis, as by a funnel, into the guts, ſerving inſtead of milk.

At each end of the *egg* are the chalazæ, which are, as it were, the poles of this microcoſm: theſe are white, denſe bodies, conſiſting each of three little globules like hail joined together; by theſe, not only the ſeveral membranes are connected, or knit together, by which means the ſeveral liquors are kept in their proper place and poſition to each other, but they ſerve alſo to keep one and the ſame part of the yolk uppermoſt, let the *egg* be turned which way it will.

About the middle, between the chalazæ, on the ſide of the yolk, and in the membrane thereof, is a little veſica or bladder, not unlike a vetch, or lentil, called the CICATRICULA, and by ſome the *eye* of the *egg*. In this veſicle is contained an humour, in, and of which the chick is generated.

All theſe parts of a pullet's *egg* are found in all other *eggs*, to which the definition of an *egg* properly and ſtrictly agrees; ſuch *egg* being that, of a part whereof the animal is formed, the reſt ſerving for its food. Accordingly, the firſt ſeed, or ſtamen of the chick, is in the cicatricula.

EGGS, in diet, ſerve for an agreeable and nouriſhing aliment; but it is neceſſary, that they ſhould be freſh, and moderately coagulated by heat. If, upon holding them to a candle, they appear of a turbid colour, they are uſually reckoned ſtale; or if, upon preſenting them to the fire, they exhale a moiſture, they are freſh. The yolk is uſed in many medicinal preparations, as emulſions, &c.

EGGS, *Albumina*, or *whites of*, are of ſome uſe in medicine, though rather externally, in the preparation of collyriums for the eyes, and *anacollemata*, on account of their cooling, agglutinating, and aſtringent quality, than internally.

Albumina are uſed for burns, and in ſome mixtures with bole armeniac, &c. for conſolidating freſh wounds, and under bandages, and compreſſes to prevent the luxation of bones after reduction. A late writer recommends them as a ſecret in the jaundice. Junck. Conſp. Therap. tab. xiii. p. 379. Quinc. Diſpenſ. part ii. § 12. p. 204. Ephem. Germ. dec. 3. an. 2 obſ. 35, p. 43.

Beſides medical, the whites of *eggs* have alſo their chemical uſes, e. gr. for the clarifying of liquors; to which purpoſe, being mixed, and incorporated with the liquors to be clarified, and the whole afterwards boiled, the whites of *eggs* are by this means brought together, and hardened, and thus carry off the groſs parts of the liquor along with them. They likewiſe form a very white and ſhining varniſh, which is applied to ſeveral kinds of work, and particularly to pictures.

EGG-*ſhell white*, in *Painting*, is ſometimes uſed in water-colours, and preferred to flake or the Troy-white: it is prepared by peeling off the inner ſkins, and levigating the ſhell to a proper fineneſs, and waſhing over the powder.

EGG, what is termed *centeninum ovum*, among *Naturaliſts*, denotes a ſort of hen's *egg*, much ſmaller than ordinary, vulgarly called a *cock's egg*; from which it has been fabulouſly held, that the cockatrice or baſiliſk was produced. Brown, Vulg. Err. lib. iii. cap. 7.

The name is taken from an opinion, that theſe are the laſt *eggs* which hens lay, having laid an hundred before; whence *centeninum*, q. d. the hundredth *egg*.

Theſe *eggs* have no yolks, but in other reſpects are like common *eggs*, having the albumen, chalazas, membranes, &c. in common with others.

In the place of the yolk is found a body reſembling a little ſerpent, coiled up, which doubtleſs gave riſe to the tradition of the baſiliſk's origin from hence.

Their formation is probably aſcribed by Harvey to this, that the yolks in the vitellary of the hen are exhauſted before the albumina. Harvey de Generat. Animal. Exerc. 12.

M. La Peyronie has carried the hiſtory of the *ova centenina* to a greater length, as well as certainty: a hen was brought to him, which, for a conſiderable time, laid no other *eggs*. The ſame hen was alſo obſerved to crow like a cock, and to render by the cloaca a thin yellow matter, much like the yolk of an *egg* diluted in water. Upon opening her, ſhe was found hydropical; a bladder as big as the fiſt, full of water, was found contiguous to the oviduct, which it preſſed and crowded in ſuch manner, as not to leave the cavity thereof above five lines in diameter; ſo that a common *egg*, ſuch as it is when it falls from the ovary into the tube, could not paſs without burſting, by which the yolk was let out, and diſcharged another way. Mem. Acad. Scienc. an. 1710. p. 730.

EGGS, *preſervation of*. Mr. de Reaumur, of the Paris academy, thinking nothing that could be a public benefit beneath the cognizance of a philoſopher, beſtowed conſiderable pains on finding a method of preſerving *eggs* for a long time, and ſucceeded at length ſo far in it, as to be able to produce *eggs* of months, nay years old, which taſted as freſh and well as if they had been laid but the day before. The *egg* always is quite full, when it is firſt laid by the hen, but from that time it gradually becomes leſs and leſs to its decay; and however compact and cloſe its ſhell may appear, it is nevertheleſs perforated with a multitude of ſmall holes, though too minute for the diſcernment of our eyes. The effect of theſe, however, is evident, by the daily decreaſe of matter within the *egg*, from the time of its being laid; a fluid matter is continually perſpiring through theſe perforations of the ſhell, which occaſions the decay; and this is carried on in a much quicker manner in hot weather than in cold. To preſerve the *egg* freſh, there needs no more to be done than to preſerve it full, and ſtop its tranſpiration; and the plain and rational method of doing this, is by ſtopping up theſe pores through which the matter tranſpires, with a matter which is not ſoluble in watery fluids, and therefore cannot be waſhed away by the matter perſpired by the *egg*; and on this principle, all kinds of varniſh, prepared with ſpirit of wine, will preſerve *eggs* freſh for a long time, if they are carefully rubbed all over the ſhell. This might ſeem to moſt people a very common and cheap ſubſtance for this purpoſe; but the misfortune is, that in country places, where it ſhould be put in practice, no ſuch thing is to be had; and the poorer ſort of country people are not eaſily brought into the uſe of any thing to which they are not accuſtomed.

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To obviate the difficulty arising from this, Mr. Reaumur thought of ſubſtituting in the place of varniſh ſome other ſubſtance more common; and ſoon found, that another ſubſtance, which is very cheap, and every where to be had, would very well ſupply the office of varniſh; for experiments proved, that any hard fat would have the ſame effect. The beſt of all fat for this purpoſe, is found to be a mixture of that of mutton and of beef; theſe ſhould be melted together over the fire, and ſtrained through a linen cloth into an earthen pan; and when thoroughly melted, an *egg* is to be dipped into it, and immediately taken out again; and it is then in a ſtate to keep perfectly freſh more than a twelvemonth. Memoirs Acad. Scienc. Par. 1735.

The only difficulty attending this method is, that the *eggs* cannot be ſo eaſily plunged into the fat, as that all their ſurfaces ſhall be covered by it; for if they are held in a pair of pincers, the parts of the *egg* where the pincers touch will be bare; but the *eggs* may be ſuſpended by a loop at the end of a thread, and by that means plunged in; and the thread being then coated over with the fat, as well as the ſurface of the *egg*, will preſerve that part which it covers as well as the coat of fat will the reſt. The great care is to uſe this means while the *eggs* are perfectly freſh; it ought indeed to be done on the very day when they are laid; for if the evaporation is begun, and the empty ſpace once made, there is room for a fermentation, which never terminates but in the deſtruction of the *egg*.

There is one advantage in this uſe of fat rather than varniſh, which is, that the *eggs* rubbed over with it boil as quick as if nothing had been done to them, the fat melting off as ſoon as they touch the hot water; whereas the varniſh, not being ſoluble even in hot water, only becomes moiſtened by it, and ſtill hanging about the *egg*, prevents the tranſpiration of juices, neceſſary to bring the *egg* to that ſtate in which it is to be eat. When the *egg*, which has been preſerved by fat, is taken out of the water, there remains very little fattineſs upon it, and what there does is eaſily wiped off with a napkin, the *egg* is as nicely freſh as if laid but the day before, and no palate can diſtinguiſh the leaſt difference.

The method of preſerving them by means of fat, is greatly preferable alſo to that by varniſh, when they are intended for putting under a hen to be hatched; as the fat eaſily melts away by the heat, while the varniſh remains and impedes the hatching. By this means the *eggs* of foreign fowl might be ſent over and hatched here, whereby many beautiful and valuable birds may be naturalized among us.

At Tonquin they are ſaid to keep *eggs* entire for three years, by covering them up in a paſte made of aſhes and brine.

EGGS, *ant*. See ANT.

EGGS *of flies*. After the congreſs with the male, the female fly is ſeldom ſo much as twenty-four hours before ſhe begins to depoſit her *eggs* on ſome ſubſtance proper to give nouriſhment to the worms that are to be produced from them.

The *eggs* are but a little time in hatching; and the growth, and all the changes of the animal, take up but a little time. The creature is found to make its way out of the upper part of the *egg*; and it is not more than three weeks from the laying the *egg* that is taken up, before the creature is ſeen in the form of a perfect fly, if a female, and ready to depoſit hers.

Among the butterfly claſs, the female has but one congreſs with the male, by which the *eggs* are fecundated, and immediately after it begins to depoſit her *eggs*, and continues ſo doing, without interruption, till ſhe has finiſhed: but it is much otherwiſe with the two-winged flies; for they, after having laid one ſet of *eggs*, have repeated congreſſes with the male for ſeveral days; and, after every one of theſe, lay a new ſet.

The female of the butterfly claſs does not depoſit her *eggs* on any plant at random, on which ſhe happened to be placed when the male coupled with her, but ſearches out ſuch a ſpecies of plant for leaving them on, as is what ſhe loved when in the caterpillar ſtate, and what the young caterpillars to be hatched from them will be able to feed on, that they may find food ready for them at the moment of their birth. She does not ſcatter them about irregularly, and without order, but ſhe diſpoſes them with perfect ſymmetry, and faſtens them one to another, not by their own glutinous nature, but by a viſcid liquor, which ſhe ſeparates for that purpoſe. In many ſpecies alſo, where the hinder part of the body of the female is covered with long hairs, ſhe, by degrees, throws off all thoſe hairs, and with them makes a neſt for the *eggs* ſhe is laying, where they are kept very ſoft, and ſafely, till the time of their hatching. This, indeed, is the whole buſineſs of her life; and when the *eggs* are all laid, ſhe dies. Memoirs Acad. Scienc. Par. 1736.

The *eggs* of butterflies are of very different ſizes, according to the ſpecies; they are alſo of many different figures, ſome are ſpheric, others ſegments of ſpheres, others conic, in different forms and degrees: nor is this all, their ſurfaces are very different alſo in the different kinds. Some are elegantly wrought, as it were; ſome dented; and others more deeply notched at the ſides; and others channelled or furrowed all over. In ſhort, the moſt ingenious artiſt could ſcarce contrive ſo many various ornaments as there are on theſe *eggs*, all which alſo are inviſible to the naked eye, being diſcoverable no way but by the microſcope.

The *eggs* of the different ſpecies of the two-winged flies, are alſo of very different figures.

There are ſome ſpecies which faſten their *eggs* to the ſides of veſſels of water; theſe all lay oblong *eggs*: ſome of them, however, are perfectly ſmooth in all parts; and thoſe of other ſpecies ſmooth only on their inner ſurface, and ridged longitudinally on the other. What is alſo the more remarkable in theſe, is, that they all have a fine thin flake running down all along the two ſides, diametrically oppoſite; and theſe two bands ſurrounding the whole *egg* in this manner, have much the appearance of a caſe, and give the *egg* the appearance of being incloſed in a paper frame. It is probable, that the uſe of this frame is to hold the body of the *egg* the better faſtened againſt the veſſel; and probably thoſe *eggs* which have it not, are depoſited from the body of the female fly with a viſcous matter about them, in ſufficient quantity to faſten them on without this aſſiſtance.

There are ſome *eggs* of the fly kingdom which muſt neceſſarily be held faſt to ſome other body, in order for the worm to be able to make his efforts towards the opening of them, without carrying them away; and ſome of the ſpecies require much more ſtrong attachments of this kind than others.

On the ſtalks of the common meadow graſſes there are alſo frequently found the *eggs* of flies depoſited in great numbers. On other ſtalks of graſs, one may often ſee alſo yellow ſpots and blotches, which may naturally enough paſs with an incurious obſerver for maladies of the plants; but, when examined with the microſcope, they appear to be, in reality, cluſters of *eggs*, and amaſſed in different numbers: ſometimes alſo they are formed perfect and whole, and at others with their ends eaten. Theſe laſt are ſuch *eggs* from which the worms have made their way. Theſe worms are white, and have a variable head, armed with two hooks, but their changes are not known. Reaumur, Hiſt. Inſect. vol. iv. p. 376—383.

EGGS *of gnats*. There are few creatures in the winged kingdom more prolific than the gnat. Its whole ſeries of changes, from the *egg* to the perfect animal, is uſually accompliſhed in three weeks or a month; and there are commonly ſeven generations of them in a year, in each of which every female is the parent of two or three hundred young ones, if all the *eggs* come to proper maturity. Theſe *eggs* are arranged by the animal in the form of a ſmall boat, and each ſeparate *egg* is of the ſhape of a ninepin. The thicker ends of theſe are placed downwards; they are all firmly joined to one another by their middles; and their narrower, or pointed parts, ſtand upwards, and make the upper ſurface of the boat of *eggs*, as it were, rough or prickly.

When theſe *eggs* are examined ſingly by the microſcope, they appear not exactly of the ninepin ſhape; the larger end is rounded, and terminated by a ſhort neck, the end of which is bordered with a ridge, which makes a kind of mouth. The neck of each of theſe is ſunk within the water on which the boat ſwims; for it is neceſſary that it ſhould keep on the ſurface, ſince, if wholly ſubmerged, the worms could never be hatched.

It is only in the morning hours that the gnats are to be found laying their *eggs*; and then they will frequently be found about the ſurfaces of ſuch waters as are in a proper condition to give ſupport to their young. The female gnat here places herſelf on a ſmall ſtick, the fragment of a leaf, or any other ſuch matter, uſually near the water's edge, and places her body in ſuch a manner, that the laſt ring but one touches the ſurface of the water; the laſt ring of all, where there is the paſſage for the *eggs*, is turned upward, and every *egg* is thruſt out vertically; and the creature, when it is almoſt diſengaged, applies it againſt the ſides of the already formed cluſter, to which it readily adheres, by means of a mucilaginous ſticking matter with which it is naturally covered, like the *eggs* of many other inſects. Ibid. p. 619. The greateſt difficulty to the creature, is the placing the firſt laid *eggs* in a proper poſition to receive the reſt, and ſuſtain themſelves and them in a proper direction; theſe ſhe with great precaution, places exactly, by means of her hinder legs; and when a ſufficient number of them are thus

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thus arranged together, the reſt is eaſy, becauſe they ſerve as a ſupport to all the following. Reaumur, vol. iv. p. 615, &c.

An EGG, improperly ſo called, is that, of the whole whereof the animal is formed: ſuch as are the *eggs* of flies, butterflies, &c. which Ariſtotle calls *vermiculi*.

The two have this farther difference, that whereas the former, after they are excluded from the female, need no external nutriment, nor any thing but warmth and incubation, to bring the *fœtus* to perfection: the latter, after they are fallen out of the ovary into the uterus, require the nutritious juices of the uterus to diſtend and enlarge them; whence, they remain much longer in the uterus than the other.

The principal differences among *eggs*, properly ſo called, are, that ſome are *perfect*, i. e. have all the parts above deſcribed, while in the ovary or uterus; and others, *imperfect*, as not having all thoſe parts till after they are excreted or laid; ſuch are the *eggs* of fiſh, which, after they are brought forth, aſſume an albumen to themſelves in the water.

Another difference is, that ſome are *fecundated*, and others not: the firſt are thoſe which contain a ſperm, injected by coition of the male, to diſpoſe them for conception; the reſt, not impregnated with this ſperm, never breed young by incubation, but always putrify.

An *egg* fecundified contains the rudiments of the chick, before the hen has ſat upon it. By the microſcope, we ſee, in the middle of the cicatricula, the plain carina of the chick, ſwimming in the liquamen or humour: it conſiſts of fine white zones or threads, which the warmth of future incubation enlarges, by rarefying and liquifying the matter firſt of the albumen, and then of the vitellus, and preſſing them into the veſſels of the cicatricula, for a farther preparation, digeſtion, aſſimilation, and accretion, till the chick, too big for its covercle, breaks the ſhell, and is delivered.

Malphigi has made very curious obſervations with the microſcope, of all the changes that happen in the *egg*, every half hour of incubation; and the learned Dr. Monro has given a ſummary of ſeveral obſervations of this kind. Med. Eſſ. Edinb. vol. ii. art. 10.

Voſſius, and diverſe other authors, are very ſolicitous about ſettling the queſtion, which was formed firſt, the *egg* or the pullet. De Idolol. lib. iii. cap. 78.

In Egypt, they hatch their *eggs* by the heat of a furnace, or oven, and frequently have ſeven or eight thouſand chickens come forth at a time. An account of the method hereof we have in the Philoſophical Tranſactions. See HATCHING.

It was anciently thought, that none but birds and fiſhes, with ſome other animals, were produced *ab ovo*, *from eggs*; but the generality of the moderns incline to think, that all animals, even man himſelf, is generated the ſame way. Harvey, de Graaf, Kerchringius, and ſeveral other great anatomiſts, have ſo ſtrenuouſly aſſerted this opinion, that it now generally obtains.

In the teſtes of women, are found little veſicles, about the ſize of green peas, which are accounted as *eggs*; for which reaſon theſe parts, which the ancients called *teſticles*, the moderns call *ovaries*. Theſe *eggs*, fecundified by the moſt volatile and ſpirituous part of the ſeed of the male, are detached from the ovary, and fall down the Fallopian tubes into the uterus, where they grow and increaſe.

This ſyſtem is countenanced and confirmed by abundance of obſervations and experiments. M. de St. Maurice, upon opening a woman at Paris, in 1682, found a fœtus perfectly formed in the teſticle.

Among the ancients, the *egg* was the ſymbol of the world; it being a tradition among them, that the world was made of an *egg*; whence *eggs* became of ſingular importance, in the ſacrifice of Cybele, the mother of the Gods. Some of their deities, they ſay, were likewiſe produced from *eggs*.

Berger, in his treatiſe de Natura Humana, lib. ii. cap. i. p. 461, makes no ſcruple to give it as his opinion, that the only difference between animals, called *oviparous*, and thoſe denominated *viviparous*, conſiſts in this: that the former caſt their *eggs* out of the body, and lay them in neſts; and that their *eggs* contain all the nouriſhment requiſite for the fruit, or fœtus: whereas, in the latter, the *eggs* are only laid from the ovary into the uterus; that they have but little juice; and that the mother furniſhes the reſt.

There is not ſo much as a plant, whoſe generation, according to the ſentiment of Empedocles, and ſince him of Malphigi, Rallius, Fabric. de Aquapendente, Grew, and others, is not effected by the means of *eggs*.

EGG, *wind*. See WIND-*Egg*.

EGG, *ſea*, *Echinus Marinus*. See ECHINODERMA.

EGG, *cows*, is a name which ſome authors give to a kind of bezoard, found in the ſtomachs of the cow kind.

EGG, in *Architecture*, an ornament of an oval form, cut in the echinus, or quarter-round of the Ionic and Compoſite capitals. The profile, or contour of the echinus, is enriched with *eggs* and anchors, alternately placed. See *Tab. Archit. fig.* 10.

EGG, *philoſophical*, in *Chemiſtry*. See PHILOSOPHICAL.

EGILOS, in *Botany*, a name given by Serapion's interpreters, to the plant which that author and Avicenna call alachuin. Their deſcriptions of the plant abundantly prove, that it is the ſame with the achillæa of the Greek writers; and this word *egilos* ſeems only a barbarous name for that plant, formed on a miſ-ſpelling of the achillæa.

EGITILLIA, a name by which ſome have called the ſtone *ægyptilla*. See ÆGYPTILLA.

EGLANTINE, or *ſweet briar*, a ſpecies of roſe. See ROSE.

EGLECOPALA, the name of a ſpecies of ſtony bluiſh marle. See MARLE.

EGOITOS, a term uſed by Van Helmont, to expreſs the light of underſtanding, by which we reflect and reaſon within ourſelves.

EGRA *ſalt*, *Egranum ſal*, a name given by Hoffman, and other writers, to a purging ſalt, extracted from the waters of *Egra* by evaporation. The waters of this place are in great eſteem for many diſeaſes; and are, by Hoffman himſelf, in ſome reſpects, preferred to the Pyrmont, as containing leſs ochre and calcareous earth. The ſalt is wholly of the nature of Glauber's ſalt, as is alſo that of many other ſprings thereabout, and even in our own country.

EGRA *water*, *Egrana aqua*, the water of a medicinal ſpring, near that place, in the German dominions. It is famous for cleanſing the viſcera, obſtructed with viſcid matter, and is found of great ſervice in all hypochondriacal caſes, and in all diſeaſes ariſing from infarctions of the viſcera; it gently purges by ſtool, and affords a ſalt, known among the German writers by the name of *Egranum ſal*.

EGUILETTE, in the *Manege*. See YERKING.

EGUISCE', ſee AIGUISCE'.

EGYPTIANS, popularly *Gypſies*, in our ſtatutes, a kind of impoſtors and jugglers, who diſguiſe themſelves in uncouth habits, ſmearing their faces and bodies, and framing to themſelves a canting language, wander up and down; and under pretence of telling fortunes, curing diſeaſes, &c. abuſe the common people, trick them of their money, and ſteal all that they can come at. There are ſeveral ſtatutes made againſt them.

Egyptians coming into England are to depart the realm in fifteen days, or be impriſoned, by 22 Hen. VIII. cap. 10. And by 1 and 2 P. & M. cap. 4. any perſon importing them into this kingdom, ſhall forfeit forty pounds; and if they remain here above one month; or if any perſon, fourteen years old, conſort with them, they are guilty of felony, without benefit of clergy. 5 Eliz. cap. 20. And we are informed by Sir M. Hale, that at one Suffolk aſſizes, no leſs than thirteen *Gypſies* were executed upon theſe ſtatutes, a few years before the Reſtoration. See alſo 39 Eliz. cap. 4. § 2. 17 Geo. II. cap. 5. § 2.

The origin of this tribe of vagabonds is ſomewhat obſcure; at leaſt, the reaſon of the denomination is ſo. It is certain, the ancient *Egyptians* had the character of great cheats, and were famous for the ſubtilty of their impoſtures; whence the name might afterwards paſs proverbially into other languages, as it is pretty certain it did into the Greek and Latin; or elſe, the ancient *Egyptians*, being much verſed in aſtronomy, which in thoſe days was little elſe but aſtrology, the name was on that ſcore aſſumed by theſe tellers of good fortune.

Be this as it will, there is ſcarce any country of Europe but has its *Egyptians*, though not all of them under that denomination: the Latins call them *Ægyptii*; the Italians, *Cingani* and *Cingari*; the Germans, *Zigeuner*; the French, *Bohemiens*; others, *Saracens*; and others, *Tartars*, &c.

Munſter, Geogr. lib. iii. cap. 5. relates, that they made their firſt appearance in Germany, in 1417, exceedingly tawny and ſun-burnt, and in pitiful array, though they affected quality, and travelled with a train of hunting-dogs after them, like nobles. The above date ſhould probably have been 1517, as Munſter himſelf owns, he never ſaw any till 1524. He adds, that they had paſſports from king Sigiſmund of Bohemia, and other princes. Ten years afterwards, they came into France, and thence paſſed into England. Several hiſtorians inform us, that when ſultan Selim conquered Egypt, in the year 1517, ſeveral of the natives refuſed to ſubmit to the Turkiſh yoke; but, being at length ſubdued and baniſhed, they

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they agreed to diſperſe in ſmall parties over the world, where their ſuppoſed ſkill in the black art gave them an univerſal reception, in that age of ſuperſtition and credulity. In a few years, the number of their proſelytes multiplied, and they became formidable to moſt of the ſtates of Europe. Paſquier, in his Recherch. lib. iv. chap. 19. relates a leſs probable origin of the *Gypſies*, thus: On the 17th of April 1427, there came to Paris twelve penitents, or perſons, as they ſaid, adjudged to penance, viz. one duke, one count, and ten cavaliers, or perſons on horſeback: they took on themſelves the character of *Chriſtians of the Lower Egypt*, expelled by the Saracens; who, having made application to the pope, and confeſſed their ſins, received for penance, that they ſhould travel through the world for ſeven years, without ever lying on a bed. Their train conſiſted of 120 perſons, men, women, and children, which were all that were left of 1200, who came together out of Egypt. They had lodgings aſſigned them in the chapel, and people went in crowds to ſee them. Their ears were perforated, and ſilver buckles hung to them; their hair was exceedingly black, and frizzled; their women were ugly, thieviſh, and pretenders to telling of fortunes. The biſhop ſoon afterwards obliged them to retire, and excommunicated ſuch as had ſhewn them their hands.

By an ordonnance of the eſtates of Orleans, in the year 1560, it was injoined, all theſe impoſtors, under the name of *Bohemians* and *Egyptians*, to quit the kingdom, on penalty of the gallies. Upon this they diſperſed into leſſer companies, and ſpread themſelves over Europe. The firſt time we hear of them in England, was in the year 1530, when they were deſcribed by the ſtatute already cited, 22 Hen. VIII. cap. 10. They were expelled from Spain in 1591. Du-Cange.

Ralph. Volaterranus, making mention of them, affirms, that they firſt proceeded or ſtrolled from among the Uxii, a people of Perſis or Perſia.

EGYPTIAN *year*. See YEAR.

EHRETIA, in *Botany*, a genus of the *pentandria monogynia* claſs of plants, with a double-celled berry, a ſingle bilocular ſeed, and a marginated ſtigma.

EIA, or EY, in our *Old Writers*, are uſed for an iſland. Hence the names of places ending in *ey*, denotes them to be iſlands. Thus, Ramſey, the iſle of Rams; Sheppey, the iſle of Sheep, &c.

EIA, is alſo ſometimes uſed for water; and hence the names of places near waters, or lakes, terminate in *ey*.

EIDER-*duck*. See DUCK.

EJACULATION, in *Medicine*, the act of emitting ſeed, from the Latin, *ejaculari, to caſt outwards*. See EMISSION.

EJACULATOR, in *Anatomy*, a name applied to two muſcles of the genitals, from their office in the ejaculation of the ſeed.

The *ejaculatores* ariſe from the ſphincter of the anus, and advance along the urethra as far as the middle thereof, where they are inſerted laterally.

The ſame denomination is likewiſe given to two muſcles of the clitoris, which, ariſing from the ſphincter ani, advance laterally along the labia, and are inſerted aſide of the clitoris.

EJACULATORY, in *Anatomy*, is a term applied to two little ducts, or canals, ariſing from the veſiculæ ſeminales. The *ejaculatory* ducts are about an inch in length: towards the veſiculæ, they are pretty wide; but they contract themſelves as they approach towards the urethra, which they penetrate together.

Some authors alſo apply the name *ejaculatory* to the vaſa deferentia.

EICETÆ, called alſo HEICETÆ and HICETÆ, heretics of the ſeventh century, who made profeſſion of the monaſtic life.

From that paſſage in Exodus, where Moſes and the children of Iſrael are ſaid to have ſung a ſong in praiſe of the Lord, after they had paſſed the Red-Sea, wherein their enemies had periſhed; the *Eicetæ* concluded, that they muſt ſing and dance, to praiſe God aright; and as Mary the propheteſs, ſiſter of Moſes and Aaron, took a drum in her hand, on the ſame occaſion, and all the women did the like, to teſtify their joy, by playing, beating, and dancing; the *Eicetæ*, the better to imitate their conduct herein, endeavoured to draw women to them to make profeſſion of the monaſtic life, and aſſiſt in their mirth.

EJECIT *infra terminum*. See QUARE *ejecit*.

EJECTION, the act of throwing out, or diſcharging any thing at ſome of the emunctories, as by ſtool, vomiting, or the like.

EJECTIONE *cuſtodiæ, ejectment de garde*, in *Law*, a writ which lies againſt him that caſts out the guardian from any land during the minority of the heir.

EJECTIONE *firmæ*, a writ that lies for the leſſee for years, who is ejected before the expiration of his term, either by the leſſor or a ſtranger.

Alſo *ejectment* may be brought by a leſſor againſt the leſſee, for rent in arrears, or holding over his term, &c. Reg. Orig. 227. But *ejectment* is now become an action in the place of many real actions, as writs of right, formedons, &c. which are very difficult, as well as tedious and chargeable; and this is the common action for trying of titles, and recovering of lands, &c. illegally kept from the right owner. Though, where entry is taken away by deſcents, fines, and recoveries, diſſeiſins, &c. *ejectment* may not be brought; ſo that all titles cannot be tried by this action.

The method of proceeding in the action of *ejectment* is, to draw a declaration, and therein feign a leaſe for three, five, or ſeven years, to him that would try the title; and alſo feign a caſual ejector or defendant; and then deliver the declaration to the ejector, who ſerves a copy of it on the tenant in poſſeſſion, and gives notice in writing at the bottom, for him to appear and defend his title; or that he, the feigned defendant, will ſuffer judgment by default, whereby the true tenant will be turned out of poſſeſſion: to this declaration the tenant is to appear, at the beginning of next term, by his attorney, and conſent to a rule to be made defendant, inſtead of the caſual ejector, and take upon him the defence; in which, he muſt confeſs leaſe, judgment, entry, and ouſter, and at the trial ſtand upon the title only: but in caſe the tenant in poſſeſſion does not appear, and enter into the ſaid rule in time, after the declaration ſerved, then, on affidavit being made of the ſervice of the declaration, with the notice to appear, the court will order judgment to be entered againſt the caſual ejector by default; and thereupon the tenant in poſſeſſion, by writ *habere facias poſſeſſionem*, is turned out of his poſſeſſion. On the trial in *ejectment*, the plaintiff's title is to be ſet forth from the perſon laſt ſeiſed in fee of the lands in queſtion, under whom the leſſor claims down to the plaintiff, proving the deeds, &c. and the plaintiff ſhall recover only according to the right which he has at the time of bringing his action. And here, another who had title to the land, upon a motion made for that purpoſe, may be defendant in the action with the tenant in poſſeſſion, to defend his title; for the poſſeſſion of the lands is primarily in queſtion, and to be recovered, which concerns the tenant, and the title thereto is tried collaterally, which may concern ſome other.

By a late ſtatute, in all caſes between landlord and tenant, when half a year's rent ſhall be in arrear, the landlord, having lawful right to re-enter for non-payment, may ſerve a declaration in *ejectment* on the tenant, without a formal demand or re-entry; or he may affix ſuch declaration on the door of the demiſed meſſuage, or notorious place of the lands, which ſhall be deemed a legal ſervice; and upon proof that half a year's rent was due before the declaration was ſerved, and no ſufficient diſtreſs on the premiſſes, the leſſor ſhall have judgment and execution; which if the leſſee ſuffer, without paying the arrears and coſts, and without filing a bill in equity to be relieved within ſix months, he ſhall be barred from all relief, except by writ of error; and the leſſor ſhall hold the premiſſes diſcharged from the leaſe: but if the tenant or leſſee tender to the leſſor, or bring into court the rent in arrear, together with coſts, all farther proceedings ſhall ceaſe; and if the leſſee be relieved in equity, he ſhall enjoy the demiſed premiſſes according to his leaſe, without obtaining a new one. Stat. 4 Geo. II. cap. 28. and 11 Geo. II. cap. 19.

EIGHT-FOIL, or *Double Quarter-foil*, in *Heraldry*, a modern DIFFERENCE, denoting the ninth ſon of the firſt houſe.

EIGHT, *piece of*. See PIECE *of eight*.

EIGHTH *pair of nerves*. See NERVE.

EIGNE, from French, *aiſne*, in *Law Books*, is uſed for eldeſt, or firſt-born. Thus we ſay, baſtard *eigne*, and *mulier puiſne*, for the elder baſtard, and the younger lawfully born.

EILAMIDES, from ειλεω, *I involve*, a word uſed by Hippocrates, to expreſs the meninges or membranes of the brain, the dura mater and pia mater.

EINBLINDER, in *Zoology*, the name of a ſort of lamprey, without eyes, called by the writers on theſe ſubjects the *lampetra cæca*, or *blind lamprey*. It is very ſmall, not exceeding the common dew-worms in length or thickneſs. It has no ſcales; but its body is divided by annular lines, into eighty-four rings, juſt in the manner of the large worms. Its mouth is in the under part of its head, and is round, and always open. It has a cavity in the middle of its head, like the reſt of the lampreys, for admitting water, and has ſeven gill-holes on each ſide. It has the common long fin running on the ridge of the back, but has no other. Willughby's Hiſt. Piſc. p. 107.

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EINECIA, in our *Old Writers*, is uſed for primogeniture. It is ſometimes writ *eſnecia* and *eſnecy*. See ESNECY.

EIRE, ſee EYRE.

EIRESIONE, Ειρεσιωνη, from ειρος, *wool*, in *Antiquity*, an olive branch bound about with wool, and crowned with all ſorts of firſt fruits, which was carried in proceſſion in the Athenian feſtival, called PYANEPSIA. Pott. Archæol. Græc. lib. ii. cap. 20. tom. i. p. 428.

EISETERIA, Εισιτηρια, from εισειμι, *I enter*, in *Antiquity*, the day on which the magiſtrates at Athens entered upon their office; upon which it was cuſtomary for them to offer a ſolemn ſacrifice, praying for the preſervation and proſperity of the commonwealth, in the temple of Jupiter Βουλαιος, and Minerva Βουλαια, i. e. the counſellors. Pott. Archæol. Græc. lib. ii. cap. 20. tom. i. p. 385.

ELA *Calli*, in *Botany*, the name of a ſhrub which grows in ſandy ſoils, in ſome parts of the Eaſt Indies, about twice as high as a man. The bark of the root triturated, and drank in water in which rice has been boiled or waſhed, is recommended againſt the dropſy, and is ſaid to be a very mild medicine; which Mr. Ray juſtly wonders at, as the plant is full of an acrid cauſtic milk; which, however, when exhibited with butter in which it has been boiled, proves a mild and gentle purgative. The leaves heated at the fire, provoke urine; and the ſteam or vapour of a decoction of them, contributes to alleviate and remove pains in any part of the body. The juice, expreſſed from the leaves, either warmed or a little toaſted, cures pains of the ears, if put into them. It alſo removes ſpecks in the eyes, if dropt into them, and contributes to the cure of ſwellings in the pudenda, if the body is waſhed with it.

ELABORATION, the act of finiſhing or perfecting any thing with labour and time.

The term is chiefly uſed in *Medicine*, where the chyle, blood, and ſemen, are ſaid to be *well elaborated*, when they are well conditioned, have undergone all the ſecretions, mixions, impregnations, and circulations, neceſſary to bring them to perfection.

If the chyle went directly from its receptaculum to the breaſts, it would not be ſufficiently *elaborated* to afford good milk. See MILK.

ELABORATORY. See LABORATORY.

ELÆGNON. See AGNUS *Caſtus*.

ELÆAGNUS, in *Botany*, a name uſed by ſome authors for the gale frutex, the Dutch myrtle or gaule. Merret. Pin. p. 82.

ELÆAGNUS, in *Botany*. See *Wild* OLIVE.

ELÆOCARPUS, in *Botany*, a genus of plants of the *polyandria monogynia* claſs; the calyx of which is a five-leaved perianthium; the corolla conſiſts of five torn petals, the fruit a drupe, and the ſeed a criſp nucleus.

ELÆOMELI, in the writings of the ancient *Phyſicians*, the name of a ſubſtance, thus deſcribed by Dioſcorides. In Palmyra, a country of Syria, the *elæomeli*, which is an oil thicker than honey, and of a ſweet taſte, flows from the trunk of a tree. Two cyathi of this oil, he adds, drank with a hemina of water, evacuate crude and bilious humours by ſtool. There was much good obtained from the giving this medicine; but it had this remarkable effect, that thoſe who took it were ſeized with a torpor, and privation of ſtrength for a time: this was, however, of no ill conſequence, but people knew of and expected it, and uſed always to keep thoſe perſons awake who had taken it, and the ſymptoms ſoon went off. The ſame author alſo adds, that the oil was ſometimes prepared from the buds of the tree; and ſuch of this kind was eſteemed the beſt that was old, thick, fatty, and not foul or turbid. It was judged of a heating nature, and frequently applied externally to the eyes, with good effect in the cure of dimneſs of ſight, and contributed to the cure of leproſies, and pains of the nerves. Hermolaus Barbarus has a ſtrange conjecture in regard to the ſubſtance, which is, that it was the ſame with the manna mentioned in Scripture, only uſed in medicine inſtead of food: but the account which Dioſcorides gives of the effects of it is a very ſufficient anſwer to the abſurdity of ſuch an opinion. Dioſcorides, lib. i. cap. 37.

ELÆOSACCHARUM. See ELEOSACCHARUM.

ELÆOTHESIUM, Ελαιοθεσιον, in *Antiquity*. See ALIPTERIUM.

ELAIS, in *Botany*, a genus of the claſs of *palmæ*: both the male and female flowers have a ſix-leaved calyx; the corolla of the male is divided into ſix ſegments, and that of the female has ſix petals; the ſtamina of the former are ſix, and the ſtigmata of the latter three; the fruit is a fibrous drupe, containing a ſingle three-valved nut.

ELANULA, in *Medicine*, the name of a peculiarly hard alum.

ELAPHEBOLIA, Ελαφηβολια, in *Antiquity*, a feſtival kept in honour of Diana Ελαφηβολος, i. e. the Huntreſs, for which reaſon, a cake made in the form of a deer, and upon that account called ελαφος, was offered to her. For a farther account of it, ſee Pott. Archæol. Græc. lib. ii. cap. 20.

ELAPHEBOLION, Ελαφηβολιων, in ancient *Chronology*, the ninth month of the Athenian year. It conſiſted of thirty days, and anſwered to the latter part of our February, and beginning of March. See MONTH.

It was thus called from the feſtival ELAPHEBOLIA kept in it.

ELAPHIS. See ELAPS.

ELAPHOBOSCUM, in *Botany*, the wild parſnep. See PARSNEP.

ELAPHOCAMELOS, in *Zoology*, a name by which ſeveral authors have called the Peruvian camel, uſually called *glama*, and employed there as a beaſt of burden. See GLAMA.

ELAPHONESUM *marmor*, a name uſed by the ancients to expreſs a ſpecies of marble uſed in ſtatuary, and called alſo *Proconenſium marmor*; it was of a bluiſh white, variegated with ſlender veins of black. See PROCONENSIUM.

ELAPS, or ELAPHIS, by ſome called alſo *elops*, the name of a ſerpent deſcribed by many authors, and met with by Bellonius in the iſland of Lemnos: it grows to about three foot long, and is on the back of a dark grey, with three longitudinal black lines, running from the head to the tail, and on the belly of a bright yellow, according to Aldrovandus. The people of Lemnos call it *laphiati*.

ELASMIS, in *Natural Hiſtory*, the name of a genus of foſſile bodies, of the talc claſs, the diſtinguiſhing characters of which are, that they are compoſed of ſmall plates, in form of ſpangles, each of which is either ſingle, and not farther fiſſile; or, if complex, fiſſile only to a certain degree, and that into ſomewhat thick laminæ. See *Tab. of Foſſils*, *Claſs* I.

The word is derived from the Greek, ελασμος, *a lamina* or *plate*: the ſeveral component parts of theſe maſſes being ſo many ſmall plates.

The bodies of this genus have been uſed to be named *mica*, *glimmer*, and *cat-ſilver*, by authors, in the ſame manner with the *bractearia*. There are only four known ſpecies of this foſſil.

ELASTIC *body*, in *Mechanics*, is that which, by being ſtruck or ſtretched, has its figure altered; but endeavours, by its own force, to reſume the ſame: or, it is a ſpringy body, which, when compreſſed or condenſed, or the like, makes an effort to ſet itſelf at liberty, and to repel the body that conſtrained it. Such is a ſword-blade, a bow, &c. which are eaſily bent, but preſently return to their former figure and extenſion. This property belongs more or leſs to almoſt all bodies; but as there are none which reſtore themſelves with the ſame force with which they were compreſſed, there are no bodies that are perfectly *elaſtic*.

The word is formed from the Greek, ελασις, *impulſor*, of ελαυνειν, *to impell*, *puſh*, &c. See SPRING.

Elaſtic bodies are either *natural* or *artificial*: thoſe moſt eminent for their *elaſtic* power among *artificial* bodies, are ſteel, braſs, ivory, and marble balls; leather, ſkins, membranes; braſs, ſilver, iron, and ſteel chords or wires; nerves, guts, hemp, and flax ſtrings, &c.

Amongſt *natural bodies*, the principal are air, ſponges, the branches of green trees, wool, cotton, feathers, &c.

It is diſputed, whether or no water hath any *elaſtic* force: the moſt common opinion has long been, that it has none of itſelf; and that if it ſhews any, it is owing to the air contained therein. See COMPRESSION, under which article the contrary is demonſtrated.

The principal phenomena obſerved to obtain in *elaſtic bodies*, are, 1. That an *elaſtic body* (i. e. *a body perfectly elaſtic*, if any ſuch there be) endeavours to reſtore itſelf with the ſame force wherewith it is preſſed or bent.

2. An *elaſtic* body exerts its force equally towards all ſides; though the effect is chiefly found on that ſide where the reſiſtance is weakeſt; as is evident in the caſe of a bow ſhooting out an arrow, a gun exploding a ball, &c.

3. *Elaſtic bodies*, in what manner ſoever ſtruck, or impelled, are inflected, and rebound after the ſame manner. Thus a bell yields the ſame ſound in what manner, or on what ſide ſoever it be ſtruck.

4. A body perfectly fluid, if any ſuch there be, cannot be *elaſtic*, if we allow that its parts cannot be compreſſed. See FLUID.

5. A body perfectly ſolid, if any ſuch there be, cannot be *elaſtic*, in that having no pores, it is incapable of being compreſſed. See SOLID.

6. Hard, long, flexible bodies, apt to acquire *elaſticity*, do

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do it chiefly in three ways; either by being extended, by being contracted, or by being bent.

7. Bodies, in dilating themſelves by their *elaſtic* power, exert a greater force at the beginning of their dilatation, than towards the end thereof; becauſe the bodies are more compreſſed at firſt, and the renitency is always equal to the compreſſion.

8. The motion, whereby compreſſed bodies reſtore themſelves, is uſually an accelerated motion. See DILATATION.

9. The *elaſtic* property of bodies ſeem to differ, according to their greater or leſs compactneſs or denſity: thus, metals, by being hammered, are rendered more compact, and alſo more *elaſtic*. Tempered ſteel is much more *elaſtic* than ſoft ſteel; and the denſity of the former to the latter as 7809 to 7738. Cold likewiſe condenſes bodies, and renders them more *elaſtic*, whilſt heat, that relaxes them, has the contrary effect. M. Belidor has found, that cannon balls are projected farther from cold guns than from the ſame guns, when heated; and the ſtring of a violin is known to act more ſtrongly in winter than in ſummer. We muſt except, however, air, and other *elaſtic* fluids, which acquire an increaſe of *elaſtic* force from heat. Muſchenb. Int. ad Phil. Nat. vol. i. p. 231. 4to.

We may add 10. That the *elaſtic* force of bodies is the ſame in vacuo as in the air, when other circumſtances are alike.

For the laws of motion and percuſſion in *elaſtic* bodies, ſee MOTION and PERCUSSION.

ELASTIC CURVE. See CATENARIA.

ELASTICITY, or ELASTIC *Force*, in *Mechanics*, denotes a property or power in natural bodies, which denominates them *elaſtic*; and by which they are reſtored to the figure and extenſion they had loſt from any external cauſe.

The cauſe, or principle of this well-known and important property is variouſly aſſigned: the Carteſians account for it from the effort of the *materia ſubtilis* to paſs through pores that are too narrow for it. Thus, ſay they, in bending or compreſſing an elaſtic body, e. gr. a bow, its parts recede from each other on the convex ſide, and approach on the concave; conſequently, the pores are contracted or ſtraitened on the concave ſide; and if they were before round, they are now oval; and the materia ſubtilis endeavouring to paſs out at thoſe pores, thus ſtraitened, muſt make an effort, at the ſame time to reſtore the body to the firſt ſtate it was in when the pores were more patent and round, i. e. before the bow was bent. Other philoſophers account for *elaſticity* much after the ſame manner as the Carteſians, with this inconſiderable difference; that, inſtead of the ſubtile matter of the Carteſians, they ſubſtitute a fine etherial medium that pervades all bodies. Others again have ſuppoſed, that this ſubtile matter or ether is itſelf *elaſtic*.

Some reſolve *elaſticity* into the preſſure of the atmoſphere; for a violent tenſion or compreſſion, though not great enough to ſeparate the conſtituent particles of bodies far enough to let in any foreign matter, muſt yet occaſion many little vacuities between the ſeparated ſurfaces; ſo that upon the removal of the force they will cloſe again, by the preſſure of the aereal fluid upon the external parts.

Others make the elaſtic force of the air included within the pores of all bodies, the principle of their *elaſticity*: but this hypotheſis is contrary to fact; ſince the elaſtic force remains *in vacuo*. Malebranche, and others after him, have aſcribed this property to imaginary vortices of matter included within all bodies, whoſe ſpherical figure is changed by compreſſion into an oval figure, and whoſe centrifugal force reſtores them, together with the parts of bodies to which they belong, to their former ſtate.

Others account for *elaſticity*, from the great law of nature, attraction, or the cauſe of the coheſion of the parts of ſolid and firm bodies. Thus, ſay they, when a hard body is ſtruck or bent, ſo that the component parts are removed a little from each other, but not quite disjoined, or broke off, or ſeparated ſo far as to be out of the reach of that attracting force whereby they cohere; they muſt certainly, on the ceſſation of the external violence, ſpring back to their former natural ſtate. But it has been objected to this hypotheſis, that when e. gr. a ſpring is bent, the particles on the convex ſide will be ſeparated from one another, whilſt thoſe on the concave will be brought nearer, and the power of attraction, inſtead of making the ſpring reſtore itſelf, will keep it in the ſame ſtate, as it happens in bodies that have no *elaſticity*, where perhaps only attraction obtains; and therefore they have ſuppoſed the conſtituent particles of bodies to be endued with both a repulſive and an attractive power: thus, if a row of round particles touch one another in the point *c* in a line from A to B (*Tab.* III. *Mechanics*, *fig.* 36.) it is plain, from the laws of coheſion, that upon the leaſt alteration out of the poſition of a ſtrait line, theſe particles will run together, and form a ſphere, in which the globules will have more points of contact; and if theſe particles are ſuppoſed to have poles like magnets, in the oppoſite places marked *n*, *s*, ſo that all the poles *n*, *n*, *n*, &c. repel one another, and all the poles, *s*, *s*, *s*, &c. repel one another, the line A B will continue ſtrait; for if by any force the ſaid line B A be put into another poſition, as into the curve *b a*, then the poles *n*, *n*, &c. being brought nearer together, while the poles, *s*, *s*, &c. are farther aſunder, will repel one another more ſtrongly, and thereby hinder the globules from running together towards the concave part, and the ſpring left to itſelf, one end as *b*, B or *β* being fixed, will reſtore itſelf, throwing its end *a* back to A, and ſo on to *α*; then, being in the poſition *α β*, the poles *s*, *s*, &c. are brought nearer together, whoſe repulſion thus increaſed, throws back *α* to A, and ſo on forward, whilſt the line of particles performs ſeveral vibrations round B. A ſpring of ſteel, or other ſprings, may probably conſiſt of ſeveral ſeries of ſuch particles, whoſe polarity and attraction acting at the ſame time, will ſhew why ſuch bodies, where they have been bent, vibrate and reſtore themſelves. Hard ſteel is highly *elaſtic*; and the metal is thus hardened by making it white-hot, and immediately quenching it, ſo that it is fixed in an almoſt fluid ſtate, and the particles which the fire had made almoſt round have but a very ſmall contact; and accordingly, ſteel thus hardened is extremely brittle: but as ſpherical particles can never make a tough ſpring, the workmen bring down the temper of the hard ſteel, or *let down the ſpring*, as they expreſs it, by a proceſs which alters the figures of its conſtituent particles. For this purpoſe they heat it anew; and whilſt it is gently cooling, the mutual attraction increaſes the contact, ſo that the particles grow flatter in thoſe places where before they had but a ſmall contact; and leſt the contact ſhould become too great, they quench the ſpring in water, oil, or greaſe. Or they have another proceſs, which is to ſhape them in cold unelaſtic ſteel, and then heating them to a ſmall degree, e. gr. to a blood-red heat, immediately to cool them in ſome proper liquor; whereby the particles are ſettled in their oblong figure before they become round in the fuſion of a white heat. Nor is it improbable that they may thus acquire polarity, ſince dipping red-hot ſteel in cold liquors in a particular poſition will make it magnetical: and iron and ſteel are alſo made magnetical only with hammering. Deſagulier's Courſe of Exper. Phil. vol. ii. p. 38—40, &c. See SPRING. Perhaps the true cauſe of the *elaſticity* of bodies may ſtill remain among the unexplored ſecrets of nature.

ELASTICITY, *laws of*. To enquire a little more expreſsly into the nature and laws of *elaſticity*, we ſhall conſider the phenomena thereof. Let it be premiſed, then, that all the bodies wherein this power is obſerved, do conſiſt, or may be conceived to conſiſt, of ſmall threads or fibres, which, laid together, conſtitute ſuch bodies. To examine *elaſticity*, therefore, in its moſt ſimple caſe, we had beſt conſider it in muſical ſtrings or chords, and particularly in thoſe of metal; for thoſe of cat-gut having a ſpiral twiſt, cannot be conſidered as the fibres whereof bodies are formed.

Now the *elaſticity* of a fibre or chord, conſiſts in this: that it may be ſtretched or extended; and that upon removing the force whereby it was ſtretched or lengthened, it returns again to its former dimenſions. Fibres have no *elaſticity*, unleſs they be extended with a certain force; as appears in lax chords, which may be moved a little out of their poſition without endeavouring to recover it; though what the degree of tenſion is, neceſſary for *elaſticity* to commence, is not yet determined by experiment: add, that when a fibre is too far ſtretched, it loſes its *elaſticity*; though here, too, the degree of tenſion that deſtroys *elaſticity* is unknown; but it is certain, *elaſticity* depends on tenſion, and is confined within a certain ſphere, or boundary thereof, on either ſide. See SPRING. This, if it doth not give us the proper adequate cauſe of *elaſticity*, yet ſhews us the difference between *elaſtic* and *unelaſtic* bodies; how it is that a body loſes its *elaſticity*, and how a body, deſtitute of any ſuch force, comes to acquire it. Thus, a plate of metal, by repeated blows of a hammer, becomes *elaſtic*; and, being heated again, loſes that property.

Between the limits of tenſion, wherewith *elaſticity* is terminated, there are different forces required to give different degrees of tenſion, in order to ſtretch chords to certain lengths: what the proportion of theſe forces is, can only be determined by experiments made with chords of metal; but as the lengthenings of ſuch chords are ſcarce ſenſible, the proportions cannot be directly meaſured; but a particular apparatus, and a kind of circuit, are neceſſary to arrive thereat. Dr. s'Graveſande has

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taken a good deal of pains, in order to fix theſe laws, the reſults of whoſe experiments are as follow:

1. That a weight, whereby a fibre is increaſed a certain length, by ſtretching, is, in different degrees of tenſion, as the tenſion itſelf; if, e. gr. there be three fibres of the ſame kind, length, and thickneſs, whoſe tenſions are as 1, 2, and 3; any weights, in the ſame proportion, will ſtretch them equally.

2. That the leaſt lengthenings of the ſame fibres are to one another nearly as the forces whereby the fibres are lengthened; which property may likewiſe be applied to their inflexion.

3. In chords of the ſame kind and thickneſs, and which are equally ſtretched, but of different lengths, the lengthenings produced by ſuperadding equal weights, are to one another as the lengths of the chords; which ariſes hence, that the chord is lengthened in all its parts; conſequently, the lengthening of a whole chord is double the lengthening of half of it, or a chord of half the length.

4. Fibres of the ſame kind, but of different thickneſſes, may be compared together after the like manner; only conſidering them as conſiſting of a greater or leſs number of fine fibres of the ſame thickneſs; the number whereof muſt be taken in the ratio of the ſolidity of thoſe fibres, i. e. as the ſquares of the diameters, or as the weights of theſe fibres, when their lengths are equal: ſuch fibres, of conſequence, will be equally ſtretched by forces that are in the ſame ratio of the ſquares of the diameters; which ſame ratio is likewiſe required between the forces whereby the chords are inflected, that the ſagittæ may be equal in the given fibres.

5. The motion of a ſtretched fibre agrees with the motion of a body vibrating in a cycloid; and how unequal ſoever the vibrations are, they are all regularly performed in the ſame time.

6. In two equal chords, unequally ſtretched, unequal forces are required to inflect them equally: their motions may be compared to thoſe of two pendulums, deſcribing ſimilar cycloids, by different forces; conſequently, the ſquares of the times of the vibrations of the fibres are to each other inverſely as the forces whereby they are equally inflected, or as the weights by which the chords are ſtretched.

7. The motions of ſimilar chords, equally ſtretched, but of different lengths, may be compared with that of pendulums after another manner; for as the times of the vibrations are to be conſidered, the celerities alſo, wherewith the chords are moved, muſt be conſidered. Now theſe celerities are to one another directly as the weights whereby the chords are inflected, and inverſely as the quantities of matter in the chords; that is, inverſely as their lengths: the celerities, therefore, are in an inverſe duplicate ratio of thoſe lengths; that is, they are inverſly as the ſquares of the lengths; and the ſquares of the times of the vibrations are likewiſe in the inverſe ratio; conſequently, the lengths of the chords will be as the times of the vibrations.

Elaſtic laminæ, or plates, may be conſidered as congeries, or bundles, of *elaſtic* chords. When the plate is inflected, ſome fibres are lengthened; and there are unequal lengthenings in ſeveral points of the ſame plate.

The curve formed by the inflected plate is eaſily determined, from what has been ſhewn concerning chords: in effect, in the vibrations of ſuch plate, or ſpring, the motion thereof is accelerated, after the ſame manner as the motion of a chord, and of a pendulum in a cycloid, is accelerated; and the vibrations of ſuch ſprings are all performed in the ſame time.

Elaſtic balls, ſpheres, &c. may be conſidered as conſiſting of ſeveral *elaſtic* plates, or ſprings; and the introceſſions, or yieldings inward, of any point thereof, are proportionable to the forces wherewith the body is compreſſed.

The ELASTICITY *of fluids* is accounted for, from their particles being all endowed with a centrifugal force; whence Sir Iſaac Newton, prop. 23. lib. ii. demonſtrates, that particles, which mutually avoid, or fly off, from one another, by ſuch forces as are reciprocally proportional to the diſtances of their centers, will always compoſe an *elaſtic fluid*, whoſe denſity ſhall be proportional to its compreſſion; and, *vice verſa*, if any fluid be compoſed of particles that fly off and avoid one another, and hath its denſity proportional to its compreſſion; then the centrifugal forces of thoſe particles will be reciprocally as the diſtances of their centers.

ELASTICITY *of the air* is the force wherewith that element dilates itſelf, upon removing the force whereby it was before compreſſed.

The *elaſticity*, or *ſpring of the air*, was firſt diſcovered by lord Bacon, and farther eſtabliſhed by the great Galileo. See *Elaſticity of* AIR.

Its exiſtence is proved by this experiment of that philoſopher: let an extraordinary quantity of air be intruded, by means of a ſyringe, into a glaſs or metal ball, till ſuch time as the ball, with this acceſſion of air, weighs conſiderably more, in the balance, than it did before; upon opening the mouth thereof, the air ruſhes out, till the ball ſinks to its former weight.

From hence we argue, that there is juſt ſo much air gone out, as the compreſſed air which had been crouded in. Air, therefore, returns to its former degree of expanſion, upon removing the force that compreſſed, or reſiſted, its expanſion; and, conſequently, it is endued with an *elaſtic force*.

It muſt be added, that as the air is found to ruſh out, in every ſituation, or direction, of the orifice; the *elaſtic force* of the air acts every way, or in every direction.

The *elaſticity of the air* making a conſiderable article in the new pneumatics, we ſhall here give the principal laws thereof.

1. The *elaſticity* of the lower air is equal to the weight of all the upper incumbent air; for the upper air is eaſily proved to preſs on the lower.

And the *elaſticity of the air* has already been ſhewn equal to the compreſſing power; whence it follows, that the *elaſticity of the air* is equal to the weight of the whole incumbent atmoſphere.

Hence as the weight of the upper air, incumbent on the lower, is equal to the weight of a column of water of the ſame diameter with the column of air, and the altitude of 31 feet; or to a column of mercury 28 inches high; the ſpring of the lower air is equal to the ſame column of water, or mercury.

Hence, again, the ſpring of the air, included in a veſſel, &c. is likewiſe equal to the weight of the whole incumbent atmoſphere: conſequently, the air, included in a veſſel, preſſes with the ſame force as the weight of the atmoſphere; and therefore the *elaſticity* of the included air is able to ſuſtain mercury to the height of twenty-eight inches, and water to the height of thirty-one feet, in an empty tube.

2. The *elaſtic force* of air compreſſed, is to that of the ſame air dilated, reciprocally as the bulk of the dilated air to that of the compreſſed air.

For the *elaſticity of air* more compreſſed, is to that of air leſs compreſſed, as the weight incumbent on that, to the weight incumbent on this; but the bulks of more and leſs compreſſed air are in the ſame reciprocal ratio of theſe weights; therefore the *elaſtic force*, &c.

Hence the *elaſticity of air* more compreſſed, is ſtronger than that of air leſs compreſſed.

3. The *elaſticity* of more compreſſed air, is to that of air leſs compreſſed, *cæteris paribus*, as the maſs, or quantity, of more compreſſed air is to a maſs of air leſs compreſſed of the ſame bulk.

4. The ratio of the ſpace filled by air preſſed only by the weight of the atmoſphere, to the ſpace it is reduced into by farther compreſſion, being given; to determine the *elaſtic force* of the compreſſed air.

Since the ſpring of the air, preſſed only by the weight of the atmoſphere, is equal to the weight of a column of mercury, of the ſame baſe with the column of air, and of the height of twenty-eight inches; to the bulk of the compreſſed air, that of the air not compreſſed, and the weight of the column of mercury, ſeek a fourth proportional; this will expreſs the quantity of the *elaſtic force* in the compreſſed air.

Hence ſubtracting the weight of the column of mercury from the quantity of the *elaſtic force* thus determined, the remainder is the force of *elaſticity* whereby it exceeds the reſiſtance of the weight of the atmoſphere.

5. Heat increaſes the *elaſticity* of the air, and cold diminiſhes it. See HEAT, and COLD.

6. The *elaſtic force* of the air, whereby it is expanded, in rarefaction, is to the *elaſticity* of the air condenſed, as the bulk of rarefied air, to the bulk of condenſed air.

ELATE, in *Botany*, a genus of the claſs of *palmæ*. They have male and female flowers, whoſe calyx is not aſcertained; the corolla in each has three petals; the male has three ſtamina; the female a ſingle piſtil; the fruit is an oval acuminated drupe.

Elate is alſo uſed, by ſome authors, for a genus of plants, called by Linnæus *phœnix*, and, in the Hortus Malabaricus, *ratovindel*. See PHOENIX.

This word was alſo uſed by the ancients to expreſs the fir-tree; and likewiſe in other ſenſes.

ELATER, the name of a genus of the *coleoptera* order of inſects, with ſetaceous antennæ; which, when laid on their backs, have a power of leaping with great force and agility. There are various ſpecies of theſe four-winged flies, diſtinguiſhed by their different colours.

ELATERIUM, in *Botany*, a genus of the *monoecia monandria* claſs. This genus hath male and female flowers in the

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the ſame plant; neither have any calyx; the corolla in both is hypocrateriform, or ſalver-ſhaped; the capſule is ſingle-celled, with two valves. Miller makes the *elaterium* of Boerhaave, or the wild cucumber, a ſpecies of the *momordica*. See *Male* BALSAM *Apple*.

ELATERIUM, Ελατηριον, in *Pharmacy*, a violently purgative medicine, prepared from the wild cucumber. See *Male* BALSAM *Apple*.

The word is formed from the Greek ελαυνω, *I impel, agitate*, &c.

Elaterium is made of the juice of the fruit, forced out with the finger; this, ſuffered to ſtand ſome time, lets fall a ſediment, which, carefully dried on chalk-ſtones, is the *elaterium*.

Elaterium is a vigorous purge, and is ſometimes uſed in lethargies, palſies, and hypochondriacal melancholies.

ELATINE, in the Linnæan ſyſtem of *Botany*, is a diſtinct genus of plants of the *octandria tetragynia* claſs; the characters of which are, that it has a four-leaved calyx, four petals, a four-celled depreſſed capſule, with four valves.

ELATINE, *Fluellin*, or *Female Speedwell*, is, in Linnæus's diſtribution, a ſpecies of the ANTIRRHINUM; under which genus he has alſo claſſed the LINARIA. Miller makes the *elatine* a ſpecies of the *linaria*, or *toad*-FLAX. This is a low procumbent plant, with oval, acuminated, downy leaves, ſet alternately on the ſtalks. It is annual, grows wild in corn-fields, and flowers in July.

ELATINE, in *Medicine*, is greatly recommended as an aperient, reſolvent, and vulnerary. Its ſimple water has been uſed for the ſame purpoſes, though it retains very little of the virtues of the plant. The infuſion is much better, and the expreſſed juice preferable ſtill. It is praiſed by ſome in leprous and ſcrophulous caſes; alſo externally for cancerous and other eating ulcers. An ointment is made of it for theſe purpoſes. At preſent, however, it is very little uſed.

A combination of its active matter with honey, prepared by boiling four pints of the depurated juice with four pounds of clarified honey, is ſometimes kept in the ſhops.

ELATITES, *fir-ſtone*, in *Natural Hiſtory*, a name given by authors to that ſort of petrified wood which ſhews the lineaments of the fir-tree wood, and has been originally either that or ſome wood of a like kind.

ELATITES was alſo a name uſed by the ancients for an iron ore, eſteemed a ſpecies of hæmatites; it was of a yellowiſh white colour, and was more uſually called XANTHUS.

ELAWANDUM, in *Zoology*, the name of a remarkable ſpecies of monkey, common in the iſland of Ceylon; its hair is whitiſh, or of a pale grey, and it has a long and beautiful black beard hanging from its chin. Ray's Syn. Quad. p. 188.

ELBOW, the outer angle made by the flexure, or bend, of the arm.

That eminence whereon the arm reſts, called by us *elbow*, is by the Latins called *cubitus*, and the Greeks αγκων, and by others ολεκρανον.

ELBOW is alſo uſed, by architects, maſons, &c. for an obtuſe angle of a wall, building, or road, which diverts it from its right line.

ELCESAITES, HELCESAITES, or ELCESAIANS, as Theodoret calls them, ancient heretics, thus denominated from their great prophet *Elceſai*.

This Elceſai, by others called Elxai, who lived in the time of Trajan, gave into the ſentiments of the Ebionites, touching Jeſus Chriſt; though he altered and reformed them in ſome things, to denominate himſelf the author of a ſect.

His fundamental doctrines were, that Jeſus Chriſt, who was born from the beginning of the world, had appeared from time to time under divers bodies; that he was a celeſtial power, or virtue, called *the Chriſt*, whereof the Holy Spirit was ſiſter (note, the Hebrew word for ſpirit is feminine); and that both of them had deſcended into Jeſus, the ſon of Mary, who was clothed with a corporeal appearance, but not with a real body.

The *Elceſaites*, according to St. Epiphanius, were by ſome alſo called *Sampſeans*, from the Hebrew word *ſames*, *ſun*. Scaliger was notoriouſly miſtaken, in holding, that *Elxai* was no more than *Eſſai*, or *Eſſene*; on which ſuppoſition he made the *Elceſaites* the ſame with the ſect of Eſſenes, which is contrary to all antiquity.

Origen makes mention of the *Elceſaites*, in one of his homilies, as a hereſy newly riſen. The retainers hereto, ſays he, do not admit all the books of the canon, but only ſome of them: they allow ſome paſſages out of the Old Teſtament and the Evangeliſts, but reject all the Epiſtles of St. Paul. Add, that they have produced a book, which, they pretend, deſcended to them from heaven; and maintain, that whoever perform what is enjoined therein, ſhall obtain pardon of all their ſins. See Euſebius, Hiſt. lib. vi. cap. 38. who remarks, that this hereſy became extinct almoſt as ſoon as it aroſe.

St. Epiphanius is very full on the ſubject of this ſect. Hær. 19. where he obſerves, that Elxai was a Jew by birth; and that, not being able to live according to the law of Moſes, he invented new opinions, and gained followers. He was a profeſſed enemy of virginity, and obliged all, who followed his doctrine, to marry. He tutored them to hypocriſy in times of perſecution; pretending, it was lawful to adore idols, provided the heart had no ſhare therein.

Some have doubted, whether the *Elceſaites* ſhould be reckoned among the Chriſtian or Jewiſh ſects; for though they acknowleged Chriſt as a great king, it is not certain whether they meant Jeſus Chriſt, or ſome other pretended Meſſiah.

ELDER, a word uſed in ſome parts of the kingdom for fuel. Dict. Ruſt.

ELDER-*tree*, *Sambucus*, in *Botany*, a genus of the *pentandria trigynia* claſs. Its characters are theſe: the flower hath a ſmall permanent empalement of one leaf, cut into five parts; it hath one concave wheel-ſhaped petal, cut into five obtuſe ſegments at the brim, which are reflexed; and five awl-ſhaped ſtamina, of the length of the petal, terminated by roundiſh ſummits, with an oval germen ſituated under the flower, having no ſtyle, in room of which is a ſwelling gland, crowned by three obtuſe ſtigmas; the germen afterward becomes a roundiſh berry, with one cell, including three angular ſeeds. There are five ſpecies.

The common *elder* is too well known to need a deſcription. Of this there are the following varieties, viz. the white and green-berried *elder*, and the variegated-leaved *elder*. For the medical virtues of that ſpecies, called the *dwarf elder*, ſee EBULUS.

The common *elder* will grow on any ſoil, or in any ſituation; the trees are frequently ſeen growing out of old walls, or cloſe to ditches, in very moiſt places, or from the hollow of another tree; for wherever the ſeeds are ſcattered, the plants will come up. The leaves and ſtalks are ſo bitter and nauſeous, that few animals will browſe upon them.

The young ſhoots of this tree are very full of pith; but as the trees grow old, the wood becomes very hard, and will poliſh almoſt as well as the box-tree; and is often uſed for the ſame purpoſe.

The bark, leaves, flowers, and berries of this tree, are uſed in medicine. The inner bark is eſteemed good for dropſies. Sydenham directs three handfuls of the inner bark to be boiled in a quart of milk and water, till only a pint remains, of which one half is to be taken in the morning, and the other at night; and this repeated every day. Boerhaave recommends the expreſſed juice of the middle bark, given from a dram to half an ounce, as the beſt of hydragogues, when the viſcera are ſound. The leaves, which are ſaid to be purgative and emetic, are outwardly uſed for the piles and inflammations. The flowers are inwardly uſed to expel wind; infuſions made from them while freſh are gently laxative and aperient; when dry, they are ſaid to promote the cuticular excretion, and to be particularly ſerviceable in eryſipetalous and eruptive diſorders; and the berries are eſteemed cordial, and uſeful in hyſteric diſorders; and are frequently put into gargariſms for ſore mouths and throats. Miller and Lewis.

Officinal preparations of the *elder*, are the *aqua florum ſambuci*, the *oleum ſambucinum*, the *unguentum ſambucinum*, made of the leaves and inner bark, and alſo of the flowers, and the *ſyrupus ſambuci*.

On the trunk of this tree frequently grows a fungous excreſcence, wrinkled, and turned up like an ear, whitiſh on the outſide, and black within, with ſeveral little veins. Theſe are called Jews ears, *auriculæ Judæorum*; they are accounted good for inflammations and ſwellings of the tonſils, ſore throats, and quinzies.

ELDER, *marſh*, or *water*. See WAYFARING-*tree*.

ELDER, *Spaniſh*. See LIZARD'S *Tail*.

ELDERS, *Seniors*, in the *Jewiſh Hiſtory*, were the moſt conſiderable perſons, for age, experience, and virtue, among that ancient people. Moſes, we read, aſſembled the *elders* of the people together, and acquainted them with what the Lord had commanded.

Long afterwards, thoſe who held the firſt rank in the ſynagogues were uſually called זקנים, *zekenim*, *elders*, in imitation of the ſeventy *elders*, whom Moſes eſtabliſhed for the judges of the ſanhedrim. Numbers xi. 16, 17, 24, 25. Exod. xxiv. 1. 9. 14. See SANHEDRIM.

The preſident, or chief, had, in a particular manner, the appellation of *elder*; being, as it were, the *decanus ſeniorum*, *dean of the elders*.

In the aſſemblies of the primitive Chriſtians, thoſe who held

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held the first place, or rank, assumed the denomination of presbyters, or *elders*; for the word *presbyters*, which occurs so frequently in the Old Testament, and which includes alike both bishops and priests, does properly signify *elders*. See M. Simon's observation thereon, in his Supplement aux Ceremonies des Juifs.

The president, or bishop, as being the chief of the *elders*, did likewise assume the denomination of *elder*; whence it is, that in the New Testament the name *bishop* is frequently confounded with that of *presbyter*. See BISHOP, and PRESBYTER.

For the like reason, the council of the first churches was called *presbyterium*, or council of the *elders*, where the bishop presided in quality of first *elder*, being seated in the middle of the other *elders*. The priests, or *elders*, who sat by him, had each his judge's chair; for which reason they are called, by the fathers, *assessores episcoporum*. Nothing of any importance was done, till it had first been examined, and resolved, in this assembly, where the bishop only made one body with the other *elders*, or priests; the jurisdiction which we now call episcopal, not being then dependent on the bishop alone, but on all the *elders*, over whom he was only the president.

ELDERS is also a denomination still retained in the presbyterian discipline.

The *elders* are officers, who, in conjunction with the pastors, or ministers, and deacons, compose the consistories, or kirk-sessions, meeting to consider, inspect, and regulate, matters of religion and discipline. They are chosen from among the people, and are received publicly with some degree of ceremony. In Scotland, there is an indefinite number of *elders* in each parish; generally about twelve. See KIRK-*Sessions*, and PRESBYTERY.

ELDRIENE, in *Zoology*, a name by which some call the small fish, known in English by the name of the MINOW, and called by authors VARIUS, from the various colour of its sides and belly.

ELEATIC *philosophy*, among the *Ancients*, a name given to that of the STOICS, because taught at Ἐλέα, in Latin Velia, a town of the Lucani.

The founder of this philosophy, or of the *Eleatic* sect, is supposed to have been Xenophanes, who lived about the fifty-sixth Olympiad, or between five and six hundred years before Christ. This sect was divided into two parties, which may be denominated metaphysical and physical; the one rejecting, and the other approving, the appeal to fact and experiment. Of the former kind were Xenophanes, Parmenides, Melissus, and Zeno, of Elea. They are supposed to have maintained principles not very unlike those of Spinoza; they held the eternity and immutability of the world; that whatever existed was only one being; that there was neither any generation nor corruption; that this one being was immoveable and immutable, and was the true God; and whatever changes seemed to happen in the universe, they considered as mere appearances and illusions of sense. However, some learned men have supposed, that Xenophanes and his followers, speaking metaphysically, understood by the universe, or the one being, not the material world, but the originating principle of all things, or the true God, whom they expressly affirm to be incorporeal. Thus Simplicius represents them as merely metaphysical writers, who distinguished between things natural and supernatural; and who made the former to be compounded of different principles. Accordingly, Xenophanes maintained, that the earth consisted of air and fire, that all things were produced out of the earth, and the sun and stars out of clouds, and that there were four elements. Parmenides also distinguished between the doctrine concerning metaphysical objects, called truth, and that concerning physical or corporeal things, called opinion; with respect to the former there was one immoveable principle, but in the latter two that were moveable, viz. fire and earth, or heat and cold; in which particulars Zeno agreed with him. The other branch of the *Eleatic* sect were the atomic philosophers, who formed their system from an attention to the phenomena of nature; of these the most considerable were Leucippus, Democritus, and Protagoras. See EPICUREANS, and STOICS. See a farther account of the opinions of these ancient philosophers, in Cudworth's Intellectual System.

ELECAMPANE, *Inula*, in *Botany*, a genus of the *syngenesia polygamia superflua* class. Its characters are these: it has a radiated compound flower, with an imbricated empalement; the disk or middle of the flower is composed of hermaphrodite flowers; the border or ray of female half florets stretched out like a tongue. The hermaphrodite flowers are funnel-shaped, and cut into five parts at the top; these have five short, slender stamina, which coalesce at the top; and they have only one long germen crowned with down. The female half florets have narrow, entire, tongue-shaped petals, no stamina, but a long crowned germen, with a hairy style. The germina in both flowers become a single, narrow, four-cornered seed, crowned with a down, sitting on a naked receptacle. There are fifteen species; the first of which grows naturally in several parts of England, but is cultivated in gardens for the sake of the roots. Miller.

Tournefort joins most species of this genus to the *aster*, or *starwort*. Ray classes it under the *helenium*.

The root of the *inula*, or *elecampane*, has been long famous in all disorders of the breast and lungs. It is also recommended as a sudorific and alexipharmic, and as such has a place in most of the compositions of that intention. The dose of the dry root in substance is from a scruple to a dram, or two. An ointment made of the fresh roots and leaves with lard, is also much recommended in the itch, and other cutaneous foulnesses. The roots yield in distillation an essential oil, which concretes into white flakes, resembling camphor in many of its properties, and soluble in spirit of wine. An extract may also be obtained from the dry root, both by water and spirit; an ounce yielding by water $6\frac{1}{2}$ drams, and by spirit $2\frac{1}{2}$.

ELECAMPANE *wine*. See WINE.

ELECT, from *eligo*, *I chuse*, *chosen*, in the *Scriptures*, is applied to the primitive Christians. In which sense, the *elect* are those chosen and admitted to the favour and blessing of Christianity.

ELECT, in some systems of *Theology*, is a term appropriated to the saints, or the predestinated. In which sense the *elect* are those persons who are said to be predestinated to glory as the end, and to sanctification as the means. See ELECTION and PREDESTINATION, ARMINIANS, CALVINISTS, &c.

ELECT is likewise applied to archbishops, bishops, and other officers, who are chosen, but not yet consecrated, or actually invested with their office, or jurisdiction.

The emperor is said to be *elect*, before he is inaugurated and crowned; a lord-mayor is *elect*, before his predecessor's mayoralty is expired, or the sword is put in his hands.

ELECTARY, in *Pharmacy*. See ELECTUARY.

ELECTI, in *Church History*, a sect of heretics who neither eat flesh, nor married. See AUDITORS.

ELECTION, a choice made of any thing, or person, whereby it is preferred to some other.

There seems this difference, however, between *choice* and *election*, that *election* has usually a regard to a company or community, which makes the choice; whereas choice is seldom used, but when a single person makes it.

We say, the *election* of a bishop, a member of parliament, &c. See BISHOP, PARLIAMENT, &c.

The most solemn *election* is that of a pope; which is performed by the cardinals, in four several ways. The first by the Holy Spirit, as they call it; when the first cardinal who speaks, having given his vote for any person, proceeds to the adoration, and proclaims him pope, as by a sudden inspiration of the Holy Ghost. In which case, he is deemed duly *elected*, if all, or at least two-thirds of the assembly, be consenting thereto.

The second, by compromise, when the whole college pitches on three cardinals, to whom they give a power of nominating the pope; which power expires upon the burning out of a candle lighted on that occasion.

The third, by way of poll or scrutiny, which last is the most usual; the cardinals throwing sealed tickets, wherein their votes are written, into a chalice, or cup, placed on the altar. Two thirds of the votes are required to determine an *election* by scrutiny.

The fourth is by way of accession; when, the votes being too much divided to *elect* any body, some of the cardinals desist from their first suffrage, and accede, that is, give their voices to him, who has already the majority by scrutiny.

The way of accession, however, is always added to the scrutiny; it being the constant practice for all the cardinals to give their voices, after the last scrutiny, to him whom they find to have the plurality already. So that all *elections* of popes are with the unanimous consent of all the cardinals. See CARDINALS, CONCLAVE, and POPE.

ELECTION *of numbers*, or *quantities*, in *Arithmetic* and *Algebra*, denotes the different method of taking any numbers of quantities given, either separately, or in pairs, &c. or it is the sum of all the combinations that can be made with a different number of quantities, in each set of combinations, out of any number of quantities proposed. Thus, the *election* of 3 quantities a, b, c, is 7; a, b, c, ab, ac, bc, abc; of 4 quantities 15; and if N represent the number of quantities given, $2^N - 1$ is equal to the number of *elections* required; but as the single

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gle quantities are equal in number to the given quantities, the number of proper *elections* will be $2^N - N - 1$.

See COMBINATION.

ELECTION *of a clerk of ſtatutes merchant*, in *Law*, a writ that lies for the choice of a clerk aſſigned to take ſtatutes merchant. It is granted out of chancery, on ſuggeſtion that the clerk, formerly aſſigned, is gone to dwell at ſome other place, or is under an impediment to attend the duty of his office, or that he has not land ſufficient to anſwer his tranſgreſſions, if he ſhould act amiſs. Fitz. Herb. Nat. Brev. 164.

ELECTION *of eccleſiaſtical perſons*. *Elections* for the dignities of the church ought to be free, according to the ſtat. 9 Ed. II. cap. 14. If any perſons, that have a voice in *elections*, take any reward for an *election* in any church, college, ſchool, &c. the *election* ſhall be void. And if any perſons of ſuch ſocieties reſign their places to others for reward, they incur a forfeiture of double the ſum; and both the parties are rendered incapable of the place. Stat. 31 Eliz. cap. 6.

ELECTION *of a verderor of the foreſt*, (*electione viridariorum foreſtæ*) in *Law*, a writ that lies for the choice of a verderor, where any of the verderors of the foreſt are dead, or removed from their offices. This writ is directed to the ſheriff, and the verderor is to be elected by the freeholders of the county, in the ſame manner as coroners. New Nat. Brev. 366.

ELECTION is alſo the ſtate of a perſon who is left to his own free will, to take or do either one thing, or another, which he pleaſes. See LIBERTY.

ELECTION, in *Theology*, ſignifies the choice which God, of his good pleaſure, makes of angels or men, for the objects of mercy, and grace.

The *election* of the Jews, was the choice God made of that people to be more immediately attached to his worſhip and ſervice, and for the Meſſiah to be born of them. And thus particular nations were *elected* to the participation of the outward bleſſings of Chriſtianity.

ELECTION alſo, in the language of ſome divines, ſignifies a PREDESTINATION to grace and glory, and ſometimes to glory only. And it has been enjoined as an article of faith, that predeſtination to grace is gratuitous, merely and ſimply ſo; *gratia, quia gratis data*. But the divines are much divided as to the point, whether *election* to glory be gratuitous, or whether it ſuppoſes obedience and good works, i. e. whether it be before, or after, the proviſion of our obedience. See GRACE, and REPROBATION.

ELECTION is alſo uſed for a part of *Pharmacy*; being that which teaches how to chooſe the medicinal ſimples, drugs, &c. and to diſtinguiſh the good from the bad.

Some diſtinguiſh a general *election*, which gives the rules and marks for all medicines in general; and a particular one for each medicine in particular. Pomet, in his Hiſtory of Drugs, gives very good rules for this *election*.

ELECTIVE, ſomething that is done, or paſſes, by election. See ELECTOR.

Some benefices are *elective*, others collative. Municipal offices in England are generally *elective*; in Spain, venal. Poland is an *elective* kingdom. All prelatures in France are *elective*, ſince the Concordat.

ELECTIVE *attraction*, in *Chemiſtry*. See AFFINITY.

ELECTOR, a perſon who has a right to *elect*, or chooſe another to an office, honour, &c.

The word is formed of the Latin *eligere*, *to chooſe*.

We ſay, the *electors* of a burgeſs, a knight of the ſhire, a grand maſter of an order, &c.

ELECTOR is particularly, and by way of eminence, applied to certain princes of Germany, in whom lies the right of electing the emperor; being all ſovereigns, and the principal members of the empire.

The origin of *electors* is not well known; ſome refer it to an edict of Otho III. confirmed by Gregory V. about the year 996. But this opinion is contradicted by the whole tenor of hiſtory. From the earlieſt period in the hiſtory of Germany, the perſon who was to reign over all, was elected by the ſuffrage of all. Thus, Conrad I. was elected either by all the princes and chief men, or by the whole nation; in 1204, Conrad II. was elected by all the chief men, and his election was approved and confirmed by the people; and at the election of Lotharius II. in 1125, ſixty thouſand perſons of all ranks were preſent, and he was named by the chief men, whoſe nomination was approved by the people. Others refer it to Frederic II. who died in 1250.

The firſt author who mentions the ſeven *electors* is Martinus Polonus, in this reign; and this reſtrictive privilege was probably obtained by degrees. The princes of greater authority were firſt allowed to name the perſon whom they wiſhed to be choſen emperor, and the people retained the right of approving or diſapproving the nomination; and when they had ſecured the right of voting firſt, or of *prætaxation*, as it was called, it became needleſs for the inferior eccleſiaſtics or barons to attend, merely to confirm their choice; more eſpecially as their attendance would become troubleſome and expenſive. Beſides, the aſſumed privilege of the ſeven electors, who poſſeſſed the moſt extenſive territories, was ſtrongly ſupported by their numerous dependents and allies; and they were conſidered as the repreſentatives of all the orders which compoſed the higheſt claſs of German nobility. See Robertſon's Hiſt. chap. v. vol. i. p. 458, &c. 8vo edit.

Others have aſcribed the origin of *electors* to Ralph of Hapſburg, founder of the houſe of Auſtria, in the year 1280.

It appears from the above account that their number was unſettled, at leaſt till the time of Frederic II. in the thirteenth century. The golden bull, publiſhed by Charles IV. in 1356, fixed the number of *electors* to ſeven; three of them eccleſiaſtics, viz. the archbiſhops of Mentz, Treves, and Cologne; and four ſeculars, viz. the king of Bohemia, the count palatine of the Rhine, the duke of Saxony, and the marquis of Brandenburgh. By the treaty of Munſter, in 1648, this order was changed; the duke of Bavaria being put in the place of the count palatine, and an eighth electorate erected for the count palatine.

In the year 1692, a ninth electorate was created by the emperor Leopold, in favour of Erneſt duke of Hanover, under the title of *elector* of Brunſwick. Some oppoſition was made to this election; and the princes of Germany ſtood out for ſome time, and refuſed to acknowlege it. But they afterwards acquieſced in it, and it has been ſince recognized by all the foreign princes. The king of France did it at laſt by the treaty of Raſtadt.

The *electors* have not only the power of chuſing the emperor, but they have actually exerciſed that of depoſing him. Thus they depoſed Adolphus of Naſſau in 1298, and Wenceſlaus in 1401.

The ſeveral functions of the *electors* are as follow: the *elector* of Mentz is chancellor of Germany; he convokes the ſtates, and gives his vote before any of the reſt. The *elector* of Cologne is grand chancellor of Italy, and conſecrates the emperor. The *elector* of Treves is grand chancellor of the Gauls, and confers the impoſition of hands on the emperor. The count palatine of the Rhine is grand maſter of the imperial palace, and preſents the emperor with a globe at his coronation. The marquis of Brandenburgh is grand chamberlain, and puts the ring on the emperor's finger. The duke of Saxony is grand marſhal, and gives the ſword to the emperor. The king of Bohemia, who was anciently only duke, is grand butler, and puts Charlemagne's crown on the emperor's head. Laſtly, the *elector* of Hanover, now king of Great Britain, is arch-treaſurer; though firſt erected under the title of ſtandard-bearer of the empire.

The *electoral* prince is the eldeſt ſon of an *elector*, and the preſumptive heir of his dignity.

Electors are always addreſſed under the title of *electoral highneſſes*.

The *electoral* college, conſiſting of all the *electors* of the empire, is the moſt illuſtrious and auguſt body in Europe. See DIET.

ELECTORS *of members of parliament*. See BURGESS, and PARLIAMENT.

ELECTORAL *crown*, or *coronet*. See CROWN.

ELECTORATE, the dignity of an elector, with the territory, or dominions, to which that quality is annexed. See ELECTOR.

Though the cuſtom ordinarily be, in Germany, for the ſons of princes to ſhare their fathers lands and territories among them; thoſe whereto the *electorate* is annexed, are not uſed to be divided, but paſs entire to the eldeſt ſon, who ſucceeds to the *electorate*.

ELECTRIC, derived from ηλεκτρον, *amber*, in *Phyſics*, is a term applied to thoſe ſubſtances, in which the *electric* fluid is capable of being excited, and accumulated, without tranſmitting it, and, therefore, called *non-conductors*, in oppoſition to CONDUCTORS, under which article the reaſon of the terms, and the difference between *electric* and conducting ſubſtances, are particularly explained. Theſe are alſo called *electrics per ſe*, and original *electrics*. To this claſs belong glaſs, and all vitrifications, even of metals, all precious ſtones, of which the moſt tranſparent are the beſt; all reſins, and reſinous compoſitions; amber, ſulphur, baked wood, all bituminous ſubſtances, wax, ſilk, cotton, all dry animal ſubſtances, as feathers, wool, hairs, &c. paper, white ſugar, and ſugar-candy, air; the vapour of water, when examined in a degree of heat, in which it is capable of condenſing into water, and alſo that of quickſilver, as Dr. Prieſtley has very lately found (Obſ. on Air, &c. 1779. p. 426); ice froze to the

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13th degree below o of Fahrenheit's ſcale, and produced from diſtilled water, as has been lately diſcovered by Mr. Achard of Berlin; oils, CHOCOLATE, calces of metals and ſemimetals, the aſhes of animal and vegetable ſubſtances, the ruſt of metals, all dry vegetable ſubſtances, and all hard ſtones, of which the beſt are the hardeſt. Subſtances of this kind are capable of being excited, ſo as to exhibit the electrical appearances of attracting and repelling light bodies, emitting a ſpark of light, attended with a ſnapping noiſe, and yielding a current of air, the ſenſation of which reſembles that of a ſpider's web drawn over the face, or any part of the body preſented to it, and a ſmell like that of phoſphorus, either by friction, or by heating and cooling, or by melting, and pouring one melted ſubſtance into another. The firſt is the moſt uſual method of exciting *electrics*; the effect of the ſecond was firſt obſerved with regard to the TOURMALIN, and has been ſince found to extend to many other ſimilar ſubſtances; and ſeveral particular circumſtances have been found to attend the operation of melting ſulphur, wax, &c. according to the nature of the veſſels in which they are diſſolved, and of the ſubſtances with which they are in contact, when left to cool.

Whenever an *electric* is excited by friction, it is neceſſary that the ſubſtance with which it is rubbed, called the *rubber*, ſhould communicate with the earth, or with bodies abounding with electricity, by means of good conductors; for, if the rubber be inſulated, i. e. if its communication with the earth be intercepted by *electrics*, the effect of friction will be inconſiderable, and the electrical power excited by it be very weak. An *electric* will not part with the power excited by friction, by bringing other *electric* ſubſtances into contact with it; and, therefore, a glaſs tube, or globe, ſurrounded by the air, which is an *electric*, retains its virtue for ſome time; but as the air is never a perfect *electric*, it will gradually loſe it, by communication to the moiſture, and other conducting particles, that float in this element. An inſulated conductor may alſo receive the electrical power, communicated to it by the approach of excited *electrics*, will then exhibit ſimilar appearances, and retain it in the ſame manner. But if any other conductor, communicating with the earth, be brought into contact with it, the electrical power will be conveyed away at once; whereas an excited *electric*, being itſelf a non-conductor, will loſe only part of the power which it poſſeſſes from that portion of the ſurface, to which the conductor is immediately preſented, and thus the whole is exhauſted by degrees; and, therefore, the ſpark of fire is not ſo denſe, nor the exploſion ſo loud from excited, as from communicated electricity.

No *electric* can be excited, without producing electrical appearances in the ſubſtance by which it is excited, provided that ſubſtance be inſulated; but the electrical powers of the excited *electric*, and of the inſulated rubber, are directly the reverſe of each other, and may be eaſily diſtinguiſhed, by their exhibiting oppoſite effects. Thus, if a ſmall ball of cork be ſuſpended by a ſilken thread, and preſented to the *electric*, it will be firſt attracted, and then repelled; but in this ſtate of repulſion from the *electric*, it will be more violently attracted by the rubber, than by any other conducting ſubſtance, and *vice verſa*. And if two ſuch inſulated balls of cork be preſented either to the *electric* or rubber ſeparately, they will repel each other; but if one of theſe balls be preſented to the *electric*, and the other to the rubber, and they be then brought within a ſufficient diſtance, they will mutually attract each other, and their electricity will be diſcharged: they have evidently the ſame effect of counterbalancing and deſtroying each other, as poſitive and negative quantities in algebra; and it has been obſerved, that two pieces of glaſs, or ſilk, poſſeſſed of theſe contrary electricities, will cohere together, and require a conſiderable force to ſeparate them. Beſides, theſe oppoſite powers may be diſtinguiſhed by preſenting any pointed conductor to the *electric*, ſuppoſed to be glaſs, and to the rubber of the common leather kind, in the dark; the light iſſuing from the *electric* to the point will appear like a ſtar upon it; but the light iſſuing from the point to the rubber will be a lucid pencil or bruſh, diverging from the point towards the rubber. See BRUSH, *Luminous* CONDUCTOR, and STAR.

We may alſo add, that a current of air may be perceived paſſing from theſe points, in both caſes, in oppoſite directions.

Moſt *electrics* may be made to acquire either of theſe electricities at pleaſure, by uſing proper rubbers; but as the former of them was firſt diſcovered by rubbing glaſs, it was called the *vitreous*, and the latter, produced by reſinous ſubſtances, as amber, ſealing-wax, ſulphur, &c. was called the *reſinous* electricity. However, electricians, afterwards concluding that excited glaſs acquired more than its natural quantity of the *electric* fluid by friction, and that excited wax or ſulphur, or the inſulated rubber, loſt part of it, called the former *poſitive*, and the latter *negative* electricity; terms which are now generally uſed, and juſtified by the principal phenomena of this ſcience. See *Theory of* ELECTRICITY.

The following table will ſhew what kind of electricity is excited in different bodies, when rubbed with different ſubſtances.

Back of a cat	Poſitive	Every ſubſtance with which it has been hitherto tried.
Smooth glaſs	Poſitive	Every ſubſtance hitherto tried, except the back of a cat.
Rough glaſs	Poſitive	Dry oiled ſilk, ſulphur, metals.
	Negative	Woollen cloth, quills, wood, paper, ſealing-wax, white wax, the human hand.
Tourmalin	Poſitive	Amber, air.
	Negative	Diamond, the human hand
Hare's ſkin	Poſitive	Metals, ſilk, load-ſtone, leather, hand, paper, baked wood.
	Negative	Other fine furs.
White ſilk	Poſitive	Black ſilk, metals, black cloth.
	Negative	Paper, hand, hairs, weaſel's ſkin.
Black ſilk	Poſitive	Sealing-wax.
	Negative	Hare's, weaſel's, and ferret's ſkin, load-ſtone, braſs, ſilver, iron, hand.
Sealing-wax	Poſitive	Metals.
	Negative	Hare's, weaſel's, and ferret's ſkin, hand, leather, woollen cloth, paper.
Baked wood	Poſitive	Silk.
	Negative	Flannel.

Cavallo's Electricity, p. 17.

See a larger catalogue of this kind, in which the rubbers were woollen garments, and ſilk, by Mr. Henly, in the Phil. Tranſ. vol. lxvii. part i. p. 122, &c.

It may be obſerved in general, that when different ſubſtances are rubbed together, the ſubſtance, whoſe electrical power is the ſtrongeſt, acquires the poſitive, and the other the negative electricity; and when two bodies, differing in the ſmoothneſs or roughneſs of their ſurfaces, are rubbed together, the ſmootheſt, which requires the leaſt friction, acquires the poſitive; and the rougheſt, the negative electricity. We may alſo obſerve, that, if an uninſulated conductor be brought within the atmoſphere, or ſphere of action, of an excited *electric*, or an electrified body, it will acquire on the ſide exhibited to the *electric*, an electricity oppoſite to that of the electrified body; which increaſes the nearer it approaches, till at laſt the conductor receives a ſpark from the *electric*, and the equilibrium is reſtored. But if the conductor be inſulated, both its ſides will in the acceſs appear to be electrified; that next to the *electric* acquiring an electricity oppoſite to that of the *electric* itſelf, and the remoter ſide poſſeſſing the ſame kind of electricity with the *electric*; and when the diſcharge is made, the electrical power of the inſulated conductor, and of the *electric*, are of the ſame kind.

If an *electric* be brought near to an electrified body, the circumſtances will be the ſame during the approach of one to the other; however, when the *electric* has received a ſmall quantity of electricity from the electrified body, it will ſtill, in ſome caſes, exhibit ſtrong electricities on different ſides, and repeated changes may ſometimes be obſerved from poſitive to negative electricity in the ſame *electric*; a phenomenon, which is explained by the non-conducting quality of an *electric*, and the diſpoſition which bodies have to acquire an electricity contrary to that of another contiguous electrified body. See *Electrical* ATMOSPHERE.

ELECTRIC, *charging and coating of*. See CHARGE, and COATING.

ELECTRICAL *air thermometer*, is an inſtrument contrived by Mr. Kinnerſley of Philadelphia, and uſed in determining the effects of the *electrical* exploſion upon air. This inſtrument conſiſts of a glaſs tube AB (*Tab.* II. *Electricity*, *fig.* 15.) about eleven inches long, and one inch in diameter, cloſed, air-tight, with braſs caps, C and D, which may be ſcrewed on or taken off at pleaſure; and of a ſmall glaſs tube, K, open at both ends, cemented into the braſs tube, L, which ſcrews into the upper part, C. The upper end of this tube has a braſs ferrel, with an air-hole, *a*, and the lower end is immerſed in coloured water at the bottom of the tube AB. Within this tube,

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AB, are fixed two wires, F and G; the wire F deſcends from a braſs cap at the upper end, and the wire G paſſes through the lower cap into the pedeſtal E, to which the veſſel, AB, is fixed by means of a male ſcrew, D, that goes into a braſs nut at E; and this wire may be raiſed or lowered at pleaſure, by means of a male ſcrew annexed to it, ſo as to produce a diſcharge from F to G. The wire, *b*, is a ſmall round ſpring, encompaſſing the tube K; and when air is blown into this tube, ſo as to raiſe the coloured water up to *c*, the gage-wire, *b*, is brought down to the top of the column, and the *thermometer* is ready for uſe. It is evident, from the conſtruction of this inſtrument, that, when the air within the tube AB is rarefied, the water will riſe in the ſmall tube, and the degree of its aſcent will meaſure the degree of rarefaction. When the wires F and G are in contact, a large charge of electricity, from above thirty ſquare feet of coated glaſs, produces no rarefaction in the air; the water in the ſmall tube not being at all moved from the gage-wire; and therefore the paſſage of the *electrical* fluid through conductors ſufficiently large, neither rarefies nor diſplaces the air about them. But when the wires are about two inches aſunder, the ſame charge raiſes the water to the top of the ſmall tube; and a charge from a glaſs jar, containing about five gallons and a half, raiſes it to *d*; which ſudden riſe is owing to a quantity of air actually diſplaced by the *electrical* flaſh. When the air coaleſces, the water in the tube ſubſides, till it is in equilibrio with the rarefied air; and then gradually deſcends, as the air cools, and ſettles at its former height. By carefully obſerving at what height above the gage-wire *b*, the deſcending column of water firſt ſtopped, Mr. Kinnerſley diſcovered the degree of rarefaction produced by the *electrical* exploſion. Franklin's Letters, &c. p. 389, &c. 4to. 1769.

ELECTRICAL *apparatus* conſiſts of glaſs tubes, about three feet long, and an inch and a half in diameter, one of which ſhould be cloſed at one end, and furniſhed at the other end with a braſs cap, and ſtop-cock, in order to rarefy, or condenſe, the incloſed air; ſticks of ſealing-wax, or tubes of rough glaſs, or glaſs tubes covered with ſealing-wax, or cylinders of baked wood for producing the negative electricity; with proper rubbers, as black oiled ſilk, with AMALGAM upon it for the former, and ſoft new flannel, or hare ſkins, or cat's ſkins, tanned with the hair on, for the latter; coated jars, or plates of glaſs, either ſingle, or combined in a battery, for accumulating electricity; metal rods, as diſchargers; an electrical machine; electrometers, and inſulating ſtools, ſupported by pillars of glaſs, covered with ſealing-wax, or baked wood, varniſhed or boiled in linſeed oil. See theſe more particularly deſcribed under the articles *Electrical* BATTERY, CONDUCTORS, DISCHARGER, ELECTRICAL *Machine*, ELECTROMETER, &c.

Signior Beccaria contrived a ſubſtitute for glaſs, which is an expenſive article in the apparatus of an electrician, by mixing equal quantities of very pure colophonium, and finely pulverized marble, well dried, melting the mixture, and then ſpreading it on a piece of tinfoil, two or three inches beyond the edge of it, about one tenth of an inch thick; over this he laid another piece of tinfoil within about two inches of the edge of the mixture; and this coated plate ſerved him inſtead of a plate of glaſs, poſſeſſed a greater power, retained it longer, was leſs liable to break, and eaſily repaired.

ELECTRICAL *atmoſphere*. See ATMOSPHERE.

ELECTRICAL *attraction* and *repulſion*. See *Experiments and Phænomena in* ELECTRICITY and ELECTRIC.

ELECTRICAL *balls*. See BALLS and ELECTROMETER.

ELECTRICAL *battery*. See BATTERY, where the method of conſtructing a battery is deſcribed.

In caſes which require a great force of electricity, batteries are commonly uſed; but experiments of this kind ſhould be conducted with great care and caution. Metalline wires of a ſmall diameter may be made red-hot, and melted by the exploſion of a *battery*; and the red-hot particles of the metal are ſcattered by the exploſion in all directions; but if the force be very great, the wire will be entirely diſperſed. If the wire be melted on a piece of glaſs, the glaſs will be marked by the exploſion with all the priſmatic colours; and a force which is juſt ſufficient to render a wire, ſtretched by weights, red-hot, will conſiderably lengthen it. A ſlender wire, incloſed in a glaſs tube, about a quarter of an inch in diameter, will be reduced, by a moderate diſcharge of a *battery* through it, into globules of different ſizes, which may be collected from the inner ſurface of the glaſs tube; they will be found hollow, and to be little elſe than the mere *ſcoriæ* of the metal. Mr. Henly, and others, have obſerved, that in melting wires of ſome inches in length, the red heat begins at the end in contact with the diſcharging rod, or with the poſitive ſide of the *battery*, and proceeds gradually towards the coating of the *battery*, plainly evincing the direction of the electrical matter in the diſcharge. The conducting power of metals correſponding to the eaſe with which they are melted, the ſame ingenious electrician endeavoured to aſcertain this, by cauſing an exploſion to paſs through metal wire of different kinds, but of the ſame diameter; but he was not ſatisfied with the reſult of his trials.

Dr. Prieſtley infers, from ſome experiments on the conducting power of different metals, that the order in which they are to be ranked, with reſpect to the power of electricity to melt them, is the following; viz. iron, braſs, copper, ſilver, and gold; however, farther experiments are ſtill wanting for the abſolute deciſion of this queſtion. In comparing different exploſions by their power to melt wires, it muſt be obſerved, that, in wires of ſome thickneſs, the forces that melt them will be in the proportion of their lengths; and in wires of the ſame length, in the proportion of the ſquares of their diameters. Mr. Henly, having obtained ſome grains of purified platina, which had received the utmoſt force of chemical fire, laid them in contact with each other on a line drawn with a blunt ended wire over the ſurface of a plate of white wax, about the length of half an inch; and at each end of the line of platina, and in contact with it, he placed a thick wire, with its ends nicely rounded off, and made perfectly ſmooth; and having covered the platina with a piece of thick plate-glaſs, and diſcharged through it three jars, containing ſixteen ſquare feet of coated ſurface, he fuſed it into ſeveral beautiful ſpherules. Mr. Nairne has ſince repeated the experiment with equal ſucceſs. Phil. Tranſ. vol. lxiv. part ii. art. 41. p. 414. 416, &c. Prieſtley's Hiſt. of Electricity, vol. ii. p. 370.

One of the moſt curious experiments in this department of electricity is that of making coloured rings on the ſurfaces of metal, by the electrical exploſion. See COLOURS, and FAIRY *Circles*.

We have already ſhewn how earthquakes may be imitated by the exploſion of an *electrical battery*. See EARTHQUAKES.

The effects of the lateral force of electrical exploſions, firſt taken notice of by Dr. Prieſtley, are beſt obſerved in the diſcharge of a *battery*; though they may be alſo ſeen in the diſcharge of a ſingle jar.

If pieces of cork, powder of any kind, or any light bodies, be placed near the exploſion of a jar, or *battery*, they will be moved out of their places at the inſtant of the diſcharge, in all directions from the center of the exploſion. A remarkable phenomenon of this kind happens in firing gun-powder by *electrical* exploſions; for, let the powder be ever ſo cloſely confined, if the exploſion is made in the center of it, a part of it only will be fired, and the reſt will be diſperſed with great violence; and the fragments of a melted wire, placed in the midſt of the powder, will fly about to a great diſtance from the place of exploſion. The greater the force of the exploſion, ſo much the greater will be the diſtance to which light bodies will be removed; and therefore it is no wonder, that very heavy bodies ſhould be moved to conſiderable diſtances by ſtrong flaſhes of lightning. Dr. Prieſtley apprehends, that this lateral force is produced by the exploſion of the air from the place where the exploſion is made; for the electrical matter makes a vacuum of air in its paſſage; and this air being ſuddenly diſplaced gives a concuſſion to all the bodies that happen to be near it. This lateral exploſion may be rendered viſible, by placing a charged jar on a table, and bringing one end of an inſulated metallic rod contiguous to its outſide coating, and placing a body of about ſix or ſeven feet in length, and a few inches broad, within about half an inch of its other end. Then, if a chain be put upon the table, with one end about an inch and a half diſtant from the coating of the jar, and one knob of the diſcharging rod be applied to the other end of the chain, and the other knob to the wire of the jar, ſo as to make a diſcharge, a ſtrong ſpark will be ſeen between the inſulated rod, which communicates with the coating of the jar, and the body near its extremity; which ſpark does not alter the *electrical* ſtate of that body; and therefore it is imagined, that this lateral ſpark flies from the coating of the jar, and inſtantaneouſly returns to it. This phenomenon may probably be owing to the interruption in the circuit; for in proportion to the interruption will be the degree of the lateral exploſion. Hiſt. Electr. vol. ii. p. 336. 8vo. 1775. Phil. Tranſ. vol. lix. p. 57.

Dr. Prieſtley tried the effects of the exploſion of a large battery on ſome of the larger animals, as on a cat and dog, with a deſign of obſerving in what manner the animal ſyſtem is affected by the *electrical* ſhock. He found that convulſions attended the ſtroke, which were followed

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by a convulsive respiration, and a rattling in the throat, with other circumstances, for which we must refer to his History, &c. vol. ii. p. 253, 8vo. 1775.

It has been doubted whether, when small animals are killed by the *electrical* shock, any of the blood-vessels are ruptured; but Mr. Henly informs the editor, that, on giving the shock of a very large battery to a full grown duck, which was instantly killed, the animal bled freely at the mouth, which fully ascertained that fact. The duck was struck by the conductor on the crown of the head, and the charge made to pass through its legs.

We shall close this article with hinting at two circumstances, which should be attended to by those who make experiments with *electrical batteries*. The jars of a large *battery* are liable to be broken at the time of their discharge; and particularly if it be constructed of the thinner glass, which is capable of receiving a greater charge than the thicker. In order to avoid this inconvenience, Mr. Nairne never discharges a *battery* through a good conductor, unless the circuit be at least five foot long; but the length of the circuit, though it may preserve the *battery*, proportionably weakens the force of the shock. Care should also be taken not to touch the wires of a *battery* with the hand, nor even that of a single jar, after the discharge, before the discharging rod be repeatedly applied to its sides; as there generally remains a *residuum* of the charge, which is sometimes very considerable. This *residuum* is occasioned by the electricity, which, whilst the jar, or *battery*, is charging, spreads itself over the uncoated surface of the glass, near the coating; this will not be discharged at first, but gradually returns to the coating after the first discharge.

ELECTRICAL *beatification*. See BEATIFICATION.

ELECTRICAL *bells*. See BELLS.

ELECTRICAL *brush*. See BRUSH.

ELECTRICAL *cement*. See CÆMENT.

ELECTRICAL *circuit*. See CIRCUIT.

ELECTRICAL *conductors*. See CONDUCTORS.

ELECTRICAL *eel*. See GYMNOTUS.

ELECTRICAL *experiments*. See ELECTRICITY, LEYDEN *Phial*, POINTS, &c.

ELECTRICAL *fish*. See TORPEDO.

ELECTRICAL *fluid*. See *Theory of* ELECTRICITY.

ELECTRICAL *kite* was contrived by Dr. Franklin, to verify his hypothesis of the identity of electricity and lightning. It consisted of a large, thin, silk handkerchief, extended and fastened at the four corners to two slight strips of cedar, and accommodated with a tail, loop, and string, so as to rise in the air like those of paper. To the top of the upright stick of the cross a very sharp pointed wire was fixed, rising a foot or more above the wood; and to the end of the twine, next the hand, a silk ribband was tied. From a key suspended at the union of the twine and silk, when the kite is raised during a thunder storm, a phial may be charged, and electric fire collected, as is usually done by means of a rubbed glass tube, or globe. Phil. Trans. vol. xlvii. p. 565, or Franklin's Letters, p. 111, 112.

Kites made of paper, covered with varnish, or with well boiled linseed-oil, in order to preserve them from the rain, with a stick and cane bow, like those of schoolboys, will answer the purpose extremely well, and are very useful in determining the electricity of the atmosphere. See CONDUCTOR.

ELECTRICAL *machine* is a part of the *electrical* apparatus, contrived for collecting a greater quantity of electricity, and exhibiting its effects in a more sensible manner than it was possible to do in any other way. The parts of which it consists are the electric, the moving engine, the rubber, and the prime conductor. The electric now commonly used is smooth glass; though in the earlier state of this science, before the method of insulating the rubber, and hereby of producing negative electricity, was introduced, other substances, as sulphur, rough glass, or sealing-wax, were used for this purpose. It is not yet absolutely determined what kind of glass is the most proper; the best flint glass is generally used. Dr. Priestley suggests, that common bottle metal, on account of its great hardness, and exquisite polish, is fittest for the purpose of excitation. Thinner glass seems to be preferable to that which is thicker; but the workmen should be cautioned not to let the glass suddenly cool, which renders it liable to break in electrical operations. The common form of the electric is either that of a globe, or of a cylinder. Each figure has its advantages and its inconveniencies. In favour of cylinders, it is alleged, that more of their surface may be touched with the rubber; and, on the other hand, globes may more easily be blown true, so as to press the rubber equally; and they may also be made larger in diameter, whereby their axis, if they have any, is farther from the excited surface, which is absolutely necessary to prevent the dissipation of the electric fire. Globes are, on this account, made with one neck, cemented to a strong brass cap, in order to adapt them to a proper frame; and Dr. Priestley advises to preserve a communication between the external air, and the air within the globe, by means of a hole in this cap, so that both may be always of the same density. The most convenient size is from nine to twelve inches in diameter. Cylinders are also made with two necks, without any axis, and their common size is from four inches diameter, and eight inches long, to twelve inches diameter, and two feet long.

Some have recommended an internal coating of some electric substance, as resin, turpentine, &c. in order to increase the *electrical* power of the glass. The best composition for this purpose is prepared by boiling four parts of Venice turpentine, one part of resin, and one part of bees-wax, for about two hours, over a gentle fire, and stirring it often, with the addition of one fourth part of vermilion; which is afterward left to cool. This mixture may be used, by breaking a sufficient quantity of it into small pieces, putting it into the glass, and holding the glass near the fire till it is melted, and, by continually turning the glass, equally spread over its surface in a coat of about the thickness of a six-pence. Phil. Trans. vol. lvii. p. 186.

There have been various contrivances for giving motion to the electric of a *machine*. Some have used multiplying wheels, which are easily turned by a winch. The common method is to fix a wheel, grooved round its circumference on the outside of the frame of the *machine*, which may be turned by a winch; and on the neck of the globe, or cylinder, to fix a pulley, whose diameter is about a third or fourth part of the diameter of the wheel; and a string of worsted, or a leathern strap, is put over both the wheel and the pulley; so that by turning the winch the electric may make three or four revolutions for one revolution of the wheel. As the string relaxes by use, it may be proper to make the wheel moveable from the frame, so that it may be fixed by means of a screw at a proper distance, for a sufficient tension of the string; or the pulley may have several grooves, forming circumferences of different diameters for this purpose. Instead of the pulley and string, some have used a wheel and pinion, or a wheel and endless screw, which renders the *machine* more neat and compact; though this construction is not without its inconveniences, which are not so easily remedied as those of the other.

The next principal part of a *machine* is the rubber, which excites the electric. Rubbers were formerly made of red basil skins, stuffed with hair, wool, flax, or bran; but Dr. Nooth has lately introduced silk cushions stuffed with hair, over which a piece of leather is to be laid, rubbed with amalgam, which are preferable to the others. If the rubber is fixed on a metal plate, the plate should be free from all edges and points, and covered with silk; it should rest on a spring, so that it may be made to suit any inequalities in the surface of the glass, which spring may, by means of a screw, be made to press more or less against the glass at pleasure. The rubber should also be insulated in any way that may best suit the construction of the *machine*, and the disposition of the electric; and a chain or wire may be easily suspended from it, to communicate with the floor, whenever the insulation is not necessary; and thus positive and negative electricity may be produced at pleasure.

The prime conductor, which is a necessary appendage to the *electrical machine*, in order to collect the electricity from the electric, and the method of insulating it, have been already described. See *Prime* CONDUCTOR.

To this general account of *electrical machines*, we shall subjoin a description of some of the principal now in use, illustrated by corresponding figures. We shall premise, however, a reference to *Tab.* II. *Electricity*, *fig.* 16. which represents Dr. Watson's machine, with a contrivance for whirling four large globes at once, and of uniting the power of them all; though no such *machines* are now constructed. Such *machines*, furnished with suitable batteries, might be employed to very important purposes, and probably lead the way to many new discoveries in the science of electricity.

The *machine*, represented in *fig.* 17. is the most compact and elegant, were it not liable to many insuperable objections. The globe A is turned with the winch B, by means of wheel-work inclosed in the brass box C; the rubber D is fixed to a spring, the position of which may be adjusted by the screw F; the conductor, GH, is a brass tube, with a round hollow ball at each end, which collects fire by the brass piece I, fixed in the ball H. The barrel of the conductor is put into the brass socket *a*, the ball G being first taken off; and to this socket is joined the brass socket K, in which the upper end of the glass

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glaſs tube L is fixed with cement; and the lower end is cemented into the wooden foot M; and it is thus inſulated.

Machines of this kind may be ſcrewed to a table, and uſed with great eaſe; but they admit of little variety with reſpect to the ſize, ſhape, or number of the electrics; and the rubber is not inſulated.

The *machine*, exhibited in *Tab.* III. *Electricity, fig.* 18. was invented by Mr. Read, mathematical inſtrument maker at Knightſbridge, and conſiſts of a cylinder A, perpendicular to the horizon, and ſupported by a braſs bow, which receives the upper end of the axis. It is moved by means of a pulley at the lower end of the axis, and a wheel B, which lies parallel to the table, and revolves four times for every ſingle revolution of the wheel. The conductor C is furniſhed with points to collect the fire, and it is ſcrewed to the wire of a coated jar D, which ſtands in a ſocket between the cylinder and the wheel. Mr. Lane's electrometer is annexed to the figure, which will be explained under the article ELECTROMETER. In this *machine* the conductor is fixed; but it admits no variety of globes or cylinders, and no inſulation of the rubber.

The *electrical machine* conſtructed by Dr. Ingenhouz, conſiſts of a circular glaſs, about nine inches, or a foot, in diameter, which turns vertically, by a branch fixed to the iron axis that paſſes through the middle of it, and is rubbed by four cuſhions, each an inch and a half, or two inches long, placed at the oppoſite ends of the vertical diameter. The frame is a board about a foot ſquare, which may be faſtened by an iron crank to a table, ſupporting two ſmaller upright boards, parallel to one another, and faſtened at top by a tranſverſe piece; the axis of the plate reſts on the middle of theſe boards, and to them the rubbers are faſtened. The conductor is a braſs tube, with two horizontal branches, extending from its extremity, and reaching within about an inch and a half of the extremity of the glaſs, and thus collecting the electricity from it. A *machine* of this kind was conſtructed about the ſame time by Mr. Ramſden, mathematical inſtrument maker in London. However ingenious the contrivance of this machine, it is liable to the inconvenience of not eaſily admitting the inſulation of the rubbers.

This machine hath been greatly improved by Mr. Cuthbertſon, at Amſterdam. He uſes two plates of glaſs, and has contrived to inſulate his rubbers in an elegant manner. In ſhort, he hath by theſe means conſtructed ſome of the moſt powerful, and at the ſame time portable, and elegant machines that have yet been exhibited.

The *machine* repreſented in *fig.* 7. *Tab. Electricity*, was conſtructed by Dr. Prieſtley, and is excellently adapted to all the purpoſes which the electrician can propoſe. The frame conſiſts of two boards of mahogany, *a*, *a*, parallel to one another, and about four inches aſunder; the lower board may be fixed to a table by iron cranks; two upright pillars of baked wood are ſupported by this board, one of which, *b*, being let through the upper, is fixed immoveably to the lower board; but the other is made to ſlide in a groove, reaching almoſt the whole length of the upper board, ſo that it may be placed at any required diſtance from the other pillar, for the convenience of admitting globes, or cylinders, of different ſizes; however, it is neceſſary only when an axis is uſed. In both pillars there are ſeveral holes, by means of which globes of different ſizes may be mounted higher or lower, or two or more globes may be uſed at the ſame time; though it will be difficult to fix proper rubbers to them all. When a globe with one neck is uſed, a braſs arm, with an open ſocket, *c*, is neceſſary to ſupport the axis beyond the pulley; and this part may be put higher or lower, together with the braſs ſocket in which the axis turns. The axis, *d*, is made to paſs through the pillar *b*, ſo that it may be turned by a handle without the wheel. The frame being ſcrewed to the table, may be placed nearer to, or farther from the wheel, as the length of the ſtring in different ſtates of the weather may require. The wheel is fixed in a frame by itſelf, as *e*, and thus it may have any ſituation with reſpect to the pulley, as may be moſt convenient; and it has ſeveral grooves for admitting more ſtrings than one, if two or three globes, or cylinders, are uſed at once. The rubber, *f*, conſiſts of a hollow piece of copper filled with horſe-hair, and covered with a baſil ſkin; it is ſupported by a ſocket, which receives the cylindrical axis of a round plate of glaſs *g*, the oppoſite part of which is inſerted into the ſocket of a bent ſteel ſpring *h*. Theſe parts are eaſily ſeparated, ſo that the rubber, or the plate of glaſs, ſerving to inſulate it, may be changed at pleaſure. The ſpring may be either ſlipped along the groove, or moved in the contrary direction, ſo as to give it every deſirable poſition with reſpect to the globe or cylinder; and it is alſo furniſhed with a ſcrew *i*, which makes it preſs harder or lighter, as the operator chuſes. The prime conductor of this *machine* has been already deſcribed under the article *Prime* CONDUCTOR.

When poſitive electricity is required, a wire or chain, *n*, connects the rubber with the table or floor; and in order to obtain negative electricity, that wire is connected with another cylindrical conductor, whilſt the pear conductor in the figure is connected by another wire, or chain, with the table; and Dr. Prieſtley obſerves, that the negative and poſitive powers are equally ſtrong. Hiſt. Electr. vol. ii. p. 112, &c. 8vo.

The *machine, fig.* 19. *Tab.* III. *Electricity*, was conſtructed by Mr. Nairne, F. R. S. an ingenious inſtrument maker in London, for the grand duke of Tuſcany. The glaſs cylinder of this *machine* is twelve inches in diameter, and the cylindrical part, excluſive of the necks, nineteen inches long; the rubber is fourteen inches long, and five broad, ſupported by two wooden ſprings, which are fixed on two glaſs rods lying horizontally under the cylinder, and ſerving to inſulate the rubber; the conductor is five feet long, and twelve inches in diameter, ſupported on two ſtands, with ſolid glaſs pillars, having at the end of it a ſhort braſs rod with a ball; the ball, which is repreſented as receiving the electrical ſpark from the conductor, is of braſs, and fixed to the end of a braſs tube, that is moveable in a hole at the top of the ſtand; from the bottom of the ſtand a chain paſſes along the floor, till it is in contact with the chain hanging from the back of the rubber. The ſpark from this conductor would ſometimes fly to the diſtance of fourteen inches. See *Prime* CONDUCTOR. Phil. Tranſ. vol. lxiv. part i. p. 79.

Another *electrical machine*, which we ſhall deſcribe, is that repreſented in *fig.* 5. *Tab. Electricity.* This is of a convenient ſize, and, in a ſmall compaſs, poſſeſſes the advantages of moſt other *machines.* The frame of the *machine* conſiſts of the board ABC, which is capable of being faſtened to a table by two iron cranks. On this board are raiſed two ſtrong wooden pillars, KI, and AH, which ſupport both the cylinder and wheel. From one of the braſs caps of the cylinder FF, an axis of ſteel proceeds, which paſſes quite through a hole in the pillar KI, and has, on the outer ſide of the pillar, a pulley, I, fixed on its ſquare end. In the circumference of the pulley there are three or four grooves, ſuiting the variable length of the ſtring *ab*, which goes round one of them, and round the groove of the wheel D. The other cap of the cylinder has a ſmall cavity, which fits the cylindrical extremity of a ſtrong ſcrew, that proceeds from the pillar H. The wheel D, moved by the handle E, turns round a ſtrong axis, projecting from almoſt the middle of the pillar KI. The rubber G is a thin quilted cuſhion of ſilk, ſtuffed with hair, and faſtened with ſilken ſtrings to a piece of wood, adapted to the ſurface of the cylinder; its length is about four inches leſs than that of the body of the cylinder, and it rubs about one fourth part of its circumference. It is terminated at its upper extremity by a piece of oiled ſilk, which covers almoſt all the upper part of the cylinder; and to the lower part a piece of leather, well rubbed with amalgam, is faſtened, which, when turned over the cuſhion, interpoſes between it and the ſurface of the cylinder. The rubber is ſupported by two ſprings, ſcrewed to its back, and proceeding from the wooden cap of a ſtrong glaſs pillar, perpendicular to the board on which the machine reſts, and made to ſlide, by a ſquare wooden baſe, in two grooves of this board; and thus the pillar may be faſtened by a ſcrew at any required diſtance from the cylinder, and the rubber made to preſs harder or lighter upon it. By means of this glaſs pillar the rubber is inſulated; and when inſulation is not required, a chain may be hung to it by a ſmall hook, communicating with the leather, and falling down to the table or floor. The prime conductor of this *machine*, made of hollow braſs, (*fig.* 4.) is ſupported by glaſs pillars, fixed by braſs ſockets in the board CC; and it receives the electric fluid through the points of the collector L, which is placed about half an inch diſtant from the ſurface of the cylinder. If the wheel D be turned by the handle E, in the direction *a b c*, and the chain remain ſuſpended from the rubber to the floor, the conductor AB will be electrified poſitively; but if the chain be removed from the rubber to the prime conductor, the rubber will be electrified negatively; and another conductor, like the former, applied to the rubber, will be charged negatively to the ſame degree, as that was charged poſitively. *Machines* of this conſtruction are made and ſold by Mr. Adams, his majeſty's philoſophical inſtrument maker, &c. in Fleet-ſtreet, London. See Cavallo's Electricity, p. 154, &c.

Dr. M. Van Marum, a late German writer, has conſtructed a *machine*, in which gum lac, in the form of a

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diſc, is ſubſtituted as an electric in the room of glaſs, and quickſilver is uſed as a rubber. He enumerates ſeveral advantages attending this conſtruction; the effect of the *machine* depends very little on the temperature of the air; its operation is uniform; it is more eaſily worked than *machines* of the common kind; it may be kept in motion by a weight, which, after being wound up to the height of twelve feet, will continue to preſerve its motion for ſix hours; a negative power may be obtained from it, exactly ſimilar to the poſitive; and the conductors annexed to it will ſerve to convey the *electrical* power, with very little alteration, wherever it is required, without any addition of chain, wires, &c. Verhandeling over het Electrizeeren, &c. or a Treatiſe concerning the Method of Electrifying, by M. Martinus Van Marum. Groningen. 1776.

ELECTRICAL *phial.* See LEYDEN *Phial.*

ELECTRICAL *repulſion.* See *Experiments, &c. in* ELECTRICITY.

ELECTRICAL *rubber.* See ELECTRICAL *apparatus*, and ELECTRICAL *machine.*

ELECTRICAL *ſhock* denotes the exploſion between the oppoſite ſides of a charged electric; ſo called, becauſe, if the diſcharge from one to the other be made through the body of an animal, it occaſions a ſudden motion by the contraction of the muſcles through which it paſſes, and a diſagreeable ſenſation. The force of the *ſhock* is proportioned to the quantity of coated ſurface, the thinneſs of the glaſs, and the power of the machine by which it is charged. Its velocity is almoſt inſtantaneous, as it has not been found to take up the leaſt ſenſible ſpace of time in paſſing to the greateſt diſtances. Mr. Ferguſon accounts for the *ſhock* being felt at the ſame inſtant by perſons at various diſtances, without allowing the inſtantaneous velocity of the electric fluid, in the following manner. If a ſmall tube of any length, and open at both ends, be filled with water, and laid down flat on level ground, the water will continue motionleſs in the tube; but if a ſyringe be filled with water, and fixed to either end of the tube, and then the piſton of the ſyringe be preſſed inward, to force more water into the tube, the whole water in the tube is thereby put into motion; and at the inſtant the piſton begins to be puſhed, the water begins to run out at the other end of the tube, which is not the water that was in the ſyringe, but that which was in the tube before. This caſe, he ſays, is exactly ſimilar to that of a number of perſons feeling the *ſhock* at once; for each perſon has his natural quantity of electric fire, which lies dormant in him, till it is put in motion by ſome outward cauſe; and at the inſtant when the contents of the charged jar are diſcharged upon the firſt perſon, the electric fire in him is put into motion, and this puts it into motion in the next to him, and ſo on through the whole connected company. He adds, that in taking ſparks with the knuckle from a prime conductor, the velocity of the ſpark is not ſo great as to elude the ſight, even through the ſmall ſpace between the prime conductor and the knuckle. See CIRCUIT.

Query, Is not this theory of Mr. Ferguſon's liable to an objection? Suppoſe a battery ſufficient to melt three feet of ſmall wire to be diſcharged through ſuch a circuit; the wire will be melted; but if the progreſs of the charge were *gradual*, beginning with the natural quantity in the wire, would the index of Mr. Henly's electrometer fall inſtantly to its ſtem upon the diſcharge, as is really the caſe? And, if the whole charge of the battery doth not ruſh through the circuit in an inſtantaneous manner, we muſt ſuppoſe the wire to contain in itſelf nearly as much electric matter as the battery is charged with; but this would be a ſuppoſition too groſs to be admitted.

It has been obſerved that the *electrical ſhock* is weakened by being thus communicated through different perſons in contact with one another. It is, indeed, obſtructed in its paſſage, even through the beſt conductors; as it will prefer a ſhort paſſage through the air to a long one through the moſt perfect conductors; and if the circuit be interrupted, either by electrics, or very imperfect conductors of a moderate thickneſs, the *ſhock* will rend them in its paſſage, diſperſe them in every direction, and exhibit the appearance of a ſudden expanſion of the air about the center of the *ſhock.* A ſtrong *ſhock* made to paſs through or over the belly of a muſcle, forces it to contract; and ſent through a ſmall animal body deprives it inſtantly of life, and haſtens putrefaction. It gives polarity to magnetic needles, reverſes their poles, and produces effects preciſely ſimilar, though inferior in degree, to thoſe of LIGHTNING.

ELECTRICAL *ſtar.* See STAR.

ELECTRICITY, or ELECTRICAL *force*, is that power, or property, which was firſt obſerved in amber, the *lyncurium*, or TOURMALIN, and which ſealing-wax, glaſs, and a variety of other ſubſtances, called ELECTRICS, are now known to poſſeſs, of attracting light bodies, &c. when excited by heat or friction; and which is alſo capable of being communicated in particular circumſtances to other bodies; and the *ſcience of electricity* is that part of natural philoſophy, which propoſes to inveſtigate the nature and effects of this power, and of other ſimilar powers connected with it. For an account of the etymology of the term, and the firſt uſe and application of it, ſee AMBER. Muſchenbroek and Æpinus have obſerved a conſiderable analogy, in a variety of particulars, between the powers of *electricity* and magnetiſm; and they have alſo pointed out many inſtances in which they differ.

The principal phenomena in which they reſemble one another are the following: as a glaſs tube touched by an excited tube has a ſucceſſion of poſitive and negative parts, ſo a rod of iron held near a magnet will have ſeveral ſucceſſive poles. Magnets, when their oppoſite poles are laid to one another, adhere; and thus bodies poſitively and negatively electrical, when in contact, will unite to one another; the poſitive and negative ſides of glaſs anſwer to the attracting and repelling ends of hardened ſteel, made magnetical; the electric and magnetic fluids are moved in both with conſiderable difficulty. As there can be no condenſation of the electric fluid in glaſs without a rarefaction, there can be no condenſation, or poſitive magnetiſm, in one end of a bar, without an evacuation, or negative magnetiſm, in the other. Steel correſponds to electrics, and iron, in ſome meaſure, to conductors; ſteel does not ſo eaſily receive the magnetic virtue, but retains it more ſtrongly than iron, as electrics receive the electric fluid with greater difficulty than conductors, but do not ſo readily part with it. Electrified bodies attract and repel other bodies, in conſequence of rendering them electrical: thus a magnet attracts iron, after having firſt of all made it a magnet. The ſeveral pieces of a tourmalin have their poſitive and negative ſide, juſt as the pieces of a broken magnet would have theirs. Theſe powers alſo differ from one another; for, although they are both excited by friction, the magnetic virtue requires a determinate mode of friction, which the electric does not. Steel rubbed with iron will excite the former, whereas an electric rubber will not excite an electric. The magnetic virtue appears in ſome caſes without friction, or the uſe of the other ordinary means of exciting electrics. A moiſt air deſtroys *electricity*, without affecting magnetiſm; the magnetic virtue is of much longer duration than the electrical. Magnetical bodies require no particular inſulation, in order to diſcover their virtue, as electrified bodies do; magnetiſm acts only on iron, whereas *electricity* affects moſt other bodies; the magnetic virtue is much ſtronger than the electric, and yet produces neither light nor fire. The equilibrium in a magnet cannot be reſtored, by forming a communication between the oppoſite ends with iron, as it may in charged glaſs. There are no ſubſtances poſitively or negatively magnetical only, as there are bodies poſitively or negatively electrical only.

Signior Beccaria has alſo made a number of experiments, with a view of aſcertaining the connection between magnetiſm and *electricity*, and explaining the effects of the former on the latter in particular circumſtances; from which he concludes in general, that the magnetic direction given to a needle by lightning and artificial *electricity*, does not depend on the direction of the electric matter in entering into the needle, but on the particular poſition of the needle when the charge is ſent through it; and he is confirmed in his conjectures, that the peculiar magnetic force, obſerved in the loadſtone, is to be attributed to either atmoſpherical or ſubterraneous ſtrokes of lightning; and that the univerſal ſyſtematical properties of magnetic bodies are produced by an univerſal ſyſtematical circulation of the electric element, through the atmoſphere, or in the bowels of the earth. See farther on this ſubject, Muſchenbroek Introd. ad Phil. Natural. vol. i. p. 342, &c. 4to. 1762. and Æpinus's Tentamen Theoriæ Electric. & Magn. 1759; or for an abridgment of Æpinus Prieſt. Hiſt. Elec. vol. i. p. 501. Beccaria's Treatiſe on Artificial Electricity, &c. 1776.

ELECTRICITY, *abſtract of the hiſtory of.* The nature and compaſs of this work will allow our only mentioning ſome of the principal diſcoveries that have been made in the ſeveral periods of the progreſs of this ſcience; premiſing, in general, that there is no ſingle branch of natural knowlege that has been cultivated with greater aſſiduity and ſucceſs, or in which ſuch rapid advances have been made within fifty years paſt, as this of *electricity.*

W. Gilbert, a native of Colcheſter, and a phyſician in London, if we conſider that the ſubject was in a great degree new and unknown in his time, made many conſiderable experiments and diſcoveries, which are contained in his treatiſe De Magnete, publiſhed in the year 1600. He enlarged the liſt both of electrics, and of the bodies on

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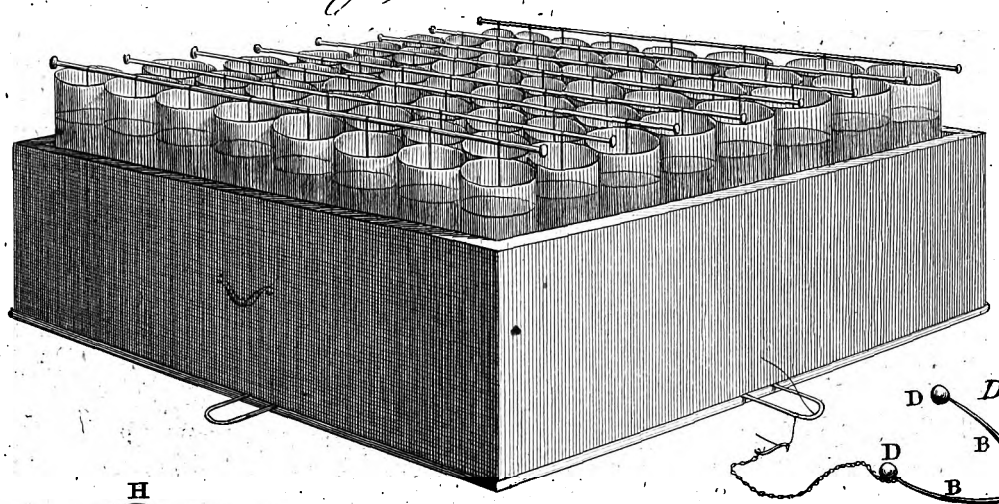
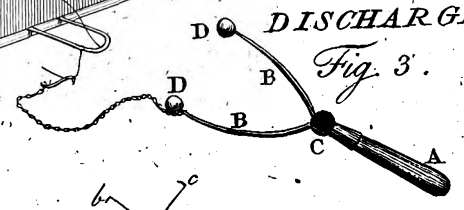
ELECTRICITY

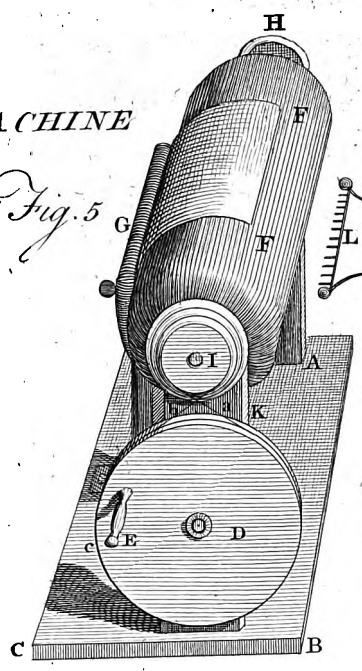
Fig. 1 BATTERY





DISCHARGER
Fig. 3.

MACHINE
Fig. 5



Prime CONDUCTOR

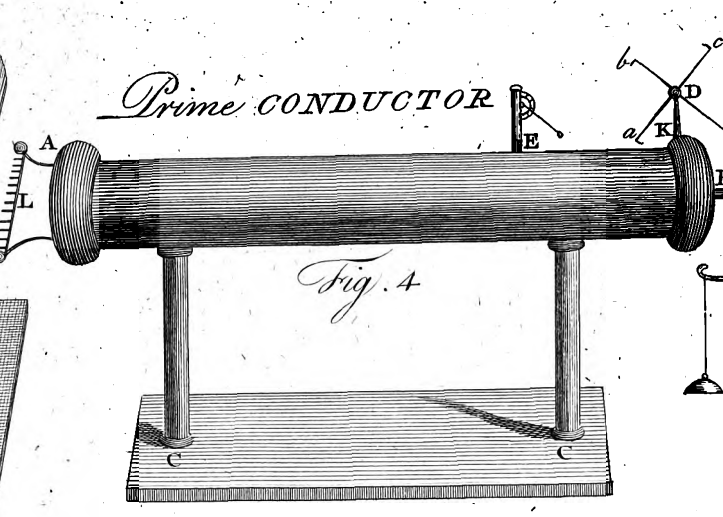


Fig. 4

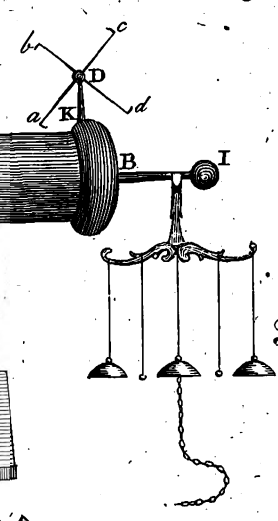


Fig. 2 BELLS.

CONDUCTOR of Lightning.

Luminous CONDUCTORS.

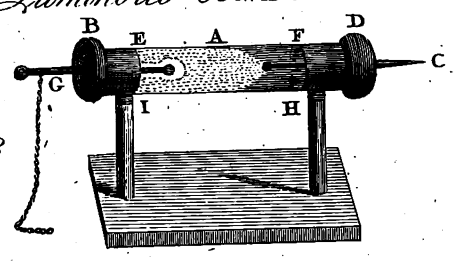


Fig. 8

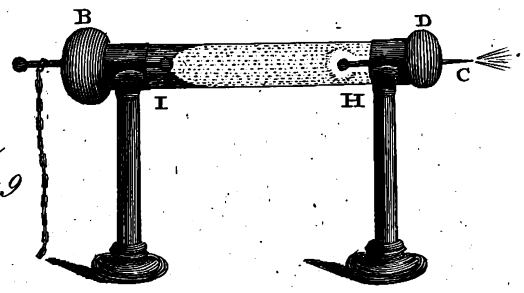


Fig. 9

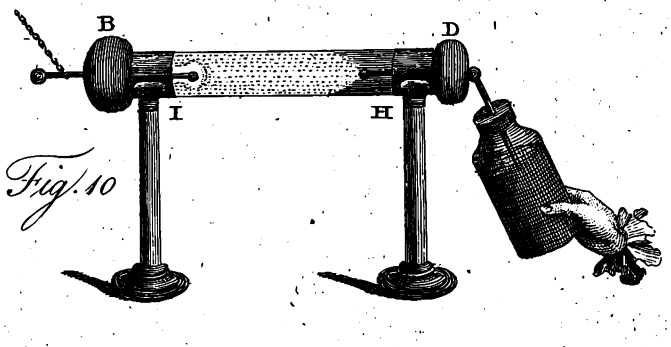


Fig. 10

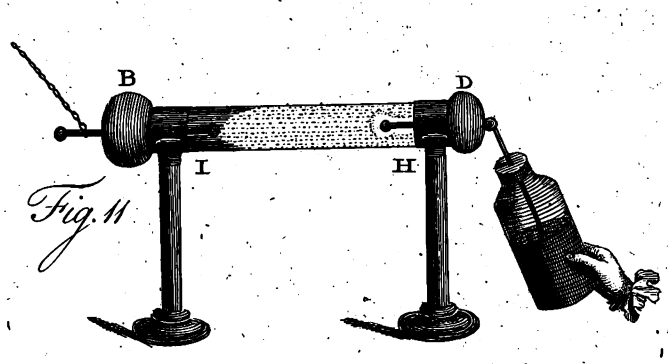


Fig. 11

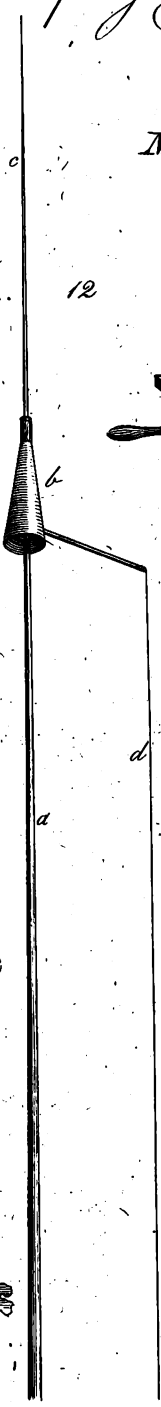
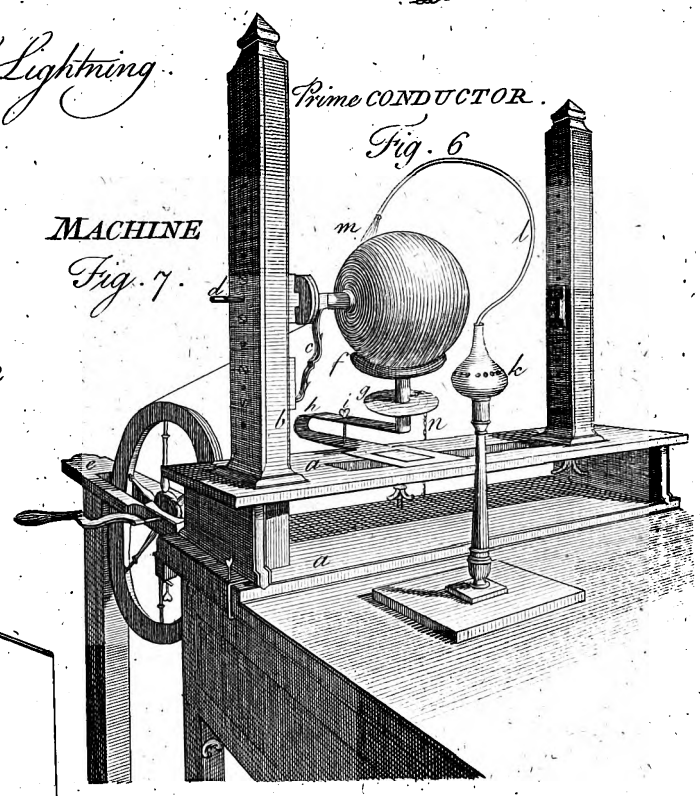


Fig. 12

Prime CONDUCTOR.
Fig. 6

MACHINE
Fig. 7.



CONDUCTOR
annexed to a Kite.
Fig. 13

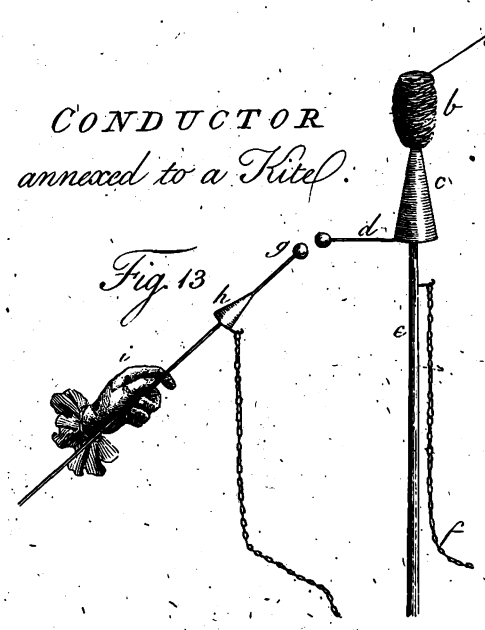


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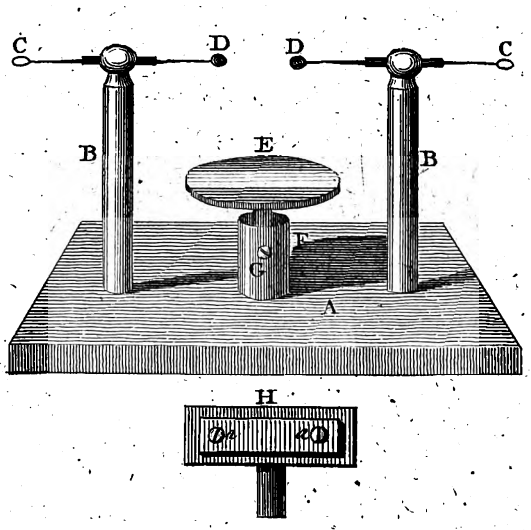
Fig. 14.

Universal DISCHARGER



ELECTRICAL Air Thermometer

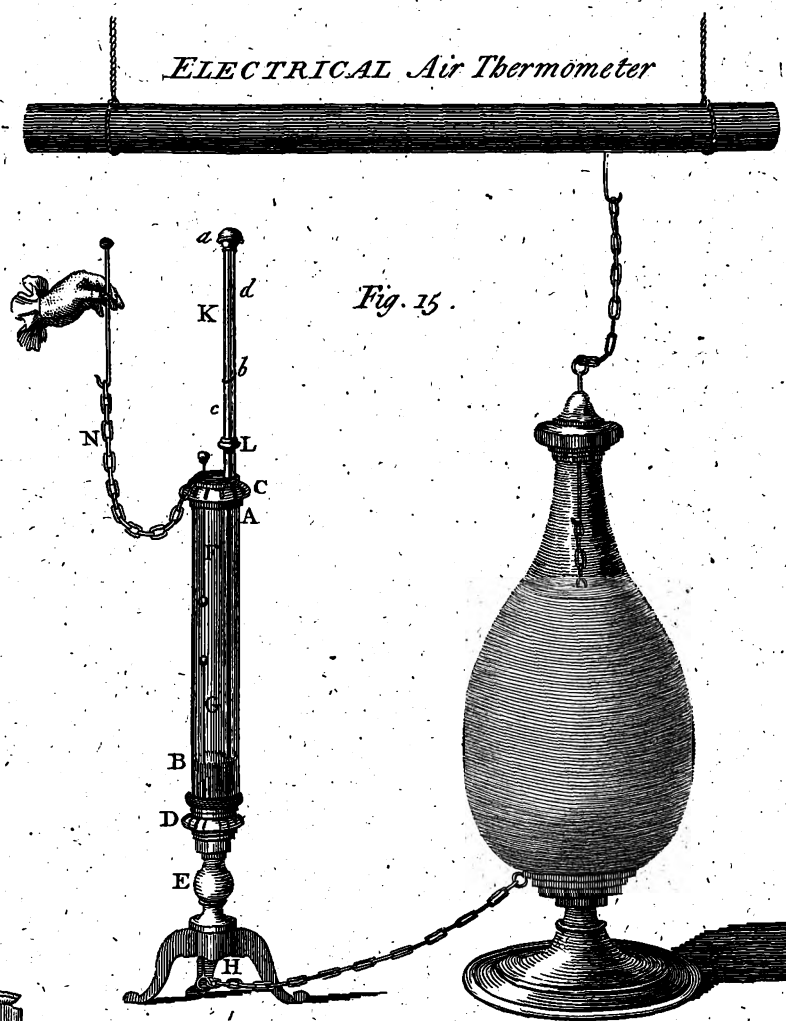
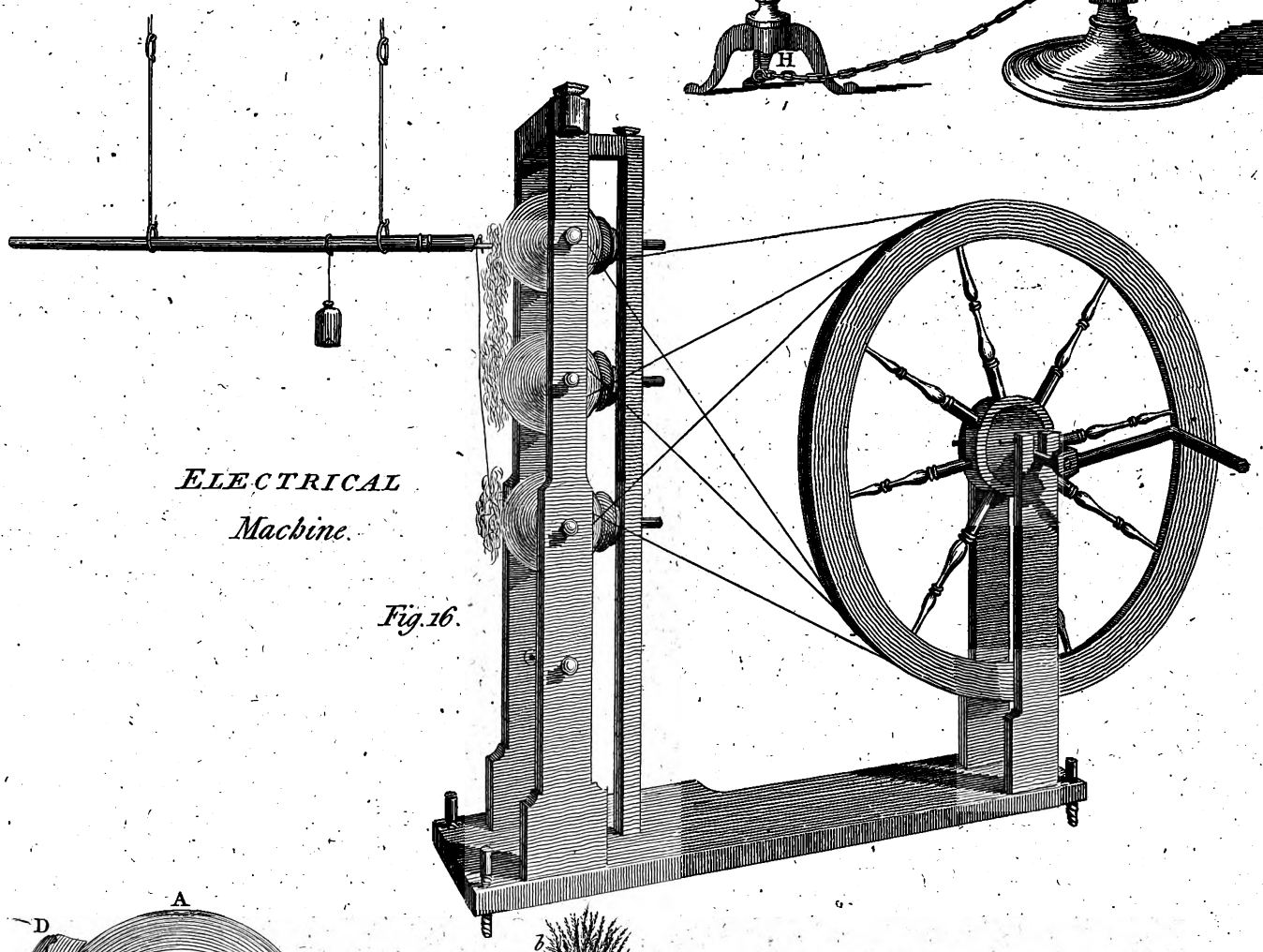


Fig. 15.



ELECTRICAL Machine.

Fig. 16.

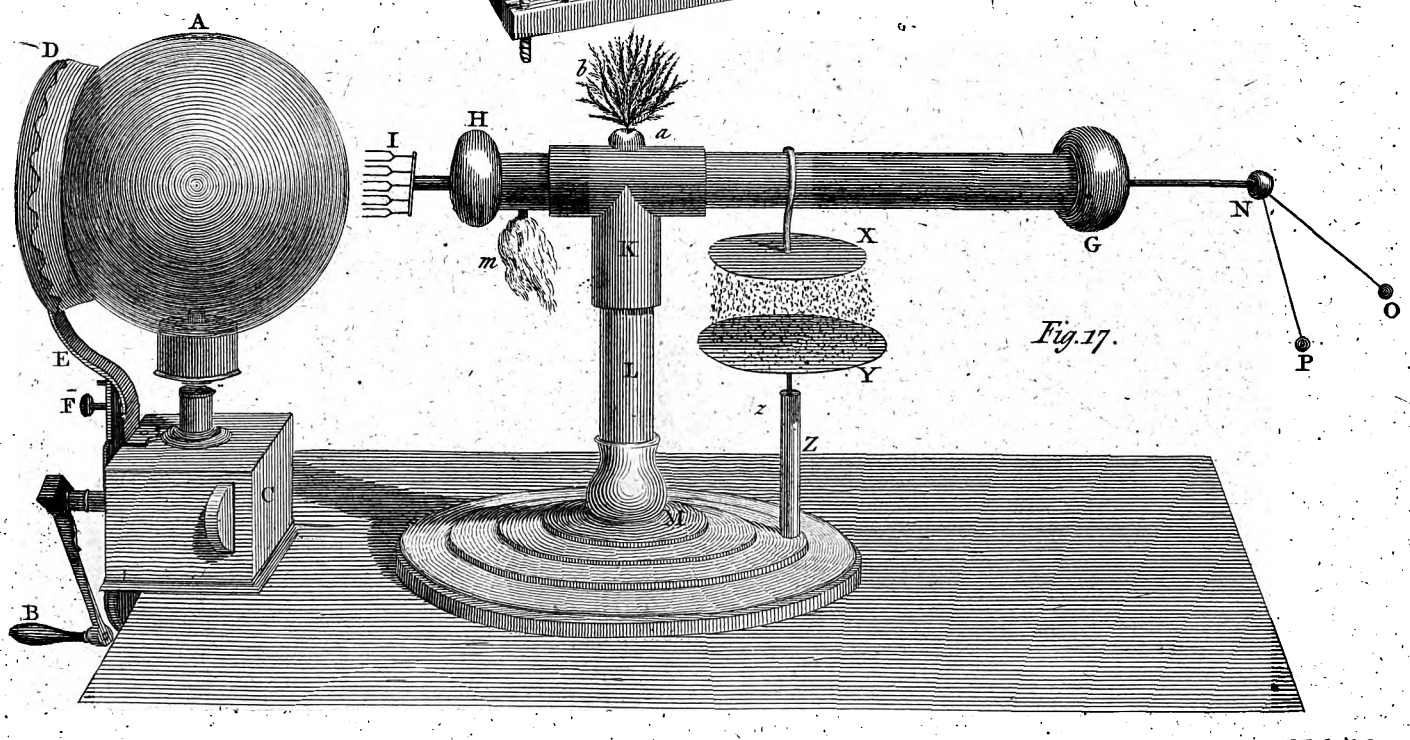


Fig. 17.

I. Taylor sculp.

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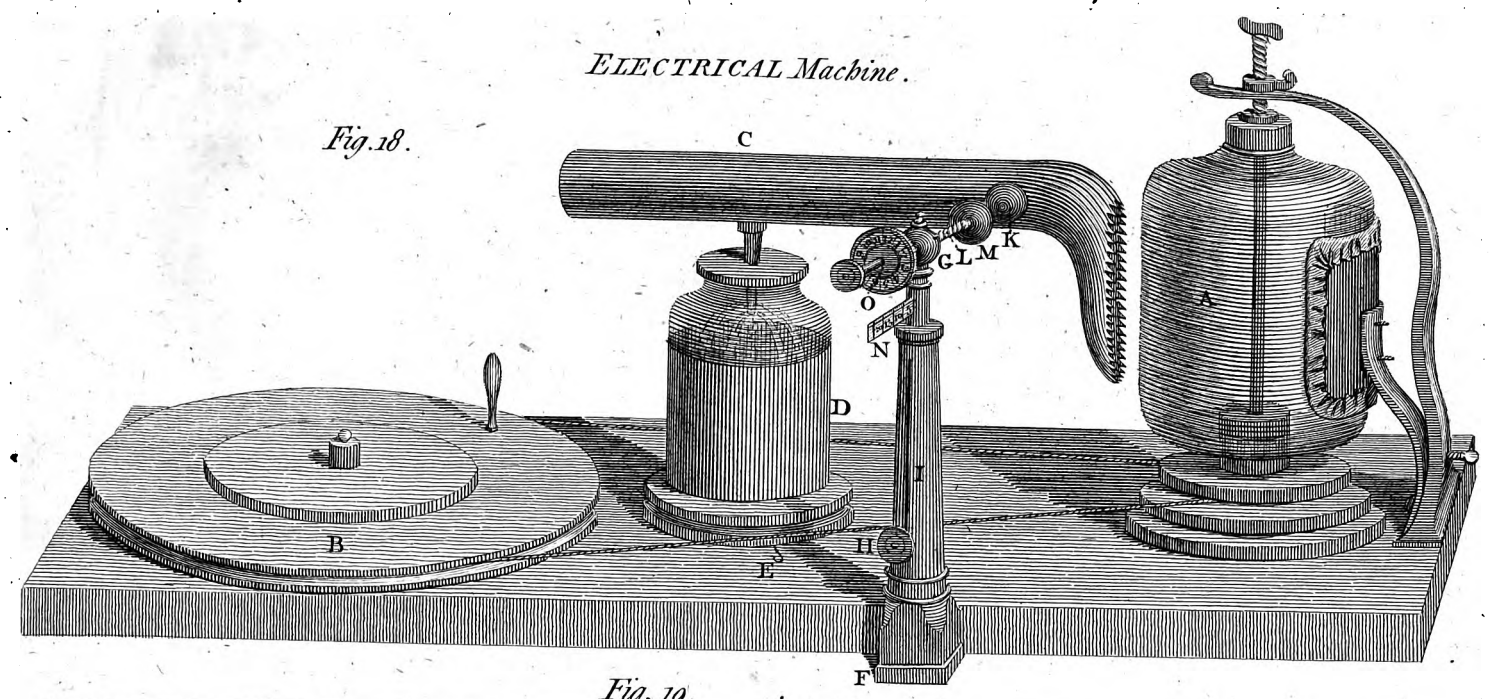
ELECTRICITY. *Tab: III.*

ELECTRICAL Machine.

Fig. 18.



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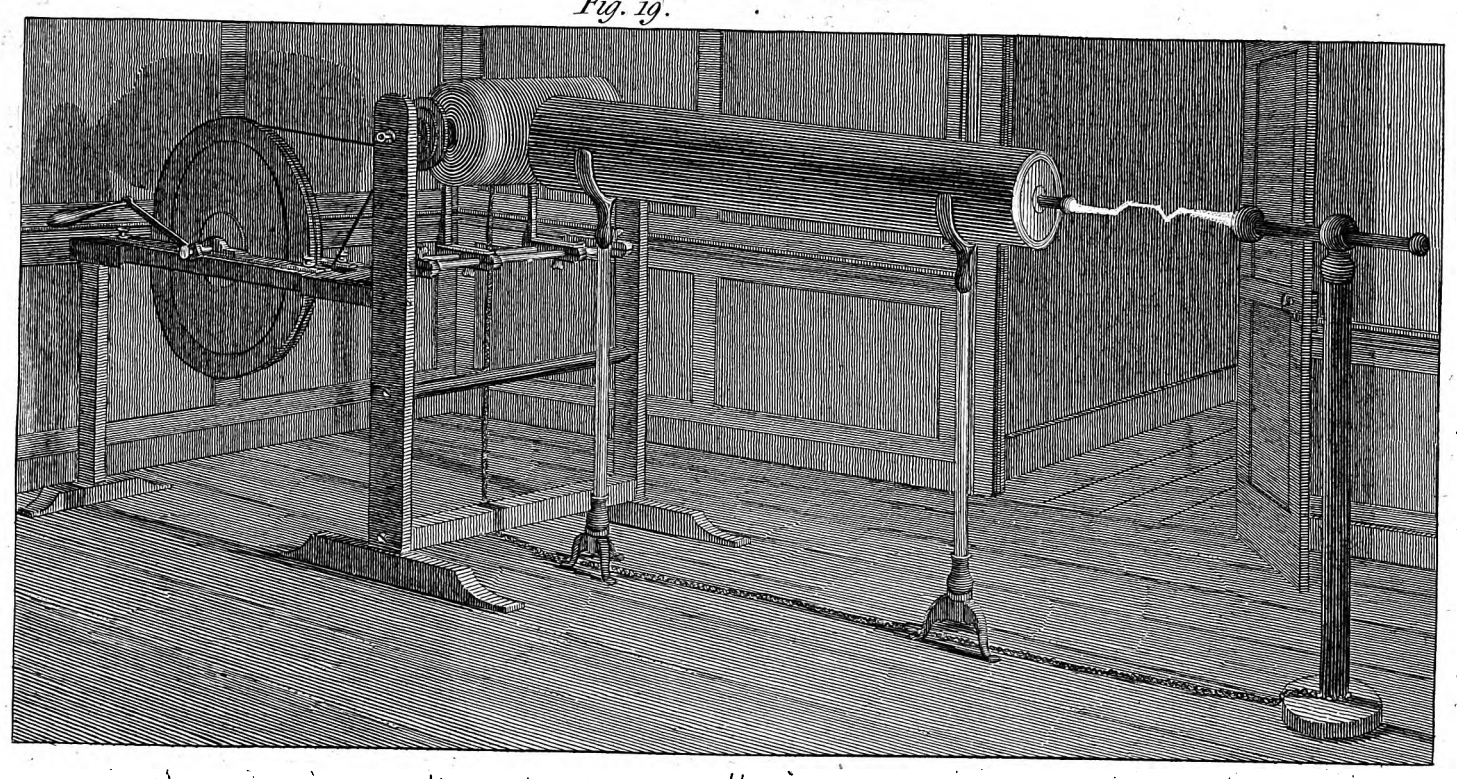

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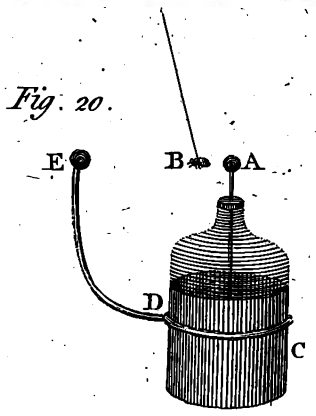

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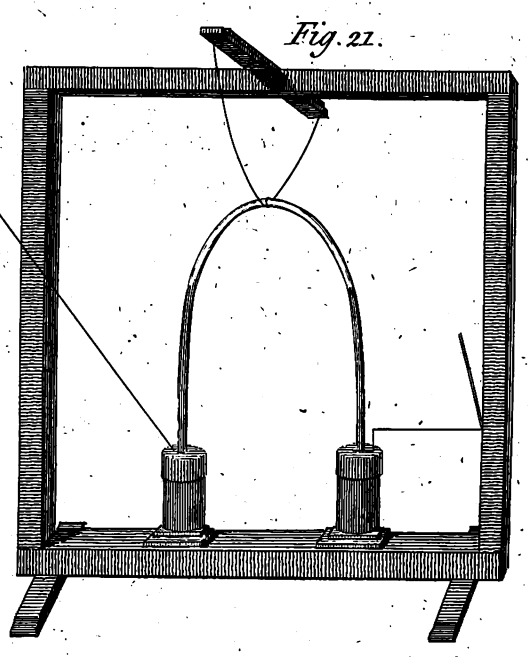

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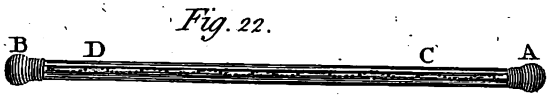
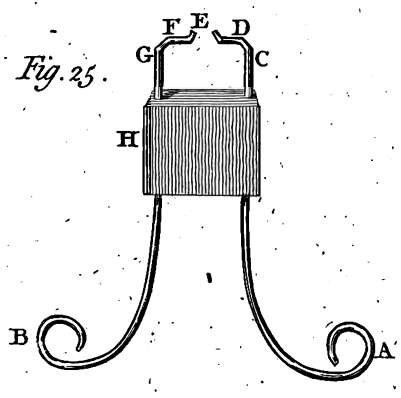


Fig. 25.



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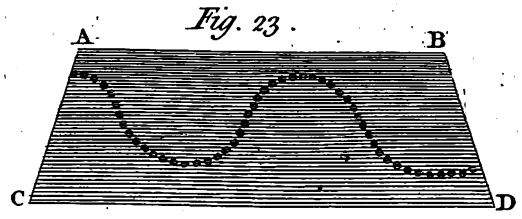


Fig. 20. N°. 2.

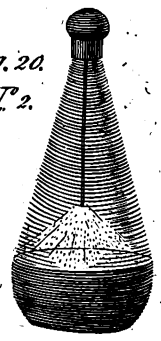
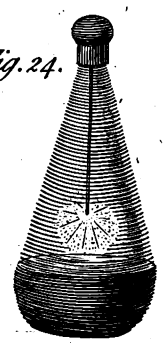


Fig. 24.



I. Taylor sculp.

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ELECTRICITY *Tab. IV.*

ELECTROMETER

Canton's

Fig. 26.

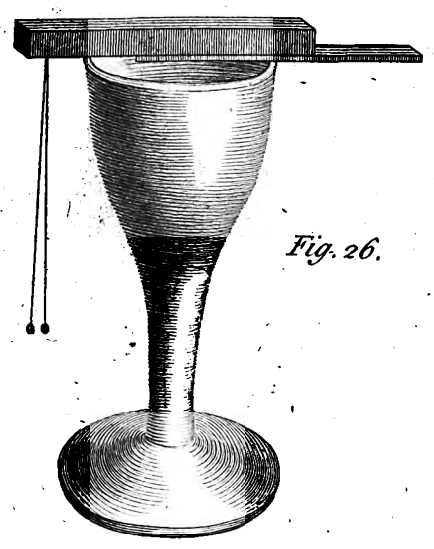
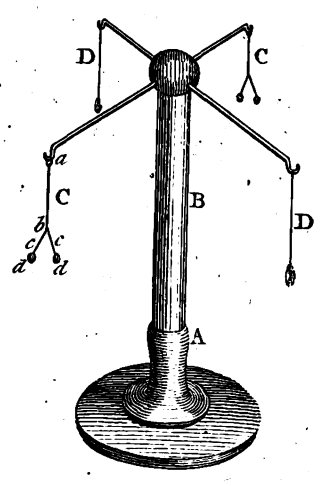
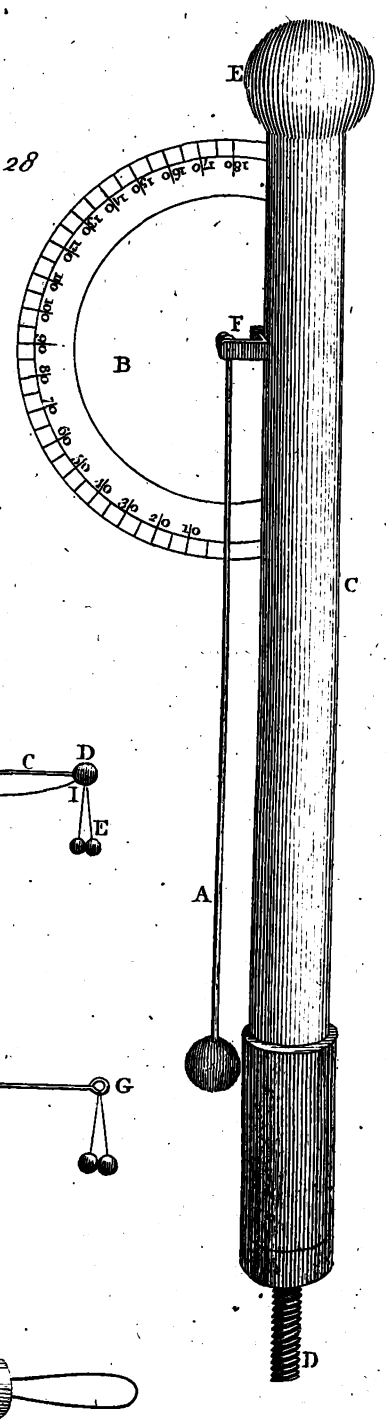


Fig. 27.

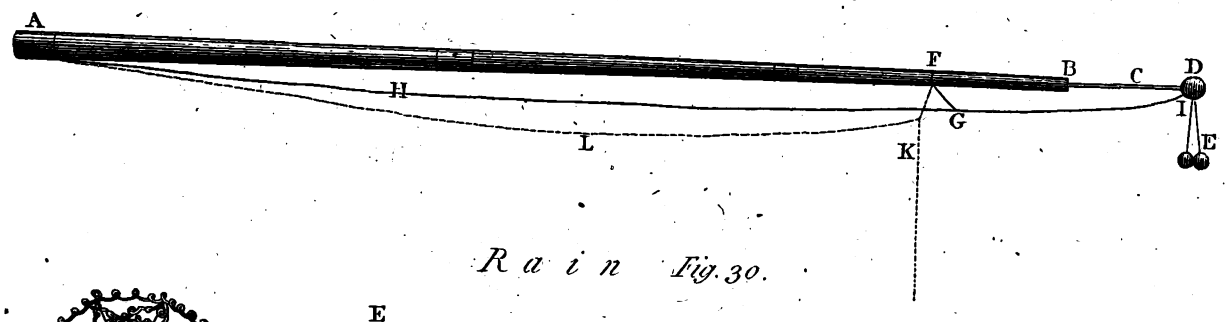


Henly's Quadrant

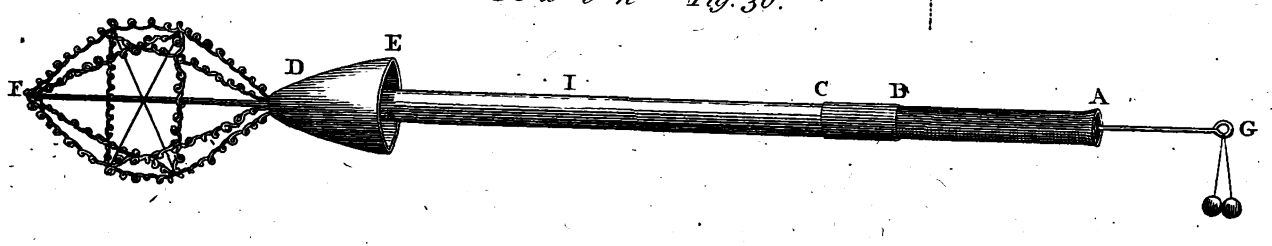
Fig. 28



Atmospherical *Fig. 29.*



Rain *Fig. 30.*



Pocket *Fig. 31.*

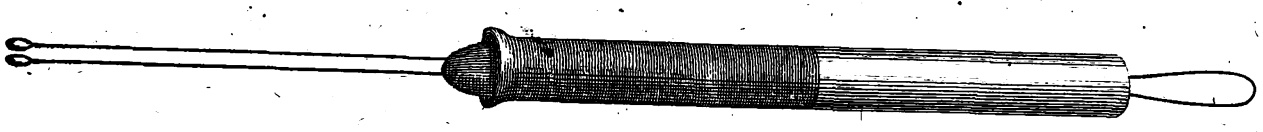


Fig. 32

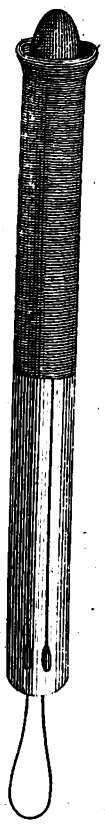
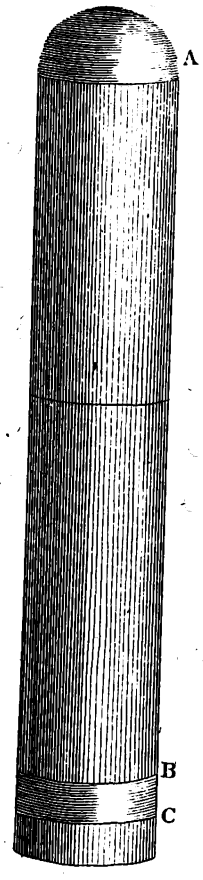
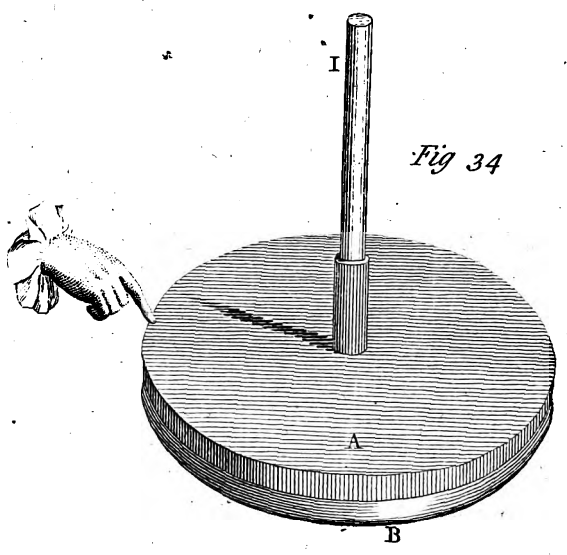


Fig. 33



ELECTROPHORUS

Fig 34



J. Taylor fculp.

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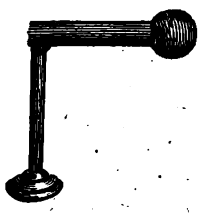
ELECTRICITY. *Tab. V.*

Theory of POINTS.

Fig. 35



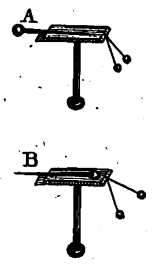


Fig. 36

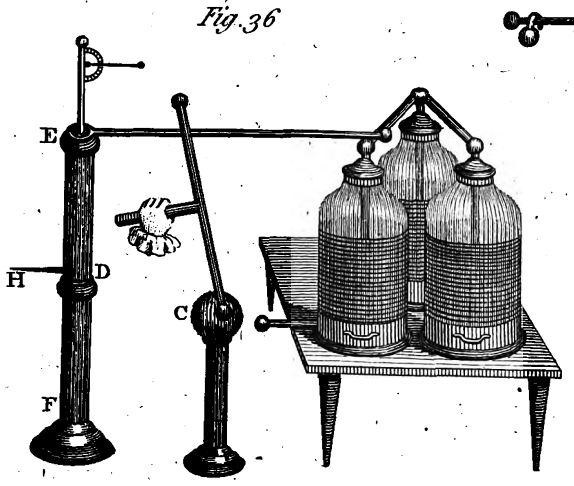


Fig 37

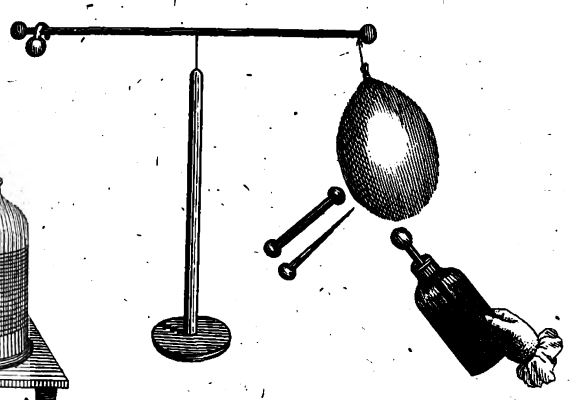


Fig. 38

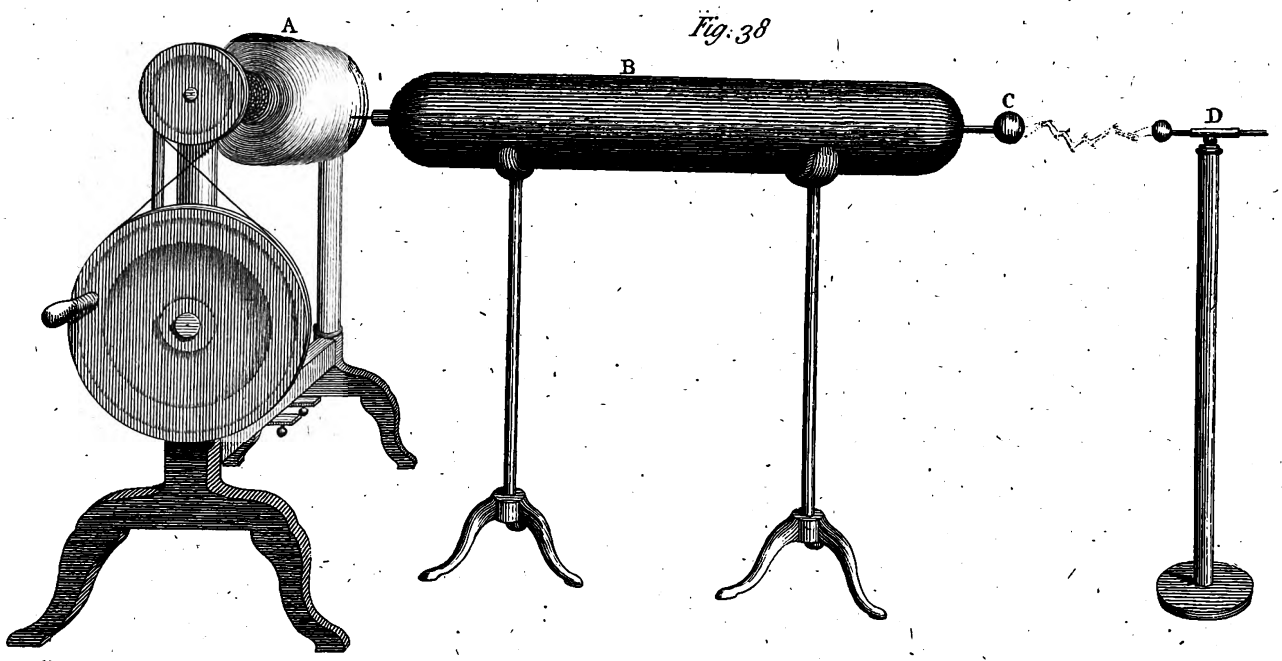


Fig. 39

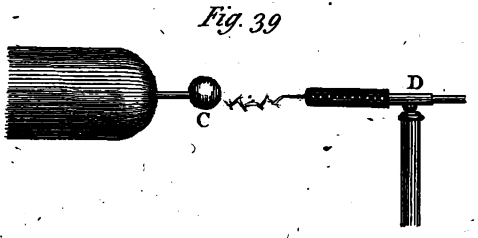


Fig. 42

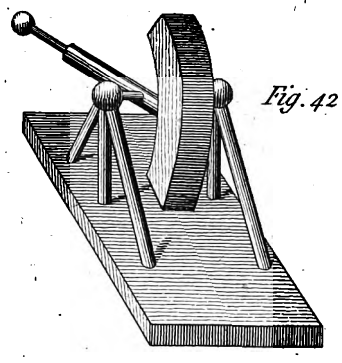


Fig. 40

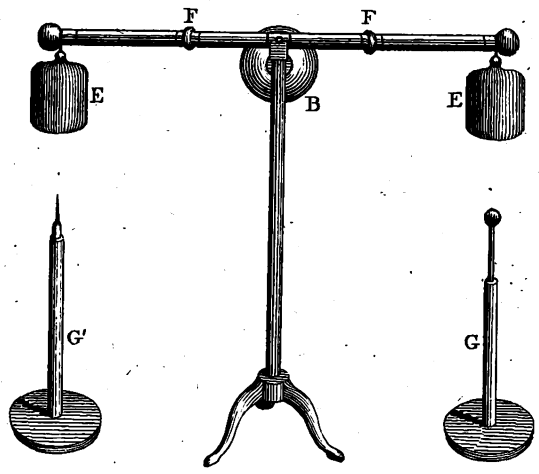
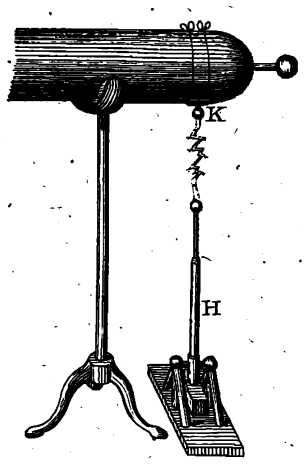


Fig. 41



THUNDER House

Fig. 43,

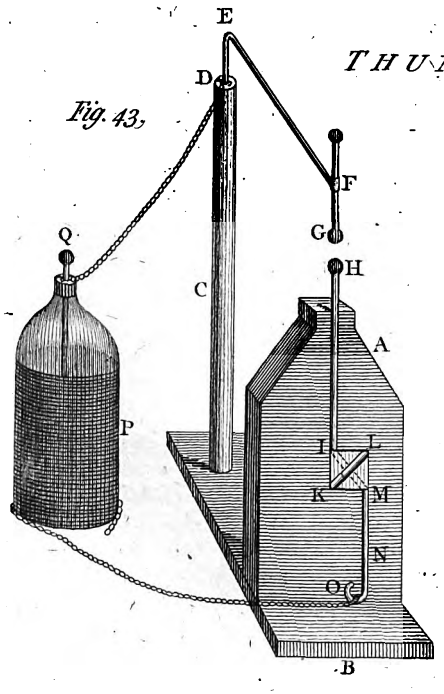
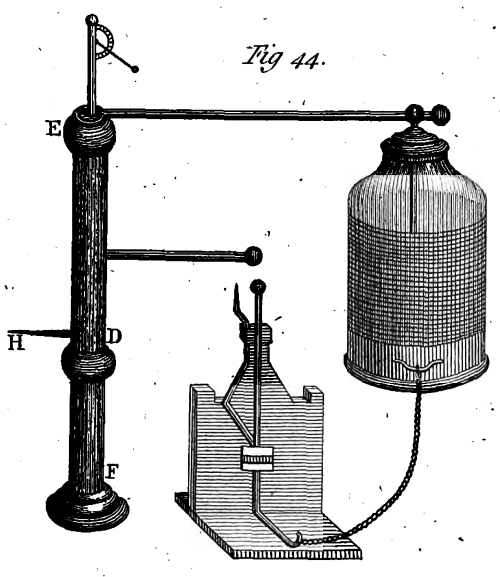


Fig 44.



TORPEDO.

Fig. 45

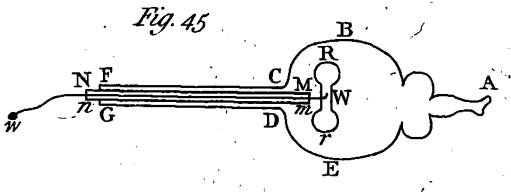
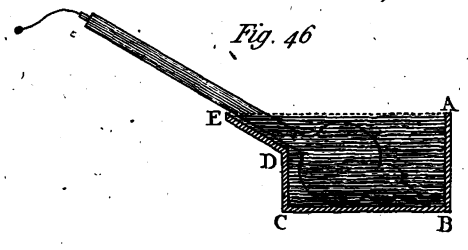


Fig. 46



I. Taylor, sculp.

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on which electrics act: he remarked, that a dry air was moſt favourable to electrical appearances, whilſt a moiſt air almoſt annihilates the electric virtue: he alſo obſerved the conical figure aſſumed by electrified drops of water: he conſidered electrical attraction ſeparately from repulſion, which, he apprehended, had no place in *electricity*, as a phenomenon ſimilar to the attraction of coheſion; and he imagined, that electrics were brought into contact with the bodies on which they act by their effluvia, excited by friction.

The honourable Mr. Boyle added to the catalogue of electric ſubſtances; but he thought that glaſs poſſeſſed this power in a very low degree: he found, that the *electricity* of all bodies, in which it might be excited, was increaſed by wiping and warming them before they were rubbed; that an excited electric was acted upon by other bodies as ſtrongly as it acted upon them; that diamonds, rubbed againſt any kind of ſtuff, emitted light in the dark; and that feathers would cling to the fingers and to other ſubſtances, after they had been attracted by electrics. He accounted for electrical attraction, by ſuppoſing a glutinous effluvium emitted from electrics, which laid hold of ſmall bodies in its way, and carried them back to the body from which it proceeded. Otto Guericke, the famous inventor of the air-pump, lived about the ſame time: this ingenious philoſopher diſcovered, by means of a globe of ſulphur, that a body once attracted by an electric was repelled, and continued in this ſtate of repulſion till it had been touched by ſome other body: he alſo obſerved, the ſound and light produced by the excitation of his globe; and that bodies immerged in electric atmoſpheres are themſelves electrified, with an *electricity* oppoſite to that of the atmoſphere. The light emitted by electrical bodies was, not long after, obſerved to much greater advantage by Dr. Wall, who aſcribes to light the electrical property which they poſſeſs; and he ſuggeſts a ſimilarity between the effects of *electricity* and lightning. Sir Iſaac Newton was not inattentive to this ſubject: he obſerved, that excited glaſs attracted light bodies on the ſide oppoſite to that on which it was rubbed; and he aſcribes the action of electric bodies to an elaſtic fluid, which freely penetrated glaſs, and the emiſſion of it to the vibratory motions of the parts of excited bodies. Mr. Haukſbee, with whom commenced a new æra in the hiſtory of this ſcience, wrote in the year 1709, and firſt took notice of the great electrical power of glaſs, the light proceeding from it, though others had before obſerved, the light proceeding from other electrified ſubſtances; and the noiſe occaſioned by it, together with a variety of phenomena relating to electrical attraction and repulſion: he firſt introduced a glaſs globe into the electrical apparatus; and to the uſe of this many of his important diſcoveries were owing. After his time, there was an interval of near twenty years in the progreſs of this ſcience; till Mr. Stephen Grey eſtabliſhed a new æra in the hiſtory of *electricity*. To him we owe the capital diſcovery of communicating the power of native electrics to other bodies, in which it cannot be excited, by ſupporting them on ſilken lines, hair lines, cakes of reſin, and glaſs; and a more accurate diſtinction than had hitherto obtained between electrics and non-electrics: he alſo ſhewed the effect of *electricity* on water much more obviouſly than Gilbert had done in the infancy of this ſcience. The experiments of Mr. Grey were repeated by M. du Fay, member of the Academy of Sciences at Paris, who added to the number many new experiments and diſcoveries of his own. He obſerved, that electrical operations are obſtructed by great heat as well as by a moiſt air; that all bodies, both ſolid and fluid, were capable of receiving *electricity*, when placed on warm or dry glaſs, or ſealing-wax; that thoſe bodies which were of themſelves the leaſt electric had the greateſt degree of *electricity* communicated to them by the approach of the excited tube. He alſo tranſmitted the electric virtue through a diſtance of 1256 feet; and firſt obſerved the electric ſpark from a living body, ſuſpended on ſilken lines, and noted ſeveral circumſtances attending it. M. du Fay likewiſe eſtabliſhed a principle, firſt ſuggeſted by Otto Guericke, that electric bodies attract all thoſe which are not ſo, and repel them as ſoon as they are become electric, by the vicinity or contact of the electric body. He alſo inferred from other experiments, that there were two kinds of *electricity*; one of which he called the *vitreous*, belonging to glaſs, rock cryſtal, &c. and the other *reſinous*, as that of *amber*, *gum lac*, &c. diſtinguiſhed by their repelling thoſe of the ſame kind, and attracting each other. He obſerved, that communicated *electricity* had the ſame property as the excited; and that electric ſubſtances attract the DEW more than conductors.

Mr. Grey, reſuming his experiments in 1734, ſuſpended ſeveral pieces of metal on ſilken lines, and found, that by electrifying them, they gave ſparks, which was the origin of metallic conductors; and, on this occaſion, he diſcovered a cone or pencil of electric light, ſuch as is now known to iſſue from an electrified point. From other experiments he concludes, that the electrical power ſeems to be of the ſame nature with that of thunder and lightning.

Dr. Deſaguliers ſucceeded Mr. Grey in the proſecution of this ſcience. The account of his firſt experiments is dated in 1739. To him we owe thoſe technical terms of *conductors* or *non-electrics*, and *electrics per ſe*, which are explained in the courſe of this work. He firſt ranked pure air among the electrics *per ſe*, and ſuppoſed its *electricity* to be of the vitreous kind. After the year 1742, in which Dr. Deſaguliers concluded his experiments, the ſubject was taken up and purſued in Germany: the globe was now ſubſtituted for the tube, which had been uſed ever ſince the time of Haukſbee, and a cuſhion was ſoon after uſed as a rubber inſtead of the hand. About this time, ſome uſed cylinders inſtead of globes; and ſome of the German electricians made uſe of more globes than one at the ſame time. By thus increaſing the electrical power, they were the firſt who ſucceeded in ſetting fire to inflammable ſubſtances. This indeed was firſt done by Dr. Ludolf, in the beginning of the year 1744, who kindled, with ſparks excited by the friction of a glaſs tube, the ætherial ſpirit of Frobenius. Mr. Winkler did the ſame by a ſpark from his own finger, and kindled French brandy and other ſpirits by previouſly heating them. Mr. Gralath fired the ſmoak of a candle juſt blown out, and lighted it again; and Mr. Boze fired gun-powder, by means of its inflammable vapour. Ludolf the younger, about this time, demonſtrated, that the luminous barometer was made perfectly electrical by the motion of the quick-ſilver: the electrical ſtar and electrical bells were alſo of German invention. Dr. Watſon in England made a diſtinguiſhed figure from this period in the hiſtory of *electricity*: he fired a variety of ſubſtances by the electrical ſpark, and firſt diſcovered, that they were capable of being fired by the repulſive power of *electricity*. In the year 1745, the accumulation of the electrical power in glaſs, by means of the Leyden phial, was firſt diſcovered. See LEYDEN *phial*. For the method practiſed about this time, of meaſuring the diſtance to which the electric ſhock may be conveyed; ſee *Electrical* CIRCUIT. Dr. Watſon made a very important diſcovery in this ſcience, that the glaſs tubes and globes did not contain the electric matter in themſelves, but only ſerved as *firſt-movers* or *determiners*, as he expreſſes it, of that power, which was alſo confirmed towards the end of 1746, by Mr. Wilſon, who made the ſame diſcovery, that the electric fluid did not come from the globe, but from the earth, and other non-electric bodies about the apparatus. Dr. Watſon alſo diſcovered what Dr. Franklin obſerved about the ſame time in America, and called the *plus* and *minus* in *electricity*. He likewiſe demonſtrated, that the electric matter paſſed through the ſubſtance of the metal of communication, and not merely over the ſurface.

We muſt omit other experiments and concluſions drawn from them by Mr. Wilſon, Mr. Smeaton, Dr. Miles in England; and by the Abbé Nollet, with regard to the effect of *electricity* on the evaporation of fluids, on ſolids, and on animal and other organized bodies, in France. The hiſtory of *medical* ELECTRICITY, commenced in the year 1747.

Whilſt the philoſophers of Europe were buſily employed in electrical experiments and purſuits, thoſe of America, and Dr. Franklin in particular, were equally induſtrious, and no leſs ſucceſsful. His diſcoveries and obſervations in *electricity* were communicated in ſeveral letters to a friend; the firſt of which is dated in 1747, and the laſt in 1754. A ſummary of his ſyſtem will be delivered under the articles *Theory of* ELECTRICITY, LEYDEN *Phial*, and POINTS. See alſo CHARGING, CONDUCTORS, ELECTRICS, &c.

The ſimilarity between lightning and *electricity* had been ſuggeſted by ſeveral writers on this ſubject; but Dr. Franklin firſt propoſed a method of bringing the matter to the teſt of experiment, by raiſing an ELECTRICAL *kite*; and he ſucceeded in collecting electrical fire by this means from the clouds, in 1752, a month after the electricians in France had verified the ſame theory, and independently of any knowlege of what they had done: and to him we owe the practical application of this diſcovery, in ſecuring buildings from the damage of lightning, by erecting metalline CONDUCTORS. See alſo LIGHTNING.

In the ſubſequent period of the hiſtory of this ſcience, Mr. Canton in England, and Signior Beccaria in Italy, acquired diſtinguiſhed reputation. They both diſcovered,

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independently of one another, that air was capable of receiving *electricity* by communication, and of retaining it when received; and they had various contrivances for this purpoſe. Mr. Canton alſo, towards the latter end of the year 1753, purſued a ſeries of experiments, which prove, that the appearances of poſitive and negative *electricity*, which had hitherto been deemed eſſential and unchangeable properties of different ſubſtances, as, e. g. of glaſs and ſealing-wax, depend upon the ſurface of the electrics, and that of the rubber. This hypotheſis, verified by numerous and inconteſtible experiments, occaſioned a controverſy between Mr. Canton and Mr. Delaval, who ſtill maintained, that theſe different powers depended entirely on the ſubſtances themſelves. About this time, ſome curious experiments were performed, by four of the principal electricians of that period, viz. Mr. Canton, Dr. Franklin, Meſſrs. Wilcke and Æpinus, in order to aſcertain the nature of electric atmoſpheres; the reſult of which may be ſeen under the article *Electric* ATMOSPHERE.

The theory of two electric fluids, always co-exiſtent and counteracting each other, though not abſolutely independent, was maintained by a courſe of experiments on ſilk ſtockings of different colours, communicated to the Royal Society by Mr. Symmer, in the year 1759, which were farther purſued by Mr. Cigna of Turin, who publiſhed an account of them in the Memoirs of the Academy at Turin for the year 1765.

Many inſtances occur in the hiſtory of the ſcience about this period, of the aſtoniſhing force of the electric ſhock, in melting wires, and producing other ſimilar effects: but the moſt remarkable is an experiment of S. Beccaria, in which he thus revivified metals. Several experiments were alſo made by Dr. Watſon, Mr. Smeaton, Mr. Canton, &c. on the paſſage of the electric fluid through a vacuum, and its luminous appearance, and on the power which particular ſubſtances poſſeſs of retaining the light communicated to them by an electric exploſion. Mr. Canton, S. Beccaria, and others, made many experiments to identify *electricity* and lightning, to aſcertain the ſtate of the atmoſphere at different times, and to explain the various phenomena of the AURORA *borealis*, *Water*-SPOUTS, HURRICANES, &c. on the principles of this ſcience.

Thoſe who are deſirous of farther information with reſpect to the hiſtory of electrical experiments and diſcoveries, may conſult the excellent work of Dr. Prieſtley, entitled, The Hiſtory and Preſent State of *Electricity*, "&c. Ed. 3. 1775." However, Dr. Prieſtly is not a mere hiſtorian: his work contains many original experiments and diſcoveries made by himſelf. He aſcertained the conducting power of CHARCOAL, and of hot glaſs; the *electricity* of fixed and inflammable air, and of oil; the difference between new and old glaſs, with reſpect to the diffuſion of *electricity* over its ſurface; the lateral exploſion in electrical diſcharges; a new method of fixing circular-coloured ſpots on the ſurfaces of metals, and the moſt probable difference between electrics and conductors; beſides a variety of other particulars, too numerous to be recited in this abſtract of the hiſtory, and yet of conſiderable importance with regard to the advancement and extenſion of the ſcience of *electricity*. We ſhall endeavour, in the courſe of this work, to do juſtice to the merits of other electricians, to whom the ſcience is under any peculiar obligations. The name of Mr. Henly often occurs in articles appropriated to this part of natural philoſophy; to him we owe ſeveral curious experiments and obſervations on the electrical and conducting quality of different ſubſtances, as CHOCOLATE, VAPOUR, &c. the reaſon of the difference between them; the fuſion of platina; the nature of the electric fluid, and its courſe in a diſcharge; the method of eſtimating the quantity of it in electrical bodies by an electrometer; the influence of POINTS, &c. &c.

ELECTRICITY, *Experiments and Phenomena in.* It may be premiſed in general for the uſe of young electricians, who have not acceſs to other treatiſes on this ſubject, that every part of the electrical apparatus ſhould be kept clean and dry; that, when the air is dry and the weather froſty, experiments are performed with the greateſt eaſe and advantage; that very hot weather is unfavourable to electrical experiments; that when the air is damp, they ſhould be performed in a room well dried with a fire. If a glaſs tube is uſed, its power may be increaſed by a ſmall quantity of bees wax drawn over its ſurface, and the hand ſhould be kept two or three inches below the upper part of the rubber. The globe, or cylinder of a machine, ſhould be firſt wiped with a clean hot flannel, or an old ſilk handkerchief; the ſilken part of the rubber ſhould be well dried; and the leather that is ſpread over it ſhould be firſt rubbed with tallow, and then with AMALGAM. It may not be improper here to mention the uſe of Dr. Higgins's amalgam, which is attended with ſeveral advantages. 1. It excites a ſtronger electricity; and 2. Does not fly off from the rubber by the motion of the electric. The compoſition is four parts of mercury to one of zinc. Theſe are melted together in an iron ladle, over a ſlow fire. Put in firſt the zinc, and by degrees add the mercury. It forms a hard maſs when cold, which may be warmed again when uſed; or it may be ſcraped off with a dull edged knife, and ſpread upon the rubber, which is firſt to be prepared with a little tallow. See an account of Mr. Canton's amalgam, under the article AMALGAMATION *of Tin.*

The rubber thus prepared, ſhould be made to communicate, when the room is very dry, with moiſt earth or water, by good conductors; and if the cylinder and rubber are in good order, the winch be turned, and no conductors communicate with the electric, the electric fluid will be felt on the knuckle held within a ſmall diſtance of it, like a current of air, attended with a ſpark and a crackling noiſe. When the machine has been uſed for ſome time, the electric will contract black ſpots from the amalgam, or foulneſs of the rubber, which muſt be carefully removed, or they will gradually increaſe, and prevent its excitation. An incruſtation of the ſame kind will be formed upon the rubber, by which it will be conſiderably improved; and if this be moiſtened or ſcraped, no addition of ſuch amalgam will be neceſſary. If the coated jars, which are deſigned for uſe, be warmed a little, they will better receive and retain the charge. Candles ſhould be placed at a conſiderable diſtance from the prime conductor, leſt their flames ſhould attract and diſperſe the electric fluid. The electrical operator ſhould be careful in the uſe of his machine, jars and battery, that he may ſuſtain no injury by any ſudden or unexpected diſcharge. Effectually to prevent this, we would always recommend the uſe of a diſcharging rod, with a handle of glaſs. With theſe precautions, there is no part of ſcience that will afford a greater variety of amuſing experiments than *electricity*. We ſhall ſelect the following as a ſpecimen:

1. If a ſmooth glaſs tube be excited by a proper rubber, and the knuckle be moved lengthways from one end of the tube to the other, without touching it, you will hear a continued ſnapping or crackling noiſe; and if the room be darkened, ſparks of light may be obſerved wherever the tube ſnaps; and a light may be ſeen following the hand that rubs the tube. When the tube is in good order, pencils of the electric matter will dart into the air from ſeveral parts of it ſpontaneouſly, and make a very beautiful appearance. If a rough tube be uſed with a proper rubber, the electric matter will be ſeen to ſpread upon its ſurface on the approach of the knuckle or any other conducting ſubſtance in a very agreeable manner. A large ſtick of ſealing-wax ſhews this phenomenon to great advantage.

2. If a ſmall light feather be brought near an excited tube, either of ſmooth or rough glaſs, it will be attracted, jump to the tube, and ſtick cloſe to the ſurface of it, till it be ſaturated with the electric matter, which, as it is a bad conductor, it receives ſlowly: it will then be repelled by it, and may be kept ſuſpended, or driven about the room by the electrified tube for a conſiderable time, unleſs it parts with its *electricity* to ſome conducting ſubſtance; and in this ſtate of repulſion, the ſame ſide of the feather will be always preſented to the tube; becauſe, being a bad conductor, the ſuperinduced *electricity* will be forced by the action of the tube to that ſide which is fartheſt from it; and that ſide will, of courſe, be moſt repelled: the charged bottle produces the ſame effect. If one perſon holds in his hand an excited ſmooth tube, and another holds an excited rough tube, or any other electric negatively electrified, at the diſtance of about one foot and a half, a feather introduced between theſe two tubes, poſſeſſing oppoſite *electricities*, will leap alternately from one to the other; or, if a finger is held at eight or ten inches from either tube, the feather will alternately jump from the tube to the finger, and from the finger to the tube. This experiment may be varied, by turning the winch of an electrical machine with one hand, and holding the other about three or four inches from the end of the prime conductor; then, if a ſmall lock of cotton be let fall on the hand near the conductor, it will jump from the hand to the conductor, and from the conductor to the hand again, being alternately attracted and repelled, and aſſuming an oblong form, though its motion will be ſo quick, that little elſe beſides its colour can be ſeen.

3. If two feathers or cork balls be ſuſpended, one by a ſilken, and the other by a linen thread, an excited tube will attract them both, but repel only the former; and if

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the ſilken thread be well moiſtened, the feather ſuſpended by it will be attracted, but no more repelled by the tube; the electric matter in both caſes being inſtantly diſcharged by the conducting moiſture and linen thread. If the ſmall ball ſuſpended by a ſilk thread of about eight inches in length, be held in the hand, about eight inches from an electrified prime conductor, whoſe *electricity*, either poſitive or negative, is not very ſtrong, it will not be attracted; becauſe, by being inſulated, it is incapable of communicating part of its electric matter to, or receiving any from other bodies, and thus of acquiring an *electricity* oppoſite to that of the conductor. But if the finger, or any conducting body, be preſented to that ſide of the ball which is fartheſt from the prime conductor, it will move towards the conductor, having either received or loſt *electricity* from the body preſented to it; and after having touched the prime conductor, it will be repelled by it, both poſſeſſing the ſame kind of *electricity*, and having either more or leſs than their natural ſhare of it. However, if the inſulated ball be brought very near the prime conductor, or the prime conductor be ſtrongly electrified, it will be attracted without preſenting to it any conducting ſubſtance; for, in this caſe, the natural *electricity* of the ball will be forced into the air, or accumulated on the ſide remoteſt from the conductor electrified poſitively; or the redundance in the ball will be acquired from the air, or its natural quantity will be accumulated on the ſide neareſt to the conductor, electrified negatively. If the cork ball be ſuſpended by a linen thread, it will be attracted at a much greater diſtance; becauſe the electric fluid will eaſily paſs to it, or from it along the thread, as the prime conductor is electrified poſitively or negatively.

4. To a ring of wire, at leaſt a foot larger in diameter than the globe of the machine, let pieces of fine linen thread, about five inches long be tied at the diſtance of about two inches from each other. Let this ring be held horizontally round the globe, the conductor being firſt removed, and the globe turned, the threads will be attracted, and point towards the center of the globe, reſembling the ſpokes of a wheel: in this caſe, the electric fluid paſſes freely from the perſon who holds the ring to or from the globe, as it is electrified negatively or poſitively.

5. If a large plumy feather, as *b* (*fig.* 17. *Tab.* II. *Electricity*) be ſtruck into the prime conductor, and the globe be turned, its fibres will repel each other, and expand in all directions; but if any conducting ſubſtance be made to touch the prime conductor; or, if the point of a needle be brought near the feather or the conductor, it will ſhrink, the *electricity* being thus taken off; and if the point of the finger be held near the feather, it will cling round it, and bend to the motion of the finger round it.

6. If the conductor, in *fig.* 17, be placed, ſo that the points I may almoſt touch the globe of the machine; and Mr. Canton's ELECTROMETER, conſiſting of ſmall cork or pith balls O and P annexed to the ends of a linen thread be ſuſpended over the wire N, the threads will hang perpendicularly and parallel to one another, and the balls will touch; but if the globe be turned, the balls will be electrified, and repel each other, more or leſs in proportion to the degree of *electricity* communicated to the conductor. They are in this caſe electrified poſitively, or they receive more than their natural quantity of the electric fluid, which cannot be diſſipated in the air as faſt as they receive it, and therefore they repel each other; but if the prime conductor were electrified negatively, they would then have leſs than their natural quantity, and the caſe would be ſtill the ſame: no electric ſubſtance applied to the conductor can bring them together; but if the prime conductor be touched with ſome conducting ſubſtance uninſulated, the redundance would be carried off, or the deficiency ſupplied, and then the balls would immediately come together.

7. The attraction or repulſion of light electrified bodies may be beautifully repreſented, by ſuſpending the braſs-plate X from the prime conductor, directly over the plate Y, and about three inches from it. See *fig.* 17. On the lower plate place any light bodies, as bran, feathers, pieces of paper, or of leaf-gold, and then work the machine; upon which theſe light bodies will move to and fro between the plates, being firſt attracted by the upper plate, and then repelled; and having diſcharged themſelves on the lower, they will be alternately attracted and repelled again. If ſmall images, in the ſhape of men and women, be laid on the lower plate, the images will dance from one plate to the other in an amuſing manner. If a piece of leaf gold be cut with a pretty large angle at one extremity, and a very acute one at the other, it will need no lower plate, but will hang by its larger angle at a ſmall diſtance from the conductor; and by the continual waving motion of its lower extremity, have the appearance of ſomething animated, nibbling at the conductor, and therefore called by Dr. Franklin the *golden fiſh*. If the *electrical* BELLS, already deſcribed, be hung from the ſame conductor, the ſinging and dancing will accompany each other; and the amuſement may be heightened, by occaſionally touching the prime conductor with a finger or braſs rod, which would make both to ceaſe at once; and when the finger or rod is removed, both will be renewed. If the application of the finger or rod be artfully concealed, the figures might be made to dance, and the bells to ring, ſeemingly at the word of command. In this experiment, the light bodies, and the lower plate, being within the atmoſphere of the upper electrified plate, become poſſeſſed of a contrary *electricity*, by communicating part of their natural quantity to the conductors with which they are connected; and thus being differently electrified, attract each other; but when theſe bodies touch the upper plate, they are endued with the ſame *electricity*, and are inſtantly repelled to the lower plate, which, being electrified with a contrary *electricity*, aſſiſts in repelling them back again to the upper one. If the lower plate Y, and its ſtand, be removed, and the light bodies be put upon a clean dry pane of glaſs, and held by one corner under the plate X, the experiment would not ſucceed; becauſe they cannot part with any of their natural quantity of the fluid, and become poſſeſſed of an *electricity* contrary to that of X; but if a finger, or any conductor, be preſented to the lower ſide of the glaſs, the attraction and repulſion will take place, becauſe the bodies will now part with their *electricity* to the upper ſurface of the glaſs, and charge it, the electric fluid belonging to the lower ſurface being repelled and carried away by the conductor. If the prime conductor were electrified negatively, the effect would be the ſame; but the *electricity* of the plates would be reverſed, the upper plate being electrified negatively, and the lower plate electrified poſitively. If a perſon, ſtanding on an inſulating ſtool, and having in his hand a chain faſtened to the prime conductor, ſtretch the other hand over the light ſubſtances on the lower plate, they will perform the dances already deſcribed.

8. Let a bent wire C D E (*fig.* 20. *Tab.* III.) be faſtened to the outſide of a coated jar, and be ſo bent as to have its knob E at the ſame height with the knob A of the jar; let a piece of cork be cut in the ſhape of a ſpider, and linen threads be drawn through it with a needle, and cut to a proper length to repreſent its legs; and then ſuſpended by a ſilk thread, ſo as to hang exactly in the middle between the knobs A and E; charge the jar, by bringing the knob A in contact with the prime conductor, and place it exactly where it ſtood before it was charged; the ſpider will now begin to move from knob to knob, ſtretching his legs towards each ball as he approaches it, and graſping each ball with them when he touches it, as if he were really animated, and continue its motion for a conſiderable time, till the jar is almoſt diſcharged. The ſpider is firſt attracted by the knob A, which communicates with the inſide of the bottle, and receiving part of its *electricity*, is repelled, and diſcharges it on the knob E, communicating with the outſide of the jar; and it is then alternately attracted and repelled by A and E, till the diſcharge is nearly completed, and the equilibrium between the oppoſite *electricities* of the inner and outer ſurfaces of the jar is nearly reſtored.

9. Let a metal cup, almoſt full of water, be ſuſpended by a loop or bow from the prime conductor, and the winch of the machine be turned, ſo as to electrify the water; and a finger be held then perpendicularly over the water, and very near it, the electrified water will riſe in a cone towards the end of the finger, and, in a dark room, a ſtream of fire will be ſeen to iſſue from the water to the finger. If one leg of a glaſs ſyphon be put into this water, and the other leg be drawn out into a capillary bore, that the water may only juſt drop out of it, and the water be electrified, it will run in a continued ſtream, which, in the dark, will be beautifully illuminated. If an unelectrified perſon with his finger, or a piece of metal, touch the prime conductor, the ſtream will ſtop, and the light diſappear; and when the metal is removed, both will be renewed.

10. Electric attraction and repulſion may be exhibited by means of the electric light, by fixing two pointed wires, one in the prime conductor, and the other in the rubber; when the winch is turned, the point of the former wire will be illuminated with a BRUSH or PENCIL, and that of the latter with a STAR: if an excited glaſs tube be brought near the firſt wire, the bruſh will be turned aſide or repelled by the atmoſphere of the tube;

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tube; and if it be held directly oppoſite to the point, the bruſh will vaniſh: but if the excited tube be brought near the point of the wire, fixed upon the rubber, the ſtar will turn towards the tube, the wire in this caſe attracting and receiving the *electricity* of the tube. If an excited ſtick of ſealing wax or other ſubſtance negatively electrified be applied in the ſame manner, the appearances will be directly the reverſe.

11. If a fly, as D *(fig. 4. Tab. Electricity)* made of ſmall braſs wires and fixed in a braſs cap, be put upon the pointed wire K, and ſcrewed to the prime conductor, and the wires *a*, *b*, *c*, *d*, are pointed, and bent in the ſame direction; when the winch of the machine is turned, a flame will be ſeen at each point, and the fly will turn round in the direction of the letters *a*, *b*, *c*, *d*, contrary to that of the points of the wires; for the air, contiguous to the points, becomes poſſeſſed of a ſtrong *electricity*, of the ſame kind with that of the points, and therefore the air and the points will repel each other. This experiment may be rendered more amuſing, by faſtening the figures of horſes cut in paper to the wires, in ſuch a manner, that the points may be in their tails, and then the horſes will ſeem to purſue each other; whence the experiment is called the electrical horſe-race. If a circular plate of metal be cut into the ſhape of a ſtar, ſo that every point may be at the ſame diſtance from the center, and the center be made to turn freely on a point, like the wires in the preceding experiment, a ſmall flame be will ſeen at every point; and if the ſtar be turned round, it will exhibit the appearance of a lucid circle, without any diſcontinuance of the light.

12. The effects of electrical attraction and repulſion may be repreſented in a very ſtriking manner, by electrifying a hoop of metal, ſuſpended from the prime conductor, about half an inch above a plate of metal, and parallel to it; and placing a round glaſs bubble, blown very light, upon the plate near the hoop: the bubble will be immediately attracted to the hoop, and the part which touches it acquiring *electricity* from it, will be repelled; but, as the electric virtue is not diffuſed over the whole ſurface of the glaſs, part of it will be again attracted by the hoop, whilſt the electrified part goes to diſcharge its *electricity* upon the plate; and this will occaſion a revolution of the bubble round the hoop, as long as the electrification is continued. In a dark room the glaſs ball will be beautifully illuminated. Two balls may be made to move round the ſame hoop, one on the inſide and the other on the outſide, in the ſame, or in oppoſite directions: if more hoops are uſed, a greater nnmber of bubbles may be made to revolve, and a kind of planetarium or orrery be conſtructed, with a ball over the centre of the hoop, to repreſent the ſun in the centre of the ſyſtem.

13. If a metal rod with a round knob be preſented to the electrified prime conductor, the electric matter will paſs with violence from the one to the other; an electric ſpark, with the appearance of fire, will be ſeen darting between them, and a report, uſually compared to a ſnapping noiſe, will be heard. The longeſt and ſtrongeſt ſpark will be drawn from that end of the prime conductor which is fartheſt from the cylinder, or from the knob I of the rod B I fixed at the end of it. See *fig. 4. Tab. Electricity.* This ſpark will iſſue in a great variety of crooked directions, exactly reſembling the courſe of lightning; and the repreſentation of it may be ſeen, *fig. 19. Tab.* III. A friend of Dr. Franklin ſuppoſes, that the ſpark is thrown out of a ſtrait courſe by the denſity of the air, increaſed by the action and re-action of the two fluids, which are repulſive of one another. Franklin's Letters, p. 167. If the braſs-plate X *(fig. 17. Tab.* II.) be hung on the prime conductor, and the room be darkened, ſtreams of fire will be ſeen to iſſue from the plate to the knuckles, held near the edge of it, and to follow the hand moved round its edge, when the conductor is electrified. The electric light may be made to flaſh between two metallic plates, if they are held back to back, parallel to one another, and about two inches aſunder, the one by an inſulated perſon connected with the prime conductor, and the other by a perſon ſtanding on the floor. When the winch of the machine is turned, flaſhes of light may be obſerved between the two plates ſo denſe and ſo frequent, that any thing may be diſtinguiſhed in a dark room. Sparks may be alſo drawn from any part of the body of a perſon inſulated and connected with the prime conductor. They may be communicated from a ſmooth ball of metal annexed to a wire held in the hand of the inſulated perſon to any other on the floor.

14. If two perſons be inſulated, and one of them be electrified poſitively, and the other negatively, either of them touching a perſon ſtanding on the floor will give a moderate ſpark; but if they touch one another, the ſpark will be much ſtronger, and they will both be unelectrified, the redundancy of the one ſupplying the deficiency of the other: but if both perſons had been electrified either poſitively or negatively, there would have been no ſpark on their touching one another.

15. There are various methods of ſetting fire to inflammable ſpirits by the electric ſpark. This may be eaſily done, by ſuſpending from the prime conductor a ſhort rod, with a ſmall knob at its end, and then putting ſome ſpirits of wine, a little warmed, into a metal ſpoon, which ſhould be held about an inch below the knob; if the winch is turned, a ſpark will proceed from the knob and kindle the ſpirits. If a perſon ſtanding on an inſulating ſtool, communicating with the prime conductor, holds the ſpoon in his hand, and another perſon on the floor brings his finger, or a piece of ice within a ſmall diſtance of it, the ſpirits will be ſet on fire; or, the ſpirits may be held by the perſon on the floor, and the inſulated perſon may communicate the ſpark by any conductor. Many other ſubſtances which throw out an inflammable vapour, may be kindled in the ſame manner.

16. Gun-powder may be fired by filling a ſmall cartridge of paper or the tube of a quill with it, and inſerting two wires, one at each end, ſo that their ends within the quill or cartridge may be about one-fourth or one-fifth of an inch from one another; then, if the charge of a phial be conveyed through theſe wires, the ſpark paſſing from the inner end of one to that of the other, will ſet fire to the gun-powder. Steel-filings mixed with the powder will make it take fire more readily.

17. The electric light is moſt beautifully exhibited in glaſs tubes and phials, exhauſted of their air. Thus, if a glaſs tube, about two inches in diameter, and about two feet long, with a braſs cap fixed to one end, and a ſtop-cock or valve to the other, be exhauſted of its air, it will appear to be full of light, whenever a ſpark is taken by it from the prime conductor, or an electric is diſcharged through it. Thus alſo, if a wire be made to paſs through a tall receiver of an air-pump, and the end of the wire within the receiver be moderately pointed, and the other end furniſhed with a knob; when the receiver is exhauſted of its air, and the knob of the wire brought into contact with the prime conductor, every ſpark will paſs through the receiver in a large diverging body of light, from the wire to the plate of the air-pump. Dr. Watſon has given us a particular account of ſeveral curious phenomena of *electricity* in vacuo, in the Philoſophical Tranſactions, vol. xlvii. p. 362, &c. The electric fluid, in its paſſage through an exhauſted tube, nearly three feet in length, and almoſt three inches in diameter, affords a very agreeable ſpectacle in a darkened room. We may obſerve, not as in the open air, bruſhes or pencils, of rays an inch or two in length, but corruſcations extending through the whole length of the tube; that is, in his experiment, thirty-two inches, and of a bright ſilver hue. Theſe did not immediately diverge, as in the open air, but frequently, from a baſe apparently flat, divided themſelves into leſs and leſs ramifications, and reſembled very much the moſt lively corruſcations of the aurora borealis. At other times, when the tube has been exhauſted in the moſt perfect manner, the *electricity* has been ſeen to paſs between two braſs-plates, contrived ſo, that they might be placed at different diſtances from each other, in one continued ſtream, of the ſame dimenſions through its whole length. The ſame experiments were tried with a Torricellian vacuum, very ingeniouſly contrived by lord Charles Cavendiſh. The apparatus (ſee *fig. 21. Tab.* III. *Electricity*) conſiſted of a cylindrical glaſs tube of about three-tenths of an inch in diameter, and of ſeven feet and a half in length, bent in ſuch a manner, that thirty inches of each of its extremities were nearly ſtrait, and parallel to each other, from which an arch ſprung, which was likewiſe of thirty inches. This tube was carefully filled with mercury; and each of its extremities being put into its baſon of mercury, ſo much of the mercury ran out, until, as in the common barometrical tubes, it was in equilibrio with the atmoſphere. Each of the baſons containing the mercury was of wood, and was ſupported by a cylindrical glaſs, of about four inches in diameter, and ſix inches in length; and theſe glaſſes were faſtened to the bottom of a ſquare wooden frame, ſo contrived, as that to its top was ſuſpended by ſilk lines, the tube filled with mercury before mentioned; ſo that the whole of this apparatus might be moved together without inconvenience. The Torricellian vacuum then occupied the ſpace of about thirty inches. In making the experiment, when the room was darkened, a wire from the prime conductor of the electrical machine communicated with one of the baſons of mercury; and any conductor touching

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touching the other baſon, while the machine was in motion, the *electricity* pervaded the vacuum in a continued arch of lambent flame; and, as far as the eye could follow it, without the leaſt divergency. S. Beccaria obſerves, that no electric light is viſible in a barometer, in which there is a perfect vacuum, and hence infers, that electric light is viſible only by means of ſome vibrations which it excites in the air; and Mr. Walſh has lately diſcovered, that an electric ſpark would no more paſs through a vacuum of the more perfect kind, made in the above-deſcribed arched barometer by the aſſiſtance of Mr. de Luc, than through a ſtick of ſolid glaſs. Mr. Nairne conſtructed a barometer on purpoſe to repeat this experiment; but his was a common ſtrait tube, in which the mercury was boiled; and he affirms, that it was as perfect a vacuum as art could make; but the vacuum of this became perfectly luminous at three feet from the large conductor to the grand-duke of Tuſcany's machine. Note, Mr. Walſh's was the arched barometer of lord Charles Cavendiſh before mentioned, and the deſign of Mr. de Luc in preparing it, was to render the illuminated vacuum more beautiful. See AURORA *borealis* and *Luminous* CONDUCTOR.

18. There have been many contrivances for giving various forms to the appearance of the electric ſpark in its paſſage from one conductor to another. This may be done by means of a board, and a number of wires, in the following manner: let two holes be made through the board, about one-fourth of an inch on each ſide of the ſpot where a ſpark is deſired; let the extremities of the wires, neatly rounded, come through theſe holes, and be brought near together, exactly over the place; and let the wires on the backſide of the board be ſo diſpoſed, as that an electric ſpark muſt take them all in the ſame circuit. When they are thus prepared, all the points will appear luminous at once, whenever a ſpark is taken by them at the prime conductor. In this manner, ſays Dr. Prieſtley, beautiful repreſentations may be made of any of the conſtellations, as of the Great Bear, Orion, &c. and thus alſo may the outlines of any drawing, as of figures in tapeſtry, be repreſented.

A ſpiral line of fire may be exhibited by the inſtrument in *fig.* 22. *Tab.* III. compoſed of two glaſs tubes, CD, one within another, and cloſed with two knobbed braſs caps, A and B: the innermoſt tube has a ſpiral row of ſmall round pieces of tin-foil ſtuck on its ſurface, at the diſtance of about one-thirtieth of an inch from each other. If one end of this inſtrument be preſented to the electrified prime conductor, every ſpark will be ſeen to paſs with a ſpiral motion from one of theſe pieces to the other round the ſmall tube. Pieces of tin-foil may alſo be diſpoſed of on a flat piece of glaſs ABCD (*fig.* 23.) ſo as to repreſent flowers, letters, &c. and they may be illuminated by holding either extremity C or B, in the hand, whilſt the other is preſented to the electrified prime conductor.

19. There are various ways of receiving and tranſmitting the electric ſhock. If a perſon puts one hand to the coating of a charged jar, and the finger of the other hand to the wire, he will receive a ſhock through his arms and breaſt. If a number of perſons join their hands, or for the ſake of varying the experiment, tread on one another's toes, or lay their hands on each other's heads, and a perſon at one end of the circuit touch the outſide of a jar, whilſt a perſon at the other extremity touches the wire, the ſhock will be felt by all at the ſame time. The ſhock may alſo be communicated, if a baſon of water be placed between every two of the perſons who are to receive it, and they dip the fingers of the hands in the water, that would otherwiſe have been joined. See CIRCUIT. Electric ſhocks may likewiſe be given to any particular part of the body, without affecting the reſt, by bringing that part only into the electrical circuit: thus, if a chain connected with the outſide of a jar charged by the prime conductor, be tied with a ſilk ſtring or ribband to the elbow, and another chain be applied in the ſame manner to the ſhoulder, and brought into contact with the prime conductor, the ſhock will only be felt from the ſhoulder to the elbow. See *Medical* ELECTRICITY and ELECTROMETER.

A very convenient apparatus hath been contrived for this purpoſe by Mr. Henly, which hath been much approved. A curious apparatus hath alſo been contrived by Mr. Partington, which he very properly calls directors of the ſhock, and by which it may with great facility be determined to any part of the body.

20. If a few ſheets of a quire of paper, or the cover of a book or a card, be interpoſed in the circuit of an electrical exploſion, they will be perforated by the diſcharge, and the hole will give a ſtrong ſmell of ſulphur.

21. The direction of the electric fluid in a diſcharge, may be ſhewn, by cauſing the exploſion to paſs over the ſurface of a card, in the following manner: lay two wires, one on one ſide of the card, and the other under it, in the ſame direction, and with their extremities about an inch diſtant; then by connecting one of the wires with the outſide of a charged jar, and the other wire with the knob of the jar, the electric fluid will run over that ſurface of the card, upon which the wire lies that is connected with the poſitive ſide of the jar; and in order to paſs to the extremity of the other wire, it will break a hole through the card juſt over the extremity of the wire that is connected with the negative ſide of the jar. This is a curious experiment of Mr. Lullin; but the honourable Frederic Chriſtian Mahling, counſellor of ſtate at Copenhagen, has admirably improved this experiment, by firſt painting the card in a line about half an inch broad on each ſurface with vermilion. Mr. Henly has preſented an account of it to the Royal Society; for which, ſee Phil. Tranſ. vol. lxviii. part ii. art. 49.

22. The courſe of the electric fluid may alſo be exhibited by the following experiment of Mr. Henly: a ſmall phial, repreſented *fig.* 24. *Tab.* III. is coated on the outſide, about three inches from the bottom, with tin-foil; to the top is cemented a braſs cap with a hole and valve, and from the cap a wire proceeds within the phial, terminating in a blunt point. When the phial is exhauſted of its air, a braſs ball is ſcrewed on the cape to defend the valve, and prevent air from getting into the exhauſted phial. If this phial be held by its bottom, and the braſs knob be preſented to and held in contact with the prime conductor electrified poſitively, the electric fluid will cauſe a pencil of rays to proceed from the wire within the phial, as in *fig.* 20; and if it be diſcharged, a ſtar will appear in the room of the pencil, as in *fig.* 24; but if the phial be held by the braſs cap, and its bottom be made to touch the prime conductor, then the point of the wire within it will appear illuminated with a ſtar, when charging, and with a pencil, when diſcharging. All theſe appearances will be reverſed, when it is preſented to a conductor electrified negatively. See *Luminous* CONDUCTOR.

23. The direction of the electric fluid may alſo be exhibited by fixing to the end of the prime conductor remoteſt from the machine, a braſs rod ſix inches long, with a braſs ball at its extremity, about three-fourths of an inch in diameter; and, when the winch of the machine is turned, let the flame of a wax taper be preſented to the ball, and it will be blown almoſt horizontally from the ball, and in the direction of the electric fluid; but if a like wire and ball be fixed to the inſulated rubber, the flame of a wax taper preſented to the ball, will be blown upon the ball, ſhewing the true courſe of the fluid in its paſſage to the rubber that is receiving it.

Experiments with the Electrical Battery. See ELECTRICAL *Battery* and *Univerſal* DISCHARGER.

Experiments with the Leyden Phial. See LEYDEN *Phial.*

Experiments on the Uſe and Efficacy of Points. See POINTS.

ELECTRICITY, *Medical.* It is natural to imagine, that a power of ſuch efficacy as that of *electricity* would be applied to medical purpoſes; eſpecially, ſince it has been found, invariably, to increaſe the ſenſible perſpiration, to quicken the circulation of the blood, and to promote the glandular ſecretion: accordingly, many inſtances occur in the later period of the hiſtory of this ſcience, in which it has been tried with conſiderable advantage and ſucceſs. Among the variety of caſes to which it has been applied, there are none in which it ſeems to have been prejudicial, except thoſe of pregnancy and of the venereal diſeaſe. In moſt diſorders, in which it has been uſed with perſeverance, it has given, at leaſt, a temporary and partial relief, and in many, effected a total cure. The firſt inſtance that occurs of its ſalutary effect, is that of a woman, who was cured in a quarter of an hour of a contracted finger, by M. Kratzenſtein, at Halle, as early as the year 1744. It was afterwards applied in a variety of paralytic caſes, by M. Jallabert of Geneva, in 1747; M. Sauvages, of the academy in Montpelier; in the courſe of whoſe experiments, it appeared, that electrification increaſes the circulation of the blood about one-ſixth; Mr. Patrick Brydone in Scotland, in 1757; the Abbè Nollet, and others; in ſeveral of which caſes preſent relief was obtained; but the beneficial effect does not appear to have been permanent. One inſtance occurs, related by Dr. Hart of Shrewſbury, and recorded in the Philoſophical Tranſactions, vol. xlviii. part ii. p. 785, in which electrification was injurious, and brought an univerſal palſy on a young perſon, whoſe right arm was paralytic; and though this palſy was removed by a courſe of medicine, the diſeaſed arm remained incurable. It alſo appears, from a number of experiments made by Dr. Franklin in paralytic caſes, that no permanent advantage was derived from *electricity* in this diſorder; and Mr. Weſley, who has been

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been long engaged in a courſe of medical *electricity*, obſerves, that though many paralytics have been helped by it, no palſy of a year's ſtanding has been thoroughly cured by it. However, a remarkable inſtance more lately occurs, in which an hemiphlegia was cured by this means, under the direction of a phyſician at Greenwich. The patient was in ſuch a ſtate, that boiling water might be applied from her hand to her ſhoulder, and from her ſhoulder to her foot, on the diſeaſed ſide, without being felt. This perſon was electrified, by drawing ſparks from the palſied ſide, and giving ſhocks, beginning with ſtronger ſhocks, till ſhe began to feel them, and continuing moderate ones, for 18 days; and in that time, during 31½ hours, the number of ſhocks was 141; and this perſeverance was attended with ſuch ſucceſs, that her feeling was quite reſtored, and that ſhe is capable of walking, and of writing with the hand, the uſe of which ſhe had loſt. Dr. de Haen obſerves, that with reſpect to partial palſies, electrification never did the leaſt harm; and that one or two perſons, who had received no benefit from it in ſix entire months, were yet much relieved by perſevering in the uſe of it; and that ſome perſons diſcontinuing it, after having received ſome benefit, relapſed again; but afterwards, by recurring to the uſe of *electricity*, recovered, though more ſlowly than before.

Dr. Hart, in 1756, mentions a cure performed on a woman, whoſe hand and wriſt had been for ſome time rendered uſeleſs, by a violent contraction of the muſcles: but the moſt remarkable caſe of this kind is that related by Dr. Watſon, Phil. Tranſ. vol. liii. p. 10. The patient, about ſeven years of age, was ſeized with an univerſal rigidity of her muſcles, ſo that her whole body felt more like that of a dead corpſe than of a living perſon: Dr. Watſon electrified her, at convenient intervals, from the middle of November 1762 to the end of January 1763, when every muſcle of the body was perfectly flexible, and ſubvervient to her will, ſo that ſhe could ſtand, walk and run like other children of her age. Mr. Miles Partington has lately communicated to the Royal Society a ſurpriſing inſtance of the cure of a very great degree of contraction and rigidity in the ſterno-maſtoideus muſcle, by means of electrical ſparks and ſhocks. Phil. Tranſ. vol. lxviii. part i. p. 97, &c. Mr. Wilſon mentions a ſingle inſtance, in which he had cured deafneſs of ſeventeen years continuance; but he acknowleges, that he tried ſimilar experiments on ſix other deaf perſons without ſucceſs. Mr. Lovet and Mr. Weſley have extended the medical application of *electricity* to a greater variety of caſes than any others: Mr. Lovet obſerves, in his Eſſay, that *electricity* is almoſt a ſpecific in all caſes of violent pains, of however long continuance, in any part of the body; as in obſtinate head-achs, the tooth-ach, the ſciatica, the cramp, and diſorders reſembling the gout; and that it has ſeldom failed to cure rigidities, or a waſting of the muſcles, and hyſterical diſorders: he adds, that it cures inflammations, and a fiſtula lachrymalis; that it has ſtopped a mortification, and diſperſed extravaſated blood; that it has been of excellent uſe in bringing to a ſuppuration, or in diſperſing without ſuppuration, obſtinate ſwellings of various kinds, even thoſe that were ſcrophulous; that it has cured the falling-ſickneſs, and ſeveral kinds of fits, and a diſorder that ſeems to have been a *gutta ſerena*. He adviſes to begin, in general, with ſimple electrification, eſpecially in hyſterical caſes; then to proceed to take ſparks, and laſtly to give moderate ſhocks. Mr. Weſley obſerves, that he has ſcarce known an inſtance, in which ſhocks all over the body have failed to cure a tertian or quartan ague: he mentions a caſe of blindneſs cured and relieved by it, and hearing given by it to a perſon who was born deaf; and he farther ſays, that it has cured bruiſes, running ſores, the dropſy, and a palſy in the tongue; and that it has brought away gravel from the kidnies. In hyſterical caſes, he recommends the patient's being ſimply electrified, by ſitting on cakes of reſin, at leaſt for half an hour morning and evening; and then taking ſmall ſparks from him, and afterwards giving ſhocks, more or leſs ſtrong, as the diſorder requires. Dr. Antonius de Haen, in his Ratio Medendi, cited by Dr. Prieſtley, Hiſt. *Electricity*, vol. i. p. 485, &c. informs us, that a paralyſis and trembling of the limbs, from whatever cauſe it aroſe, never failed to be relieved by *electricity*; and that it alſo certainly cures St. Vitus's dance; that it has been of ſome uſe in caſes of deafneſs; but failed in its application to a *gutta ſerena* and ſtrumous neck. Mr. Hey, ſurgeon of Leeds, mentions ſeveral caſes, in which the power of *electricity* has been ſucceſsfully applied to an AMAUROSIS. The machine was uſed twice a day; the patient was placed on a ſtool with glaſs legs, and had ſparks drawn from the eyes and parts ſurrounding the orbits, eſpecially where the ſuperciliary and infra-orbitary branches of the fifth pair of nerves ſpread themſelves. After this operation had been continued for half an hour, the patient was made to receive for an equal time ſlight ſhocks through the affected parts, which were ſometimes directed acroſs the head, from one of the temples to the other, but chiefly from the ſuperciliary and infraorbitary *foramina* to the *occiput*. Med. Obſ. and Inq. vol. v. p. 1, &c. In rheumatic caſes, Mr. Ferguſon obſerves, that he has generally found *electricity* ſucceſsful, by continuing to take ſparks from the places where the pain lies, till the ſkin has been red and pimpled, and the patient has felt a glowing warmth where the ſparks were drawn off; and the ſame method has alſo proved effectual in old ſprains. The uſe of *electricity* has been lately recommended in caſes of ſudden death. See DROWNING.

In all caſes where ſhocks are given, gentle ones ſhould be firſt uſed; and if the diſorder continues, they may be gradually increaſed; and they ſhould be confined to the affected part. The efficacy of *electricity* in the tooth-ach is ſo great, that it ſeldom or ever fails to give immediate relief, unleſs the tooth be very much decayed. The following inſtrument will ſerve for this purpoſe: it conſiſts of two wires, AE and BE, fixed in the piece of baked wood H, and bent at CD and FG, and at A and B, as in *fig.* 25. *Tab.* III. *Electricity*. If the affected tooth be brought within the two wires at E, and the ring A or B be connected by a chain with the outſide of a charged jar, and the other ring be connected by a chain with the knob of the jar, the ſhock will paſs through the wires, and conſequently through the tooth.

Under this head of *medical electricity*, it may be proper juſt to mention thoſe medicated tubes, the imaginary virtues of which were firſt diſcovered by Signior Pivati at Venice, and which were much recommended in the years 1747 and 1748, both in Italy and by Mr. Winkler at Leipſick. Theſe gentlemen imagined, that odorous ſubſtances, confined in excited glaſs veſſels, would tranſpire through the pores of the glaſs, and communicate their medicinal virtue to the atmoſphere of a conductor, and to all perſons in contact with it; and that theſe ſubſtances would yield their virtues by being held in the hands of perſons electrified; and they pretended that many cures were wrought in this way, by the operation of medicines, without being taken into the ſtomach: but the whole was ſoon diſcovered to be a fallacy; and it was inconteſtibly proved, that no effluvia could paſs from the included ſubſtances through the pores of excited glaſs; and that no method was known for cauſing the power of medicine to inſinuate itſelf into the human body by *electricity*. Dr. Franklin, by proving that glaſs was impermeable to the electric fluid itſelf; and that its *electricity* was collected from the rubber, &c. evinced the abſurdity of every attempt to tranſmit the effluvia of any ſubſtances through the glaſs. See Franklin's Letters, p. 82, &c.

ELECTRICITY, *theory of*. It will be needleſs to recite the ancient hypotheſis on this ſubject, ſuch as that of the ſympathetic power of the Peripatetics, that of unctuous effluvia emitted by excited bodies, and returning to them again, adopted by Gilbert, Gaſſendus, Sir Kenelm Digby, &c. or that of the Carteſians, who aſcribed *electricity* to the globules of the firſt elements, diſcharged through the pores of the rubbed ſubſtance, and in their return carrying with them thoſe light bodies, in the pores of which they were entangled. Theſe hypotheſes were framed in the infancy of the ſcience, and of philoſophy in general, and have been long ſince exploded. In the more advanced ſtate of *electricity*, there have been two principal theories, each of which has had its advocates. The firſt we ſhall mention is that of two diſtinct electric fluids, repulſive with reſpect to themſelves, and attractive of one another, adopted by Mr. du Fay, on diſcovering the two oppoſite ſpecies of *electricity*, viz. the vitreous and reſinous, and ſince new-modelled by Mr. Symmer. Theſe two fluids are ſuppoſed to be equally attracted by all bodies, and to exiſt, in intimate union, in their pores; and in this ſtate to exhibit no mark of their exiſtence. The friction of an electric by a rubber ſeparates theſe fluids, and cauſes the vitreous *electricity* of the rubber to paſs to the electric, and then to the prime conductor of a machine, and the reſinous *electricity* of the conductor and electric to be conveyed to the rubber; and thus the quality of the electric fluid poſſeſſed by the conductor and the rubber is changed, but the quantity remains the ſame in each. In this ſtate of ſeparation, the two electric fluids will exert their reſpective powers; and any number of bodies charged with either of them will repel each other, attract thoſe bodies that have leſs of each particular fluid than themſelves, and be ſtill more attracted by bodies that are wholly deſtitute of it, or that are loaded with the contrary. According to this theory, the electric ſpark makes

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a double current; one fluid paſſing to an electrified conductor from any ſubſtance preſented to it, whilſt the ſame quantity of the other fluid paſſes from it; and when each body receives its natural quantity of both fluids, the balance of the two powers is reſtored, and both bodies are unelectrified. Thus alſo, when a phial is charged by a conductor, the reſinous *electricity* of that ſide which is connected with the conductor is tranſmitted to the oppoſite ſide connected with the rubber; and an equal quantity of the vitreous *electricity* is returned from this ſide to the other; ſo that all the vitreous *electricity* is conveyed to one of the ſides, and all the reſinous to the other. In this ſtate they mutually attract each other through the ſubſtance of the intervening glaſs, are thus prevented from being drawn away by any force that can be applied to them ſeparately, and ruſh to one another by means of proper conductors. For a farther account of the explication of ſome of the principal phenomena of *electricity* by this theory, we ſhall refer the reader to Dr. Prieſtley's Hiſtory, vol. ii. § 3. who, with a philoſophical liberality, has ſtated it in its full force, though he adopts the other theory, which we ſhall now offer in as few words as the nature and importance of it will allow. This is commonly diſtinguiſhed under the denomination of *poſitive and negative electricity*, and was firſt ſuggeſted by Dr. Watſon, and digeſted, illuſtrated, and confirmed by Dr. Franklin; and has been ſince known by the appellation of the Franklinian hypotheſis. This theory ſuppoſes, that all the phenomena of *electricity* depend on one fluid, *ſui generis*, extremely ſubtile and elaſtic, diſperſed through the pores of all bodies, by which the particles of it are as ſtrongly attracted as they are repelled by one another. When bodies poſſeſs their natural ſhare of this fluid, or ſuch a quantity as they are capable of retaining by their own attraction, they are then ſaid to be in an unelectrified ſtate; but if the equilibrium is diſturbed, and they either acquire an additional quantity *from* other bodies, or loſe part of their natural ſhare by communication *to* other bodies, they exhibit electrical appearances. In the former caſe they are ſaid to be electrified poſitively, or *plus*; and in the latter, negatively, or *minus*. This electric fluid is ſuppoſed to move with great eaſe in thoſe bodies that are called CONDUCTORS, and with extreme difficulty and ſlowneſs in the pores of ELECTRICS; whence it comes to paſs, that all electrics are impermeable to it. Moreover, electrics are ſuppoſed to contain always an equal quantity of this fluid, ſo that there can be no over-charge or increaſe on one ſide without a proportionable decreaſe or loſs on the other, and *vice verſa*; and as the electric does not admit the paſſage of the fluid through its pores, there will be an accumulation on one ſide, and a correſponding deficiency on the other. See CHARGE. When both ſides are connected together by proper conductors, the equilibrium will be reſtored by the redundant fluid's ruſhing from the over-charged to the exhauſted ſurface. Thus alſo if an electric be rubbed by a conducting ſubſtance, the *electricity* is only conveyed from one to the other, the one giving what the other receives; and if one be electrified poſitively, the other will be electrified negatively, unleſs the loſs be ſupplied by other bodies connected with it, as in the caſe of the electric and inſulated rubber of a machine. The manner in which this effect is produced, has not yet been ſufficiently explained: S. Beccaria ſuppoſes, that the ſurface of the electric is enlarged by the action of the rubber, and rendered capable of receiving a greater quantity of the electric fluid from it, which additional *electricity* appears on the ſurface of the electric, when the rubber is withdrawn, and the capacity of the electric is again contracted.

This theory ſerves likewiſe to illuſtrate the other phenomena and operations in the ſcience of *electricity*. Thus, bodies differently electrified will naturally attract each other, till they mutually give and receive an equal quantity of the electric fluid, and the equilibrium is reſtored between them. Beccaria ſuppoſes, that this effect is produced by the electric matter making a vacuum in its paſſage, and the contiguous air afterwards collapſing, and thereby puſhing the bodies together. Bodies having the ſame kind of *electricity*, whether it be poſitive or negative, will repel each other; becauſe neither the augmentation nor diminution of the electric fluid on the ſurface of any body can take place, unleſs that ſurface be contiguous to an electric, which can acquire a contrary *electricity* at a ſmall diſtance; and therefore the augmented or diminiſhed quantity, in endeavouring to diffuſe itſelf over every part of the ſurface of electrified bodies, on account of the attraction ſubſiſting between the electric fluid and all the particles of matter, will make the bodies recede from each other, ſo that a quantity of air may be interpoſed between their ſurfaces, ſufficient to acquire a contrary *electricity* at a ſmall diſtance from them.

The influence of points in drawing or throwing off the electric fluid, depends on the leſs reſiſtance which it finds to enter or paſs off through fewer particles than through a greater number, whoſe reſiſtance is united in flat or round ſurfaces. The electric light is ſuppoſed to be part of the electric fluid, which appears when it is properly agitated; and the ſound of an exploſion is produced by vibrations, occaſioned by the air's being diſplaced by the electric fluid, and again ſuddenly collapſing.

As to the nature of the electric fluid, philoſophers have entertained very different ſentiments: ſome, and particularly Mr. Wilſon, have ſuppoſed, that it is the ſame with the ether of Sir Iſaac Newton, to which the phenomena of attraction and repulſion are aſcribed; whilſt the light, ſmell, and other ſenſible qualities of the electric fluid are referred to the groſſer particles of bodies, driven from them by the forcible action of this ether; and other appearances are explained by means of a ſubtile medium diffuſed over the ſurfaces of all bodies, and reſiſting the entrance and exit of the ether; which medium is ſuppoſed to be the ſame with the electric fluid, and to be more rare on the ſurfaces of conductors, and more denſe and reſiſting on thoſe of electrics: but Dr. Prieſtley has ſhewn, that though they may poſſeſs ſome common properties, they have others eſſentially diſtinct; the ether is repelled by all other matter, whereas the electric fluid is ſtrongly attracted by it. Others have had recourſe to the element of FIRE; and from the ſuppoſed identity of fire and the electric fluid, as well as from the ſimilarity of ſome of its effects, the latter has been commonly called the electric fire: but moſt electricians have ſuppoſed, that it is a fluid *ſui generis*. The honourable Mr. Cavendiſh has publiſhed an attempt to deduce and explain ſome of the principal phenomena of *electricity* in a mathematical, ſyſtematic manner from the nature of this fluid, conſidered as compoſed of particles which repel each other, and attract the particles of all other matter, with a force inverſely as ſome leſs power of the diſtance than the cube, whilſt the particles of all other matter repel each other, and attract thoſe of the electric fluid, according to the ſame law. Phil. Tranſ. vol. lxi. part ii. p. 584—677. A ſimilar hypotheſis and method of reaſoning have been alſo propoſed by Mr. Epinus, in his Tentamen Theoriæ Electricitatis & Magnetiſmi.

Dr. Prieſtley concludes, from experiments made with a view of determining the effects of the electrical exploſion on different kinds of air, that the electric matter either is or contains PHLOGISTON, ſince he found that both produced ſimilar effects. Mr. Henly alſo apprehends, that the electric fluid is a modification of that element, which, in its quieſcent ſtate, is called phlogiſton; in its firſt active ſtate, *electricity*; and when violently agitated, fire: and he has collected a variety of facts and obſervations, which ſeem to render this hypotheſis, at leaſt, probable. It uniformly appears, that bodies poſſeſſing an equal quantity of phlogiſton, or thoſe of the ſame kind, as glaſs or metal, acquire little or no *electricity* by friction; and as the difference in this reſpect is greater, ſo much the more *electricity* does the one body acquire from the other; and that thoſe bodies which poſſeſs a greater quantity of phlogiſton give the electric fluid to thoſe that have leſs of it, or acquire a negative *electricity* when rubbed with ſuch bodies; and that thoſe which have little phlogiſton acquire *electricity*, or are electrified poſitively, by the uſe of the ſame rubbers. Perhaps we may be allowed to enlarge our views, and conſider the ſun as the fountain of the electric fluid, and the zodiacal light, the tails of comets, the *Aurora borealis*, lightning, and artificial *electricity*, as its various and not very diſſimilar modifications. See on this ſubject, beſides Dr. Prieſtley's Hiſt. of *Electricity*, vol. ii. part iii. § 1, 2, 3. Wilſon's Eſſay towards an Explication of the Phenomena of *Electricity*, deduced from the Ether of Sir Iſaac Newton, p. 5. 1746. Wilſon and Hoadley's Obſ. &c. p. 55. 1759. Freke's Eſſay on the Cauſe of *Electricity* 1746. Prieſtley on Air, vol. i. p. 186. 274, &c. Phil. Tranſ. vol. lxvii. part i. p. 129, &c. and Mr. Eeles's Letters, on the ſame ſubject.

ELECTRICITY, *vindicating*, is a term introduced by Signior Beccaria, to expreſs a particular phenomenon in this ſcience: if two electrified electrics are joined together, they will be found to adhere, and their *electricities* diſappear; but as ſoon as they are ſeparated, they recover their *electricities*. Thus, in an experiment of Mr. Lane, firſt propoſed by Mr. Eeles, if two glaſs plates with plane ſurfaces be laid on one another, and their outward ſurfaces be coated with tin-foil, and they are then charged, they will adhere very firmly to each other; but if they are ſeparated, that plane, whoſe coating was preſented to the

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the prime conductor, in charging, will be positively electrified on both sides; and the other, whose coating was connected with the conductors, communicating with the earth, will be electrified negatively on both sides. If these plates be again laid together, and discharged, they will appear, when separated, to be electrified; but the first plate will be negative on both sides, and the second positive. And if they are separated after the discharge in the dark, flashes of light will be seen between their inward surfaces; and these flashes will appear for a considerable time, whenever they are laid together, their coating is touched, and they are again separated; but they will gradually diminish, and at last vanish. Mr. Henly observes, that crown glass will answer the purpose of this experiment as well as plate glass; and that Dutch plates, treated in the same manner, and kept a little time before they are separated, will have each a positive and negative surface, and that the *electricity* of each surface is reversed in the discharge. He adds, that if a clean, dry, uncoated plate of looking-glass be placed between the two first plates, it will appear, after charging, to be negatively electrified on both sides; but if it be placed between the Dutch plates, it acquires, like them, a positive *electricity* on one surface, and a negative *electricity* on the other. Beccaria's Artificial Electricity, part ii. § 6. Phil. Trans. vol. lxvi. part ii. p. 517, &c. Id. vol. lxvii. part i. p. 98, &c. See ELECTROPHORUS.

ELECTROMETER, formed of ηλεκτρον, and μετρω, *I measure*, is an instrument contrived for measuring the quantity, and determining the quality of electricity in any electrified body. Mr. Canton, previous to the invention of instruments of this kind, estimated the quantity of electricity in a charged phial, by presenting the phial with one hand to an insulated conductor, and giving it a spark, which he took off with the other; and he proceeded in this manner till the phial was discharged, and then determined the height of the charge by the number of sparks.

The most simple *electrometer* is a linen thread, called by Dr. Desaguliers the *thread of trial*; which, if brought near to an electrified body, will be attracted by it; but this will do little more than determine, whether the body is in any degree electrified or not; without determining with any precision its quantity, much less its quality. The abbé Nollet used two threads, and shewed the degrees of electricity by the angle of their divergency exhibited in their shadow on a board placed behind them.

Mr. Kinnersley's ELECTROMETER is already described under the article ELECTRICAL *Air-Thermometer*.

Mr. Canton's ELECTROMETER consisted of two balls of cork, or pith of elder, nicely turned in a lathe to about the size of a small pea, and suspended on fine linen threads, about six inches long, which may be wetted in a weak solution of salt. See *fig.* 26. *Tab.* IV. *Electricity.* These may be kept in small boxes, of the length of the strings, that they may lie in them without being bent; and they may be thus carried in the pocket, and will be ready for use. See *Pocket* ELECTROMETER.

If the box containing these balls be insulated, by placing it on a drinking glass, or any other electric substance, and an excited smooth glass tube be brought near them, they will first be attracted by it, and then repelled both from the glass, and from each other; but on the approach of excited wax, they will be attracted, gradually approach, and come together; and *vice versâ*. This apparatus will also serve to determine the electricity of the clouds and air, by holding them at a sufficient distance from buildings, trees, &c. for if the electricity of the clouds or air be positive, their mutual repulsion will increase by the approach of excited glass, or decrease by the approach of amber or sealing-wax; and if negative, their repulsion will be diminished by the approach of excited glass, and increased by amber or sealing-wax. See an account of Mr. Canton's curious experiments with this apparatus in the Phil. Trans. vol. xlviii. part i. and part ii.

If two balls of this kind are annexed to a prime conductor, as in *fig.* 17. *Tab.* II. *Electricity*, they will serve to determine the degree and quality of its electrification, by their mutual repulsion and divergency. *Electrometers* of this kind may be combined, as in *fig.* 27. *Tab.* IV. in which B represents a pillar of wax, glass, or baked wood resting on a wooden base A. From the top, project four arms of glass, or of baked wood, supporting four *electrometers*; two of which, D, D, are silken threads, about eight inches long, to each of which a small downy feather is annexed; the other two, C, C, are formed of a stick of glass, as *a b*, about six inches long, covered with sealing-wax, and terminated at the upper end by a ring; from the lower end are suspended two fine linen threads, *c c*, about five inches long, each of which bears a small cork or pith ball, about an eighth of an inch in diameter. The balls, in the figure, are represented in a state of electrification and repulsion; the glass stick, *a b*, serves for an insulating handle, by which it may be supported, whenever it is used, without the stand AB. Cavallo's Electr. p. 161.

ELECTROMETER, *the discharging*, represented in *fig.* 18. *Tab.* III. was invented by Mr. Lane. It consists of brass work, G, the lower part of which is inclosed in the pillar F, made of wood, baked, and boiled in linseed oil, and bored cylindrically about two-thirds of its length; the brass work is fixed to the pillar by the screw H, moveable in the groove I, so that it may be raised higher or lower, as the height of the jar D requires. Through the brass work is made to pass a steel screw, L, the distance of whose threads is about one twenty-fourth of an inch, to the end of which, and opposite to, K, a polished hemispherical piece of brass, fixed to the prime conductor, is fixed a well polished ball of brass, M. To this screw is annexed a circular plate, O, divided into twelve equal parts, and in every revolution of the screw, pointing to the divisions of the scale N; each of which divisions is equal to each turn of the screw. The use of this *electrometer* is to discharge a jar, D, or any battery connected with the prime conductor, without a discharging rod (see *Universal* DISCHARGER); and to give shocks successively of the same degree of strength; and on this account it is particularly adapted for medical purposes. Then, if a person holds a wire, fastened to the screw H in one hand, and another wire fixed to E, a loop of brass wire passing from the frame of the machine to a tin-plate, on which the phial D stands, he will perceive no shock, when K and M are in contact; and the degree of explosion, as well as the quantity of electricity accumulated in the phial, will be regulated by the distance of K and M from each other. Phil. Trans. vol. lvii. p. 451.

The surfaces of the balls, K and M, are very liable to lose their polish by the explosion, and in this case the instrument becomes unfit for use. But this is an inconvenience, to which the *quadrant* ELECTROMETER of Mr. Henly is not subject. This instrument consists of a stem C, (*fig.* 28. *Tab.* IV.) terminating at its lower end with a brass ferrule and screw D, by means of which it may be fixed to a hole in the prime conductor, or to a knob of a jar or battery, or to a stand, as occasion requires; and at its upper end in a ball E. B represents a graduated semicircle of ivory, on the center of which the index A, being an exceeding light rod, with a cork ball at its extremity, reaching to the brass ferrule of the stem, is made to turn on a pin in the brass piece E, so as to keep near the graduated limb of the semicircle. The stem and index are box, well rounded, and made smooth with emery paper. When the *electrometer* is not electrified, the index hangs parallel to the stem C; but as soon as it begins to be electrified, the index, repelled by the stem, will begin to move along the graduated edge of the semicircle (see E, *fig.* 4. *Tab. Electricity*), and mark, with the utmost exactness, the degree in which the prime conductor, &c. is electrified, or the height to which the charge of any jar or battery is advanced. This instrument, being made of materials that are very imperfect conductors, will not dissipate the electricity which it receives. Phil. Trans. vol. lxii. p. 359, &c.

Mr. Henly hath also very much improved Mr. Lane's *electrometer*, by taking away the screw, the double milled nut, and the sharp-edged graduated plate. His improved discharger is made as follows: a spring tube is supported by a socket of brass, which slips upon a supporter of glass. Through the spring tube passes, in an horizontal direction, a thick rod, or tube, of metal, furnished with a ball at each end. Two or three inches, at one end of this tube, are divided into tenths of an inch; and when the instrument is to be used, the ball at one end of the rod is made to touch the end of the spring tube, in which the horizontal rod, or tube, moves, and the ball at the other end of the same rod, or tube, at the same time, touches the prime conductor. The rod being then drawn back to any given distance, the end of the spring tube, through which it passes, cuts the divisions upon the rod, or tube, and shews to the one-tenth of an inch the distance the ball next the conductor has been separated from it, and consequently the length of the space of air through which the charge of electricity is to strike.

Mr. Henly's discharger of this kind has two tubes, one sliding within the other, in order to lengthen, and thus accommodate it to larger apparatus.

The following ELECTROMETER was contrived by Mr. Cavallo for observing the electricity of the atmosphere. It consists of a common jointed fishing-rod, AB, *fig.* 29. *Tab.* IV. without the last, or smallest joint. From the extremity of this rod proceeds a slender glass tube C, covered with sealing-wax, and having a cork D at its end,

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end, from which a pith-ball *electrometer* is ſuſpended. HGI is a piece of twine, faſtened to the other end of the rod, and ſupported at G by a ſmall ſtring FG. At the extremity of the twine I, a pin is faſtened, which, when puſhed into the cork D, renders the *electrometer* E uninſulated. In this ſtate the inſtrument, held by the end A, is projected upwards from an higher window into the air, ſo as to make an angle of about 50° or 60° with the horizon; and when it has been kept in this ſituation for a few ſeconds, the pin is diſengaged from the cork D, by pulling the twine at H, which then falls into the ſituation LK, leaving the *electrometer* inſulated and electrified with an electricity contrary to that of the atmoſphere. The inſtrument is withdrawn, and the quality of the electricity examined, without any obſtruction from wind or darkneſs.

The ſame ingenious electrician has contrived a *Rain*-ELECTROMETER, which is a ſtrong glaſs tube, ABCI, *fig.* 30. about two feet and a half long, with a tin funnel, DE, cemented to its extremity, and defending part of it from the rain. The tube is covered with ſealing-wax from A to B, and alſo under the funnel. FD is a piece of cane, round which ſeveral braſs wires are twiſted in different directions, ſo as to catch the rain, without reſiſting the wind; the cane is fixed into the tube, and a ſlender wire paſſes from it through the tube to the ſtrong wire AG, thruſt through a piece of cork at the end A of the tube; from a ring at G, at the end of this wire, a pith-ball *electrometer* is ſuſpended. The inſtrument is faſtened to the ſide of a window-frame, by ſtrong braſs hooks at CB, the part FC is out of the window, and the end F a little elevated above the horizon; the remaining part paſſes into the room through a hole in a glaſs of the ſaſh. This inſtrument is frequently electrified, when it rains, eſpecially by flying ſhowers; and the divergency of the *electrometer* ſhews the quantity and quality of the electricity it receives. Mr. Cavallo obſerves, that the rain is generally electrified negatively, and ſometimes to ſuch a degree, that he has been able to charge a ſmall coated phial at the wire AG.

Mr. Cavallo has alſo deſcribed a convenient *Pocket* ELECTROMETER. The caſe of this *electrometer* is a glaſs tube, *fig.* 31, and 32. *Tab.* IV. about three inches long, and three-tenths of an inch in diameter, half of which is covered with ſealing-wax; to the uncovered end a loop of ſilk is fixed, which ſerves for occaſionally ſuſpending the *electrometer*; and to the other extremity a cork is adapted, which, by tapering at both ends, may be made to fit the tube with either extremity. From one end of the cork two linen threads proceed, ſomewhat ſhorter than the glaſs tube, and bearing little cones of pith of elder. When the inſtrument is uſed, the cork is inſerted in the tube, ſo that the cones of pith may hang outward, as in *fig.* 31. When it is carried in the pocket, the cork ſtops it, and the cones hang freely within the tube, as in *fig.* 32. This *electrometer* may be kept in a caſe, like a common tooth-pick caſe, *fig.* 33. cloſed at one end, A, with a piece of amber, which will ſerve to electrify the inſtrument negatively; and at the other end with a piece of ivory, faſtened to a piece of amber BC; the amber inſulates the ivory, which, in this inſulated ſtate, by being rubbed againſt woollen cloths, acquires a poſitive electricity, and will ſerve to electrify the *electrometer* poſitively. Phil. Tranſ. vol. lxvii. part i. p. 48, &c. part ii. p. 399. or Cavallo's Electr. p. 370, &c.

Mr. Cavallo has invented a third *electrometer*, perfectly incloſed in a phial, which is a very curious invention, and very ſenſible in its operation.

ELECTROPHORUS, derived from ηλεκτρον, and φερω, *I bear*, is an inſtrument, or machine, invented by M. Volta of Como, near Milan, in Italy, for exhibiting perpetual electricity. This machine conſiſts of two plates (ſee *fig.* 34.) one of which, B, is a circular plate of glaſs, covered on one ſide with ſome reſinous electric, as beeswax and reſin, or equal parts of reſin, ſhell-lac, and ſulphur, and the other, A, is a plate of braſs, or a circular board, coated with tin-foil, and furniſhed with a glaſs handle I, which may be ſcrewed into its center by means of a braſs or wooden ſocket. If the plate B be excited by rubbing it with new white flannel, and the plate A be applied to its coated ſide, a finger, or any other conductor, will receive a ſpark on touching this plate; and if the plate A be then ſeparated, by means of the handle I, it will be found ſtrongly electrified with an electricity, contrary to that of the plate B. By replacing the plate A, touching it with the finger, and ſeparating it again, it will be found electrified as before, and give a ſpark to any conductor, attended with a ſnapping noiſe; and by this means a coated phial may be charged. The ſame phenomena may be repeatedly exhibited, without any renewed excitation of the electric plate B. The electric power of B has continued for ſeveral days, and even weeks, after excitation, though there is no reaſon for imagining that it is perpetual. Mr. Cavallo prepares this machine, by coating the glaſs-plate with ſealing-wax; and with a plate of this kind, no more than ſix inches in diameter, once excited, he has given a charge to a coated phial, which was ſufficient to pierce a card; the other plate, ſeparated from it, has emitted ſtrong flaſhes to the table on which the electric plate reſted, and to the ſurrounding air; and the power has been ſo ſtrong, that the two plates have adhered together, and the coated glaſs has been ſuſtained by the upper plate. Inſtruments of this kind have been made with plates twelve or fifteen inches in diameter, which have afforded a ſucceſſion of ſparks at the diſtance of three inches or more, and ſome, five feet in diameter, have given ſtrong ſparks at the diſtance of more than twelve inches.

Mr. Adams, philoſophical inſtrument maker to his majeſty, prepares machines of this kind with plates formed from a compoſition of two parts of ſhell-lac, and one of Venice turpentine, without any glaſs plate.

The action of theſe plates depends on a principle diſcovered and illuſtrated by the experiments of Franklin, Canton, Wilcke, and Epinus, that an excited electric repels the electricity of another body, brought within its ſphere of action, and gives it a contrary electricity. Thus the plate A, touched by a conductor, whilſt in contact with the plate B, electrified negatively, will acquire an additional quantity of the electric fluid from the conductor; but if it were in contact with a plate electrified poſitively, it would part with its electricity to the conductor connected with it. See an account of ſeveral curious experiments made with this machine, by Mr. Henly, and Mr. Cavallo, and Dr. Ingenhouſz, in the Phil. Tranſ. vol. lxvi. part ii. p. 513. vol. lxvii. part i. p. 116, &c. and part ii. p. 389, &c. and vol. lxviii. part ii. 1027, and p. 1049. See *Vindicating* ELECTRICITY.

ELECTRUM is ſometimes uſed for AMBER.

ELECTRUM more frequently ſignifies a mixed metal, of great value among the ancients.

ELECTRUM *minerale* is a name given by ſome chemiſts to a metallic maſs formed of tin and copper, and martial regulus of antimony, to which gold is ſometimes added. The maſs is powdered, and detonated with nitre and charcoal, to a kind of *ſcoria*; then powdered whilſt hot, and digeſted in ſpirit of wine; whence a tincture of a red colour is obtained, which is eſteemed a deobſtruent.

ELECTUARY, in *Pharmacy*, a form of medicine, compoſed of powders, and other ingredients, incorporated with ſome conſerve, honey, or ſyrup; to be divided into doſes, like boluſes, when taken.

Voſſius obſerves, that all the remedies preſcribed for the ſick, as well as the confections taken by way of regale, were called by the Greeks εκλειγματα, and εκλεικτα, of the verb λειχω, *I lick*; whence, ſays he, was formed the Latin *electarium*, and afterwards *electuarium*. This conjecture he ſupports from the laws of Sicily, where it is ordained, that *electuaries*, ſyrups, and other remedies, be prepared after the legal manner. The Bollandiſts, who relate this etymology, ſeem to confirm it. Act. Sanct. Mart. tom. ii. p. 131.

Electuaries are either ſoft, or ſolid; and of each kind, ſome are alterative, others corroborative, others purgative, &c. The *ſoft* are of the conſiſtence of honey, and may conſiſt of three ounces of powder to a pound of honey, or conſerve, and ſyrup.

The purgatives are uſually of the ſoft kind; but the corroborative only admit of 1, or 1½ ounce of powders, to five or ſix ounces of conſerve, with a proper quantity of ſyrup.

Among the ſoft *electuaries* of the ſhops, are reckoned lenitive *electuary*, Venice treacle, mithridate, the confection of hamech, that of alkermes, the catholicon, diaprunum, diaphœnicum, Galen's hiera picra, &c. which ſee explained under their reſpective articles.

Among the ſolid *electuaries*, are reckoned thoſe of carthamum, roſe juice, violet juice, &c. M. Lemery reckons up about a hundred and twenty ſorts of *electuaries*, and beſide theſe there is an infinite variety in extemporaneous preſcriptions.

To make *electuaries* in perfection, where a ſyrup is the baſis of the compoſition, as in the *electuary* of ſaſſafras, and the like, the ſyrup ſhould be prepared in a cloſe veſſel, that none of the virtues of the ingredients may be loſt; the powders, to be afterwards added to this, ſhould be freſh, and very finely ſifted; the gums, when there are any in the compoſition, ſhould be well cleanſed, and diſſolved in their proper menſtruums; and the whole muſt be reduced to a ſmooth maſs, of ſuch a conſiſtence, as will neither be ſubject to candy nor ferment.

Where ſyrups are uſed only to bring *electuaries* into form,

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care muſt be taken that they are not boiled too high; for that will ſubject them to candy in the *electuary*, and ſpoil the whole, as the being too low boiled, or thin, will leave them ſubject to ferment in hot weather, and afterwards grow ſour, ſo as to change, invert, or deſtroy the nature of the medicine.

Electuaries made of the pulp of fruits, are leſs diſpoſed to keep than others, on account of the great tendency theſe ſubjects have to ferment and putrefy. Hence a lenitive *electuary* can never keep long, eſpecially if made too thin.

Juſt the contrary of this is the caſe, however, with the capital *electuaries*, as Venice treacle, mithridate, and the like; for theſe require to be ſome time made, that the ingredients may digeſt or ripen, as it were, and grow mellow together, as the gums and ſpices that are in that compoſition keep it from any decay, provided the honey doth not candy, which ſome prevent by uſing it unclarified; and if theſe *electuaries* prove too dry, they are to be moiſtened with Canary wine, and thus they improve by keeping. This, however, is not the caſe with the diaſcordium, which loſes of its aſtringency as the ingredients become mellow together; and this is much better made up with ſugar of roſes, or ſyrup of diacodium, inſtead of honey. Shaw's Lectures, p. 209.

The way of powdering and ſifting the ingredients for *electuaries* is liable to loſe their finer and lighter parts, in form of a light duſt, and that of grinding them in a horſe-mill has the ſame inconvenience, with the additional one of a great quantity of ſtony matter mixing itſelf from the mill-ſtones with the powder. The beſt way would certainly be, by means of two iron rollers moving againſt one another in a cloſe box, as in the making of chocolate, and to grind together all the ingredients, with the honey and wine, and bringing all at once to a proper conſiſtence. Perhaps, indeed, a much better way than all, though a very troubleſome one, would be to get out the full virtues of all the ingredients ſeparately, in the form of extracts and eſſential oils, &c. and mix theſe with a proper quantity of honey, and, by this means, to concentrate the medicine, ſo that it might be given agreeably in very ſmall doſes.

ELECTUARY *e ſcammonio*, a new name given, in the London Pharmacopœia, to the compoſition commonly called *electuarium caryocoſtinum*. The compoſition is alſo ſo much altered, that inſtead of an ounce, a dram and a half is now a common doſe. The preſcription for it is this: take ſcammony, an ounce and a half; cloves and ginger, of each ſix drams; oil of carraway ſeeds, half a dram; honey, half a pound; mix all into an *electuary*. Pemberton's Lond. Diſp. p. 336.

ELECTUARY *for the Dyſentery, for the Epilepſy, for the Gonorrhœa, for the Piles, for the Palſy, for the Rheumatiſm.* See DYSENTERY, EPILEPSY, GONORRHOEA, HÆMORRHOIDS, PALSY, and RHEUMATISM.

ELEEMOSYNA *Carucarum*, or *pro Aratris*, or *Aratri*, in our *Ancient Cuſtoms*, a penny which king Ethelred ordered to be paid for every plough in England, towards the ſupport of the poor. Sometimes it is alſo called *eleemoſyna regis*, becauſe firſt appointed by the king.

ELEEMOSYNÆ is alſo uſed for the poſſeſſions belonging to churches. See ALMS, and FRANK *Almoign*.

ELEEMOSYNARIA. See AMBRY.

ELEEMOSYNARIUS, in our *Old Writers*, is uſed for the almoner, or peculiar officer who received the eleemoſynary rents and gifts, and diſtributed them to pious and charitable uſes. There was ſuch an officer in all religious houſes. The biſhops alſo uſed to have their almoners, as now the king has. Linn. Provinc. lib. i. tit. 12. See alſo Du-Cange, Gloſſ. Lat.

ELEEMOSYNARY *Corporations*. See CORPORATIONS.

ELEGANCE, ELEGANCY, from *eligo, I chuſe*, denotes a manner of doing, or ſaying things politely, agreeably, and with choice.

With choice, ſo as to riſe above the common manners; politely, ſo as to ſtrike people of delicate taſte; and agreeably, ſo as to diffuſe a reliſh which gratifies every body.

ELEGANCE, in *Oratory*, is one of the three parts of general ELOCUTION, and reſpects the purity and perſpicuity of the language. By the former a diſcourſe is rendered correct, and by the latter intelligible; and both extend to the ſelection of ſingle words, as well as to their conſtruction in ſentences. See PURITY, and PERSPICUITY.

Poetical *elegancies*, *elegantiæ poeticæ*, are of ſervice to ſcholars in making their verſes; by being too regular in the grammatical conſtruction, we loſe certain licences, wherein the *elegance* of language conſiſts. *Elegance*, though irregular, is better than regularity without *elegance*.

The *elegance* of a painting is not founded on the correctneſs of the deſign, as appears in Raphael, and the antique. It is moſt felt in works otherwiſe careleſs and inaccurate; as in Correggio, where, in ſpite of all the defects as to juſtneſs of deſign, there is an *elegance* even in the manner of the deſign itſelf, as well as in the turn of the attitudes, &c.

The *elegance* of a deſign is a manner which embelliſhes and heightens objects, either as to their form, or colour, or both; without deſtroying or perverting the truth.

ELEGIA, in *Botany*, a name given, by ſome authors, to the *arundo ſcriptoria*, or *writing reed*, common in Greece and Italy.

ELEGIAC, in the *Latin Poetry*, ſomething that belongs to *elegy*.

Elegiac verſes, Ελεγοι, are alternately hexameter, and pentameter.

Quintilian eſteems Tibullus the chief of the *elegiac* poets; but the younger Pliny gives the preference to Propertius. They have each of them reaſon on their ſide; and one might make a third choice, as juſt as either of them. See ELEGY.

ELEGIT, in *Law*, a judicial writ, given by the ſtatute Weſtm. 2. 13 Edw. I. cap. 18. which lies for him who has recovered debt or damages, or upon a recognizance in any court, againſt one not able in his goods to ſatisfy; and directed to the ſheriff, commanding him to make delivery of half the party's lands, and all his goods, oxen and beaſts for the plough excepted.

This writ ſhould be ſued out within a year and a day after the judgment.

The creditor ſhall hold the moiety of the ſaid land ſo delivered to him, till his whole debt and damages are ſatisfied; and during that time he is tenant by *elegit*. See TENANT.

ELEGY, Ελεγεια, a mournful, and plaintive kind of poem.

Voſſius, after Didymus, derives the term from ἐ, ἐ, λεγειν, *to ſay alas!*

The firſt inventor of the *elegy* is not known: ſome ſay it was one Theocles of Naxus, or, according to others, of Eretria, who, in the heat of his phrenſy, firſt produced this kind of compoſition. But there is no wonder that we are at this time in the dark as to the matter; Horace aſſures us it was a point not ſettled among the grammarians even in his time, who the author was.

Quis tamen exiguos elegos *emiſerit auctor,*
Grammatici certant, & adhuc ſub judice lis eſt.

The chief writers of *elegy* among the Greeks, are Callimachus, Parthenius, and Euphorion; and among the Latins, Ovid, Catullus, Tibullus, and Propertius.

The Flemiſh have diſtinguiſhed themſelves among the moderns for this kind of Latin verſe. The *elegies* of Bidermann, Grotius, and eſpecially Sedronius and Vallius, ſeem worthy of the pureſt antiquity. The counteſs de la Suze has diſtinguiſhed herſelf for *elegies* in the French tongue.

In the Engliſh, we have nothing conſiderable of the *elegiac* kind, but what we have in Milton. The Engliſh and French *elegies* are chiefly in Alexandrine verſes.

In proceſs of time, *elegy* degenerated from its original intention; and not only matters of grief, but alſo joy, wiſhes, prayers, expoſtulations, reproaches, and almoſt every ſubject, were admitted into *elegy*.

The office of *elegy* is well delivered by M. Boileau:

La plaintive elegie en long habits de deuil,
Scait, les cheveux epars, gemir ſur un cercueil:
Elle peint des aimans la joye, & la triſteſſe;
Flate, menace, irrite, oppaiſe une maîtreſſe.

In mourning weeds ſad *elegy* appears,
Her hair diſhevell'd, and her eyes in tears:
Her theme, the lover's joys, but more his pains;
By turns ſhe ſings, ſooths, threatens, and complains.

The diction of *elegy* ought to be clean, eaſy, perſpicuous, expreſſive of the manners, tender, and pathetic; not oppreſſed with ſentences, points, &c. No apoſtrophes are allowed; and the ſenſe ought to be generally cloſed in every diſtich, or two lines; at leaſt, in Latin compoſitions.

ELEMENTARY, ſomething that relates to the principles or *elements* of bodies.

The *elements* of a body are alſo called the *elementary principles* thereof. See PRINCIPLE.

The whole ſpace, included within the concave, or orbit of the moon, is called the *elementary region*, as being the ſeat, or ſphere, of the four vulgar *elements*, and the bodies compounded thereof.

The author of the Comte de Gabalis gives the name *elementary people* to a kind of beings who are ſuppoſed to inhabit the *elements*, and are only known by what they call the *philoſophers*, or *ſages*. According to theſe perſons, the *element* of *fire* is inhabited by ſalamanders; *water*, that is, the

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the ſea and rivers, by nymphs, or oridians; *earth* by gnomes and gnomides; and *air* by ſylphs and ſylphides.

ELEMENTARY *Air*, *Fire*, *Geometry*, *Muſic*. See the ſubſtantives.

ELEMENTS, in *Phyſics*, the firſt principles or ingredients of things, whereof all bodies are compounded; and into which they are all reſolvable.

Elements are conceived as the moſt ſimple, homogeneous parts, or corpuſcles; of an aſſemblage and mixture whereof, all the bodies we ſee, conſiſt.

Authors generally talk wildly, and inconſiſtently, of the *elements*, and confound them with the *principles* of things, yet there is great difference; and we find by experience, that all things cannot indifferently be made of all; that ſtone, for inſtance, and marble, are not convertible into fleſh, nor are fit to nouriſh or augment an animal body: it ſeems to follow, that all the variety of bodies could never ariſe from the firſt ſimple combination of the two principles, matter and form; but only ſome infinitely ſimple beings, or corpuſcles, which being variouſly intermixed, might conſtitute all other bodies. Now thoſe moſt ſimple of all beings, thus formed of the firſt determination and concretion of principles, are what the philoſophers properly call *elements*; ſo that *elements* and principles have this difference between them, that a principle, as matter, is a kind of incomplete nature; but an *element* is a perfect or complete one.

Hence it follows, that there muſt, of neceſſity, be more *elements* than one; ſince otherwiſe all things would be equally ſimple, and there would be no ſuch thing as a compound in nature. Moſt of the ancients, not aware of this, confound *element* with principle; by which means the *elements* are ſometimes repreſented as corruptible, and ſometimes as incorruptible. The retainers to incorruptible *elements*, mean preciſely by *element* what we mean by the firſt matter. In effect, their *elements* are their atoms, or corpuſcles, which are ſuppoſed indiviſible, incorruptible, &c.

Democritus is held to have been the firſt author of this tenet; which accordingly is adhered to by Epicurus, and many of their deſcendants, the Epicurean and corpuſcular philoſophers. Among thoſe who hold the *elements* corruptible, ſome will only have one, and ſome ſeveral. Of the former, the principal are Heraclitus, who held fire; Anaximenes, air; Thales Mileſius, water; and Heſiod, earth; as the only *element*. Heſiod is followed by Bernardin, Teleſius; and Thales, by many of the chemiſts.

Among thoſe who admit ſeveral corruptible *elements*, the principal are the Peripatetics; who, after their maſter Ariſtotle, contend for four *elements*; viz. fire, air, water, and earth. Ariſtotle took the notion from Hippocrates; Hippocrates from Pythagoras; and Pythagoras from Ocellus Lucanus, who ſeems to be the firſt author of the dogma.

The Carteſians only admit three *elements*; which they pretend are all that could ariſe from the firſt diviſion of matter. See CARTESIAN *Philoſophy*.

Our great Sir Iſaac Newton conſiders the primary *elements* of bodies on the atomical ſyſtem, thus, all things conſidered, it ſeems probable, that God in the beginning formed matter in ſolid, maſſive, hard, impenetrable, moveable particles of ſuch ſizes, and figures, and with ſuch other properties, and in ſuch proportion to ſpace, as moſt conduced to the end for which he formed them; and that theſe primitive particles, being ſolids, are incomparably harder than any porous bodies compounded of them; even ſo very hard as never to wear out; no ordinary power being able to divide what God made one in the firſt creation. While the particles remain entire, they may compoſe bodies of one and the ſame nature and texture in all ages; but ſhould they wear away, or break in pieces, the nature of things, depending on them, would be changed; water and earth, compoſed of old worn particles, and fragments of particles, would not be of the ſame nature and texture now, with water and earth compoſed of entire particles in the beginning. And, therefore, that things may be laſting, the changes of corporeal things are to be placed only in the various ſeparations, and new aſſociations and motions, of thoſe permanent particles; compound bodies being apt to break not in the midſt of ſolid particles, but where thoſe particles are laid together, and only touch in a few points. It ſeems to him likewiſe, that theſe particles have not only a *vis inertiæ*, with the paſſive laws of motion reſulting therefrom, but are alſo moved by certain active principles; ſuch as is gravity, and that which cauſes fermentation, and the coheſion of bodies. See COHESION, EARTH, FERMENTATION, GRAVITY, and PRINCIPLE.

ELEMENTS, in *Chemiſtry*, are the principles, or component parts, of natural bodies, into which they are reſolvable by fire, &c.

The effect of chemiſtry is, to analyſe or reſolve bodies into their *elements*.

The chemical *elements* are divided into *active* and *paſſive*.

The chemiſts are ſomewhat divided as to their *elements*. Some to the vulgar Peripatetic *elements*, water, which they call phlegm; and earth, which they call *caput mortuum*, add three more; viz. ſalt, ſulphur, and mercury. Salt they hold the principle of taſte; and ſulphur, of ſmell, and inflammability: as to mercury, which they alſo call ſpirit, ſome hold it the principle of colours, but others deny this; and, in effect, they agree in nothing, but that it is the moſt ſubtile and ſpirituous part.

Other chemiſts conſider fire, air, water, and earth, as the only proper *elements*, or ſimple bodies; alleging, that by the moſt complete and accurate analyſes which have been made, nothing has been ever ultimately produced but from one or more of theſe four ſubſtances, according to the nature of the decompoſed bodies; and that they really act as ſuch in all chemical operations. Macquer.

The *elements* of foſſils are, 1. Mercury, as the baſe. 2. Sulphur, as the coagulator, or binder. 3. Salt. 4. Earth. The *elements* of metals, are ſulphur and mercury alone; mercury as the baſe, or matter, and ſulphur as the binder, or cement. The *elements* of foſſil ſalts are an acid ſpirit, and inſipid earth. The *elements* of earths are an oil, a little acid ſalt, and a calx. The *elements* of ſulphurs are an acid ſpirit, an oil, and an earthy or metallic matter. Boerhaave.

But, after all, it muſt be added, that there is no aſſigning any preciſe number of chemical *elements*; ſome bodies yielding more, and others leſs. And even theſe very *elements* themſelves are reducible, by a farther proceſs, into other *elements*. Thus, by repeated diſtillations of wine, we ſucceſſively get a ſpirit of wine, a vapid water, a ſubacid water, a more acid water, oil, bitter yellow ſpirit, and a *caput mortuum*, which is reſoluble into earth, oil, &c. Now, are theſe ſo many ſeveral *elements*? Add, that what they account an *element*, now that it is ſeparated, is very different from what it was when it exiſted in the mixt; as appears hence, that upon remixing all the *elements* a body is reſolved into, the mixture will bear no reſemblance to the firſt body.

In effect, theſe *elements* ſeem rather to be produced by the fire, than ſeparated by it. Beſide, that they are convertible, or at leaſt reſolvable, into one another. Thus ſpirit of wine is found to yield an acid, an oil, and a water; and ſalts yield either an acid, or an alkali, with phlegm. What makes the notion of the chemical *elements* ſtill more precarious, is, that a pot-herb, and a poiſonous herb, ſhall ſometimes yield *elements* perfectly alike; more ſo, than the ſame plant analyſed at two different times. M. Homberg has conſidered the difficulties charged on *elements* with great attention.

The reſult of numerous experiments made to aſcertain the matter is, that the four principles, ſalt, oil, water, and earth, are always found in all plants, in what manner ſoever analyſed; that theſe principles are more or leſs volatile, or fixed, according to the different manners of analyſing; that this difference ariſes, not only from the different force of fire, but alſo from the fermentation of the mixed, preceding the analyſis; that a vehement fire, rendering different *elements* equally volatile, confounds them in the analyſis; that the fire evaporates, and abſolutely loſes ſeveral parts; and that to have the *elements* as pure as may be, only fermentation, and a gentle fire, muſt be uſed.

ELEMENTS is alſo uſed, figuratively, for the grounds and principles of arts and ſciences.

Thus we ſay, letters are the *elements* of ſpeech: he does not know the firſt *elements* of grammar.

The ELEMENTS of mathematics have been delivered by ſeveral authors in their courſes, ſyſtems, &c. The firſt work of this kind is that of Peter Herigon, in Latin and French, publiſhed in 1664, in ten tomes; wherein are contained the *elements* of Euclid, Euclid's Data, Apollonius Pergæus, &c. with the *elements* of arithmetic, algebra, trigonometry, architecture, geography, navigation, optics, ſpherics, aſtronomy, muſic, perſpective, &c. The work is remarkable for this, that throughout, a kind of real and univerſal characters are uſed; ſo that the demonſtrations may be underſtood by ſuch as only remember the characters, without any dependence on language or words at all.

Since Herigon, the *elements* of the ſeveral parts of mathematics have been laid down by others, particularly the Jeſuit Schottus, in his Curſus Mathematicus, in 1674. Sir Jonas Moor, in his New Syſtem of Mathematics, in 1681; De Chales, in 1674; Ozanam, in his Cours de Mathematique, in 1699; and, above all, Chriſt. Wolfius, in his Elementa Matheſeos Univerſæ, in two vols. 4to. the firſt publiſhed in 1713, and the ſecond in 1715; a work

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a work never enough to be commended. There has been another edition of this excellent work publiſhed at Geneva, in five volumes in quarto; the firſt volume in 1732, the ſecond in 1733, the third in 1735, the fourth in 1738, and the fifth in 1741.

The *Elements* of Euclid are the firſt and beſt ſyſtem of geometry. We have abundance of editions and comments on the fifteen books of Euclid's *Elements*. Orontius Fincus firſt publiſhed the firſt ſix books in 1530, with notes, to explain Euclid's ſenſe. The like did Peletarius in 1557. Nic. Tartaglia made a comment on all the fifteen books, about the ſame time, with the addition of ſome things of his own; and the like did Fran. Fluſſates Candalla, a noble Frenchman, in the year 1578, with conſiderable additions as to the compariſon and inſcriptions of ſolid bodies; which work was afterwards republiſhed, with a prolix comment, by Clavius, whoſe edition has ſince been reprinted, at various places and times.

Dr. Gregory publiſhed an edition of all Euclid's works, including his *Elements*, in Greek and Latin, in 1703, fol. But as the whole fifteen books do not ſeem neceſſary, eſpecially for young mathematicians, ſome authors have choſen only the firſt ſix, with the eleventh and twelfth at moſt. It would be endleſs to relate the ſeveral editions hereof; there is a French one of De Chales, and a Latin one of And. Tacquet; the beſt edition of the former of which is that of Paris in 1709, by Ozanam; and of the latter, that of Cambridge in 1703, by Mr. Whiſton.

Mr. T. Simpſon's *Elements* of Geometry is an excellent compendium of this kind; and Dr. Simpſon of Glaſgow publiſhed, in 1756, a Latin edition of the ſix firſt, and eleventh and twelfth books of Euclid, with notes.

ELEMENTS, in the *Higher Geometry*, are the infinitely ſmall parts, or differentials, of a right line, curve, ſurface, or ſolid. Thus, (*Tab. Analyſis, fig.* 18.) the ſmall ſpace PM*mp*, formed by the two ordinates PM, *p m* infinitely near each other, and the arc M*m* of the curve, is the *element* of the ſpace APM, P*p* is the *element* of the abſciſſe AP, M*m* that of the curve AM, &c. See DIFFERENTIAL, FLUXION, &c.

ELEMENTS, in *Aſtronomy*, are thoſe principles deduced from aſtronomical obſervations and calculations, and thoſe fundamental numbers, which are employed in the conſtruction of tables of the planetary motions. Thus, the *elements* of the theory of the ſun, or rather of the earth, are his mean motion and eccentricity, and the motion of the aphelia. The *elements* of the theory of the moon are its mean motion, that of its node and apogee, its eccentricity, the inclination of its orbit to the plane of the ecliptic, &c.

ELEMI, or ELEMY, in *Pharmacy*, a pellucid reſin, of a whitiſh colour, intermixed with yellowiſh particles, and often much of the colour and conſiſtence of wax; of a pretty briſk bitter, though not diſagreeable taſte; and a ſmell ſomewhat like that of fennel.

It is uſually called *gum elemi*, though very improperly, inaſmuch as it takes fire readily enough, and diſſolves in oleaginous liquors, which are the characters of a reſin, not a gum. It totally diſſolves in rectified ſpirit of wine; and in diſtillation with water, ſixteen ounces of gum yield one ounce of eſſential oil. It flows from inciſions made in the trunk and large branches of a large and tall tree, of the olive kind, growing in Ethiopia, and Arabia Felix. It is alſo found in Apulia, a province of the kingdom of Naples.

Pomet in his Hiſtory, and Lemery in his Dictionary of Drugs, deſcribe *elemi* as a white reſin, bordering on green, odoriferous, and brought from Ethiopia, in cakes of two or three pounds a-piece, and uſually wrapped up in the leaves of the Indian cane.

It is excellent in diſeaſes of the head; and is proper to digeſt, reſolve, and ſuppurate. It is held a kind of natural balſam; and is ſovereign in the cure of all ſorts of wounds.

One of the beſt officinal digeſtives, commonly called the ointment or liniment of Arcæus, conſiſts of ſix parts of the *elemi*, five or ſix of turpentine, and twelve of lard, or a mixture of lard and ſuet, melted together.

The true *gum elemi* is that above deſcribed; but there are ſeveral ſpurious ſorts, ſome natural, and others factitious, frequently ſold for it.

The factitious, or counterfeit, is uſually made of reſin waſhed in oil of aſpic; though the ill ſmell, and white colour of this, might eaſily diſcover the fraud. The natural gums, obtruded for *elemy*, are,

1. A gum brought from the American iſlands, in cags of different weights, covered up with the leaves of a plant unknown in Europe.

The ſecond might be taken for common reſin, but for its ſmell, which is ſomewhat ſweeter, and more aromatic.

The third is of an aſh colour, bordering on brown, brought over in large pieces, and very dry and friable.

Pomet does not take any of theſe for different genuine gums; but rather ſuppoſes them to be originally *elemy*, only impure, and coarſe, ſince melted down, and made up by the fire.

ELENCHUS, in *Antiquity*, a kind of ear-rings, ſet with large pearls.

ELENCHUS, Ελεγχος, in *Logic*, by the Latins called *argumentum*, and *inquiſitio*, is a vicious, or fallacious argument, which deceives under the appearance of a truth; the ſame with what is otherwiſe called *ſophiſm*.

ELEOCARPUS, in *Botany*. See ELÆOCARPUS.

ELEOSACCHARUM, rather ELÆOSACCHARON, Ελαιοσακχαρον, in *Pharmacy*, a mixture of ſugar with a diſtilled oil; in order to bring it to mix with ſome aqueous fluid for preſent uſe.

Grind an ounce of fine and dry loaf ſugar to an impalpable powder, in a glaſs mortar, with a glaſs peſtle; then add to it, by degrees, a dram of any eſſential oil, or half a dram, if the oil be very tenacious; continue rubbing them together till the oil be thoroughly mixed, and drank into the ſugar. The oil, in this operation, uſually diffuſes a fragrance to a great diſtance; wherefore, to prevent the loſs of its finer parts, the operation ſhould be performed as quick as poſſible, and the mortar covered, and the peſtel ſurrounded by a clean linen cloth; and if a little quantity of the white of an egg be added in the grinding, and mixed in with the ſugar and oil, the oil thus becomes more eaſily miſcible, but the mixture will not keep ſo long without growing rancid. Thus ſugar, which is a pure ſoap, or a true eſſential oily ſalt, divides the glutinous tenacity of the oil, interpoſes itſelf between the principles thereof, unites them cloſely with itſelf, and makes an extemporaneous ſoap, which may be commodiouſly diluted with water for medicinal uſes.

Though this mixture is not ſo perfect as an actual ſoap, or true eſſential ſalt, yet it ſuffices for uſe; nor is there reaſon to apprehend any inconvenience from the ſugar in this preparation; for ſugar is unjuſtly ſaid to be unwholſome, as there are no ſolid proofs extant of this; on the contrary, it is a wonderful ſalt that perfectly mixes with water, and ferments therewith into wine, and yet, what is ſurpriſing, it appears oleaginous and perfectly inflammable in the fire, whence it is known to conſiſt of oil and ſalt.

If theſe *eleoſaccharums* be carefully prepared, and put up in clean dry glaſſes, exactly cloſed with glaſs ſtoppers, they may be preſerved perfect a long time; and in this manner very effectual medicines may be eaſily carried from place to place, and, upon occaſion, directly uſed upon a journey, by mixing a ſmall quantity of them in a glaſs of wine. An *eleoſaccharum*, or mixture of the ſame nature, at leaſt, might be alſo made, by mixing an eſſential oil with a fixed alkaline ſalt, by grinding, by which means alſo a kind of ſoap is obtained; but alkalies, thus mixed, deſtroy the grateful properties of the eſſential oils, and change their natural taſtes and odours. Such mixtures alſo would preſently reſolve in the air, and thence be eaſily altered; but, by the method with ſugar, the phyſicians may always readily prepare a medicine rich in virtues. If the *eleoſaccharum* of mint, for inſtance, be diſſolved in mint water, then ſtrengthened with an addition of ſpirit of mint, and the mixture ſweetened with ſyrup of mint, the whole virtues of the plant will be thus obtained. Boerh. Chem. part ii. p. 100.

ELEOSELINUM, in *Botany*, a name by which ſome authors have called the paludapium or ſmallage. Ger. Emac. Ind. 2.

ELEPHANT, *Elephas*, in the Linnæan ſyſtem of *Zoology*, the name of a diſtinct genus of the *bruta*, in the claſs of *mammalia*. The characters which make the diſtinction of this genus, are, that the *elephant* has no *dentes inciſores*, or cutting-teeth, and that the *canine*, or dog-teeth, of the upper-jaw are very long; that it has a very long, flexible proboſcis, and almoſt naked body. The proboſcis is a long, cartilaginous trunk, formed of many rings, and terminated with a ſmall moveable hook. This trunk ſerves the animal inſtead of a hand, to convey any thing into the mouth, and to defend it from its enemies; the noſtrils are at the end of the proboſcis, which is the organ of feeling and of ſmell, both which ſenſes the *elephant* poſſeſſes in a very exquiſite degree. Beſides the proboſcis, the *elephant* has two large tuſhes projecting from the upper-jaw, and bending a little upwards. The largeſt of thoſe imported into England are ſeven feet long, and weigh a hundred and fifty-two pounds each. The eyes of this animal are ſmall; its ears large and pendulous; the back is arched; the lips are thick and clumſy; the neck ſhort; the feet are round and undivided, but terminated at their margins with five ſmall hoofs; the knees are flexible; it has two paps on the breaſt; the tail reſembles that of a hog, and the ſkin is very thick and callous, and, when dreſſed, impenetrable by

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by a muſket-ball, of a duſky colour, and has a few ſcattered hairs on it. The *elephant* is the largeſt of all land animals, and is ſaid to be twelve or even fifteen feet high. See *Tab. Quadrupeds, fig.* 2.

Elephants are found both in Aſia and Africa; but thoſe of Aſia are the largeſt, though they are much more numerous in Africa. They are ſaid to go a year with young, and to bring forth one at a time; they live, according to Tavernier, in his Voyages, a hundred and twenty or a hundred and thirty years, and are thirty years before they attain their full growth. The *elephant*, notwithſtanding its enormous ſize, is exceedingly ſwift; and ſo ſtrong, that, after being tamed, they have been employed to carry pieces of artillery, ſmall towers, with a number of people in them, and alſo vaſt loads. The Indians have from very early times employed them in their wars; Porus, as Quintius Curtius informs us, lib. viii. cap. 41. oppoſed the paſſage of Alexander over the Hydaſpes, with eighty-five of theſe animals; and M. de Buffon apprehends, that ſome of the *elephants* taken by that monarch, and afterwards tranſported into Greece, were employed by Pyrrhus againſt the Romans. The *elephant*, notwithſtanding its ſize and ſtrength, is the moſt docile and tractable of all animals. Naturaliſts relate many inſtances in which they have diſcovered a ſenſibility of benefits, a reſentment of injuries, a modeſty, and an ambition, of a very ſurpriſing degree.

The figure of an *elephant* is found on many of the ancient medals. Julius Cæſar, towards the end of the Roman republic, being prohibited from putting the figure of his own head on their coin, ſubſtituted that of the *elephant*; thus flattering his ambition by a very trivial circumſtance; as in the Punic language, *Cæſar* ſignified an *elephant*. The *elephant* was afterwards uſed as a ſymbol of ſovereign power, of eternity, and of piety towards the Deity.

ELEPHANTS, *taming of*. The method of taking and taming this creature, in the iſland of Ceylon, is as follows: the natives pitch upon a proper place for a warren, or park, which is broad at the entrance, and grows narrower farther in, till, at the end, it is ſo narrow, that an *elephant* cannot turn himſelf, and it runs on of this narrowneſs ſo far, that twenty *elephants* may ſtand in it one behind another. When the incloſure of this warren is finiſhed, all the people of the neighbouring places aſſemble, and make a circumference round the woods, where they know there are *elephants*, which takes in, perhaps, ſixty miles. The men now ſtand at twenty-five yards diſtance, and kindle fires between them, and make all the noiſe they can, by ſhouting, blowing horns, beating drums, and the like, and, by degrees, approach nearer and nearer the warren. The *elephants* run from the fires and noiſe, and conſequently can go no where but towards the warren; the men, who every where ſurround them, except on the warren ſide, follow upon them in this manner, till they come together, and make a ring, and the *elephants* are driven into the incloſure. When theſe creatures perceive that they are thus taken, they make reſiſtance, and often turn upon the men, but there are always near the warren fences of poles, lying flat upon the ground, which the hunters need only raiſe up, and they keep in the prey, ſo that they can neither eſcape, nor injure them; they then purſue the *elephants* with firebrands, and drive them into the narrow part where they cannot turn.

They are, from this place taken one by one, and led to the ſtable, each between two tame *elephants* bred for that purpoſe, the points of whoſe long teeth are cut; and theſe, if the wild *elephant* be troubleſome, will lay hold of his trunk with theirs, and beat him with their teeth. A man, ſitting upon each of the tame *elephants*, directs them by a ſtaff with a hook at the end, with which he occaſionally touches their heads, and orders them as he pleaſes, without bridle, or any other furniture. When they are brought into the ſtable, they are led between two poſts, with ſtakes put athwart before their breaſts, and under their bellies, and are ſo tied that they cannot ſtir, nor lie down upon the ground; for, if permitted to lie down, they would become ſorrowful, and refuſe to eat, and would die. They are here fed with the trunks of plantains, a food they much delight in, and when they have been kept thus about ſix weeks, they become tame enough for ſale. If not ſold at that time, they feed them about ſix weeks longer in the ſtable with cocoa leaves, and they are, at the end of that time, perfectly tame as a ſpaniel, and will eat graſs with the oxen in the fields. Phil. Tranſ. N° 277. § 1.

The *elephants* of Ceylon have been ſo long hunted, that they now know man for their mortal enemy, and ſeldom fail to ſeize upon and kill him wherever they meet him; but if a man lie upon the ground, and pretend to be dead, they never meddle with him. Several people have, in this iſland, lain aſleep while *elephants* paſſed by them; and ſome have only pretended ſleep, and a perfect ſtillneſs has always been found to preſerve them, even though the creature came up to examine them.

ELEPHANT, *Elephas*, gives the denomination to an ancient and honourable military order, conferred by the kings of Denmark on none but perſons of the higheſt quality, and extraordinary merit.

It is called the *order of the elephant*, from its badge, which is an *elephant*, with a caſtle on its back, ſet with diamonds, and hung on a watered ſky-coloured ribband, like the George in England.

There are different ſentiments as to the origin and inſtitution of this order; the firſt is that of Mennenius and Hoepingius, who attribute it to Chriſtian IV. who was elected king in 1584. The ſecond, that of Selden and Imhof, who derive it from Frederic II. elected in 1542. Gregorio Leti goes back as far as Frederic I. who reigned about the year 1530. Bernard Robolledus will have king John to be the author, who began to reign in 1478. Anſhelmius, Roſſærus, and Loeſcher, hold it to have had its riſe under Chriſtian I. father of Frederic I. Laſtly, Voigtius, Becman, and Bircherodius, maintain Canutus VI. to have been the firſt inſtitutor; and the occaſion thereof to have been the croiſades. This prince, according to the chronology of Swaning, reigned towards the cloſe of the twelfth century, from the year 1168, to 1191. This, at leaſt, we are certain of, that the order was ſubſiſting in the year 1494; there being a painting ſtill extant, done that year by count Reinden, a knight of this order. And we have even authentic evidences of the marquis of Mantua's being created knight of the ſame order by Chriſtian I. in 1474. There are bulls of pope Pius II. and Sextus IV. confirming the ſtatutes of the order, authorizing the holding of aſſemblies, or chapters, in the chapel of Roeſchild, and ſettling the privileges of the knights.

The order was at firſt called the *order of St. Mary*, *ordo S. Mariæ*; though it ſeems to have had the appellation of the *elephant* as early as Chriſtian I. witneſs the figure of an *elephant* ſo often ſtruck on his coins, medals, &c.

The manner of its inſtitution is thus related: king Canutus having ſent a fleet againſt the Saracens in 1189, which took Siluma and Ptolemais, a gentleman among the Daniſh croiſees killed an *elephant*; in memory of which extraordinary accident the order was erected. This account is rendered the more probable by this; that it is referred to an æra, when nothing was more common than to take the ſpoils of a vanquiſhed enemy for armories or cognizances; and accordingly, ſome of the principal arms of the like kind now on foot, e. gr. the lions of the Low-Countries, had their riſe at the time of the croiſades, as is ſhewn by Heuterius and Hoepingius; which circumſtances greatly corroborate the opinion of thoſe who aſcribe the order to king Canutus.

To the collar of the order hangs an *elephant*, with a ſilver turret on its back; and underneath the *elephant*, an image of the Holy Virgin, incircled with rays. See the abbot Juſtiniani, Hiſt. de tutti gl'Ord. Milit. e Caval. tom. ii. cap. 72.

The chapel of Roeſchild was founded by Chriſtian I. for the aſſemblies or chapters of this order to be held in. It was firſt called the *Chapel of the Three Kings*, *Capella Trium Regum*; afterwards Frederic I. gave it the name of the *Royal Chapel*.

The order was reſtored by Frederic II. who created abundance of knights at the ceremony of his coronation, which is the only time when the Daniſh kings made any knights of the *elephant*. Chriſtian V. augmented and enriched it very conſiderably. In the year 1694, a grand chapter of the order was held at Frederickſburg, in the chapel of the knights, wherein ſix German princes were admitted into the order.

We have a multitude of writings on the ſubject of this order, whereof that of Janus Bircherodius may ſerve for all the reſt; it is the lateſt, moſt ample, and learned. It was publiſhed at Copenhagen in 1705, under the title of Breviarum Equeſtre, ſeu de Illuſtriſſimo, & Inclytiſſimo Ordine Elephantino, &c.

ELEPHANT's *bones*. Many teeth and bones of animals have been found in a foſſile ſtate, both in Siberia, and on the banks of the Ohio, in North America. The French academicians, on comparing ſome of theſe with the bones of real *elephants*, determined, that they belonged to the ſame ſpecies of animal: but Dr. Hunter has diſcovered, on a more accurate examination, that they are very different from thoſe of the *elephant*, and belong to another animal. The tuſks of the true *elephant* have a ſlight lateral bend; but thoſe brought from America have a larger twiſt, or ſpiral curve, towards the ſmaller end: the grinders of the latter are made like

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thoſe of a carnivorous animal, being furniſhed with a double row of high and conic proceſſes, as if deſigned to maſticate, and not to grind its food; whereas, thoſe of the *elephant* are flat, and ribbed tranſverſely on their ſurface: beſides, the thigh bone is of a very diſproportionate thickneſs to that of the *elephant*, and has ſome other anatomical variations. And though the American tuſks, when cut and poliſhed by the workmen in ivory, did not differ in texture and appearance from the true ivory, Dr. Hunter concludes, that genuine ivory muſt be the production of two different animals, and not of the *elephant* alone; and that the animal to which theſe bones belonged may be the ſuppoſed *elephant* or mammouth of Siberia, and other parts of the world, which is yet unknown. Phil. Tranſ. vol. lviii. art. 5.

ELEPHANT's *foot*, in *Botany*. See ELEPHANTOPUS.

ELEPHANT's *head*, in *Botany*, a ſpecies of the *rhinanthus*. See LOUSEWORT.

ELEPHANT-*caterpillar*, a name given by ſome authors to a ſpecies of inſect, commonly known in Ireland by the name of *Connaught-worm*, and ſuppoſed to be poiſonous to cattle which feed on it. See *Connaught* WORM.

ELEPHANT's *noſe*, or *elephant's neuſe*, as it is called by the Dutch, is a ſpecies of the acus or needle-fiſh, caught in the Eaſt-Indies, ſo called from the reſemblance of its ſnout to the trunk of an *elephant*. It is a very ſingular ſpecies, the lower jaw running out into a very long and ſharp-pointed ſpine: it is round-bodied, and beautifully variegated with ſpots, and has on each ſide a green line running from head to tail. It is caught in ſalt-waters. Ray's Ichthyogr. app. p. 4.

ELEPHANT, *water*, ſee HIPPOPOTAMUS.

ELEPHANTIASIS, in *Medicine*, a kind of leproſy, called alſo *lepra Arabum*, in contradiſtinction to the *lepra Græcorum*, which is another diſeaſe.

The *elephantiaſis* is thus denominated, becauſe thoſe ſeized therewith have their arms and legs big ſwollen, and tumorous; the ſkin bloated, yet rough to the touch, and all wrinkled and rugoſe like the ſkin of an elephant.

The *elephantiaſis* is a diſeaſe unknown in our parts of the world, at leaſt in theſe days. Some authors call it *leontiaſis*, and others *ſatyriaſis*. The Greeks call it ελεφαντιασις, and ſometimes ελεφας, *elephant*; alſo ελεφαντια, and ελεφαντιασμος. The *elephantiaſis Græcorum*, or *lepra Arabum*, is deſcribed by Deodatus as a contagious diſeaſe, infecting the body with a variety of evils.

In the *lepra Arabum*, the ſkin is beſet with a dry ſcabby cruſt: as in the former caſe the ſalts, being left deſtitute of their humidity, are not ſo active, and therefore affect only the cuticle; in the latter caſe theſe ſalts, with their vehicle, crowding faſter than they can be evaporated through the pores of the ſkin (being ſtill *in fluore*, and ſo more cauſtic) corrode deeper, and eat not only the cuticle, but the excretory veſſels, and ſurface of the ſkin itſelf, which thereby exudes a liquor ſomewhat thicker than uſual; which, when the thinneſt and moſt aqueous parts are evaporated, are condenſed into that cruſt or ſcab, which is the diſtinguiſhing character of this diſeaſe.

Galen defines the *lepra*, an effuſion of thick diſorderly blood, that corrupts the whole habit of the body. Avicenna calls it an *univerſal cancer*.

The *lepra* always begins within-ſide, a long time before it appears without-ſide. It was frequent in Europe in the tenth and eleventh centuries, but ſeems at preſent almoſt extinct; unleſs we allow the venereal diſeaſe to be the ſame with the *lepra*, as was the opinion, among many others, of the learned Pitcairn; and has been lately endeavoured to be proved by Mr. Becket, in a diſcourſe expreſly on the ſubject, in the Philoſophical Tranſactions.

The ſymptoms of the ancient *lepra*, as laid down by Galen, Aretæûs, Pontanus, Ægineta, Cardan, Varanda, Gordon, Pharæus, and others, are as follow: the patient's voice is hoarſe, and comes rather through the noſe than the mouth; the blood is full of little white ſhining bodies, like grains of millet, which, upon filtration, ſeparate themſelves from it; the ſerum is ſcabious, and deſtitute of its natural humidity, inſomuch, that ſalt applied to it does not diſſolve; it is ſo dry, that vinegar poured on it boils; and is ſo ſtrongly bound together, by little imperceptible threads, that calcined lead thrown into it ſwims. The face reſembles a coal half extinct, unctuous, ſhining, and bloated, with frequent hard knobs, green at bottom, and white at top. The hair is ſhort, ſtiff, and brinded, and not to be torn off without bringing away ſome of the rotten fleſh to which it adheres: if it grows again, either on the head or chin, it is always white. Athwart the forehead run large wrinkles or furrows, from one temple to the other; the eyes are red, and inflamed, and ſhine like thoſe of a cat; the ears ſwollen, and red, eaten with ulcers towards the bottom, and encompaſſed with little glands; the noſe ſunk, becauſe of the rotting of the cartilage; the tongue dry, and black, ſwollen, ulcerated, divided with furrows, and ſpotted with grains of white; the ſkin covered with ulcers, that die and revive on each other, or with white ſpots or ſcales, like a fiſh; it is rough, and inſenſible, and when cut, inſtead of blood, yields a ſanious liquor. It arrives in time to ſuch a degree of inſenſibility, that the wriſt, feet, or even the large tendon, may be pierced with a needle, without the patient's feeling any pain. At laſt the noſe, fingers, toes, and even privy members, fall off entire; and by a death peculiar to each of them, anticipate that of the patient. It is added, that the body is ſo hot, that a freſh apple held in the hand for an hour, will be dried and wrinkled as if expoſed to the ſun for a week.

Matthew Prior ſays, that in Chriſtendom there were fifteen thouſand hoſpitals for lepers; but the diſeaſe having been diſcontinued for two hundred years, the revenues of thoſe hoſpitals were abuſed, and perſons feigned themſelves lepers, to be entitled to the proviſion, which occaſioned their regulation in ſome countries, and their entire ſuppreſſion in others.

In France, they were united to the order of the religious of St. Lazarus and Mount Carmel in 1664, and the adminiſtration of them given to the knights of that order. See LAZARUS. In England they have been converted to other purpoſes.

Formerly the cauſes of lepers were committed to the eccleſiaſtical tribunals; and it was prohibited to proſecute a leper before a lay-judge, in regard they were under the protection of the church, which ſeparated them from the reſt of the people, by a ceremony ſtill to be ſeen in the ancient rituals.

As to the cure, that which proved effectual in thoſe ſouthern countries, is found to fail among us, where the ſtrongeſt medicaments, and the moſt powerful mercurials are neceſſary. Bathing is judged to be of good uſe in the *lepra*. Dogs and hares are ſaid to be ſubject to this diſeaſe. Among the Indians, a white man is deſpiſed, this paſſing with them for the mark of a leper.

The *elephantiaſis* of Madeira appears at firſt in the form of tubercles on any or all parts of the body; in time they ulcerate: if they happen on the beard or eye-brows, the hairs fall off, but not on the head. The legs ſwell, and are hard, white ſcales cover them, and fiſſures appear in different parts, though in ſome inſtances the legs are emaciated, and full of ulcers. Many other very diſagreeable ſymptoms are obſerved in different patients. None are obſerved to receive this diſorder from other by contact; but the children of the diſeaſed are generally ſubject to it. The bark, attended with a proper embrocation and bliſtering, have effected a cure of this diſorder, after mercurials and antimonials have failed. London Med. Tranſ. vol. i. p. 23, &c. See LEPROSY.

ELEPHANTINE, ſomething that relates to, or partakes of the qualities of elephants.

The term is chiefly applied to certain books of the ancient Romans, wherein were recorded the tranſactions of the emperors, and the proceedings, acts, &c. of the ſenate. This we learn from Pollio and Vopiſcus, in the Life of the Emperor Tacitus, where he obſerves, that in the ſixth preſs of the Ulpian library, was kept one of theſe *libri elephantini*; wherein, for a long courſe of time, were written down the decrees and edicts of the ſenate.

In ſome of theſe books, were regiſtered all the acts and proceedings of the ſenate, and the magiſtrates of Rome; in others, the proceedings and events in the provinces, the armies, &c. There were about thirty-five large volumes of them, as many as there were tribes. In them were likewiſe contained the births, and claſſes of the citizens, with the muſters, and all things belonging to the cenſus. They were renewed every five years with the cenſors, and were all anciently kept in the ærarium, or public treaſury, in the temple of Saturn.

Vigenere, and ſeveral others, believe theſe books to have been called *elephantine*, by reaſon of their enormous bulk: but Loiſel, on the ſeventeenth chapter of the eleventh book of Aulus Gellius, gives us a different etymology; and aſſures us, they were called *elephantine*, becauſe, compoſed of ivory leaves or tablets, which every body knows is a production of the elephant. See DIPTYCHA.

ELEPHANTOPUS, of ελεφας and πους, *foot*, *elephant's foot*, in *Botany*, a genus of the *ſyngeneſia polygamia ſegregata* claſs. Its characters are theſe: the flowers are collected in one common involucrum, each containing four or five florets, which are tubulous, and divided into five equal parts; they have five very ſhort hairy ſtamina: in the bottom is ſituated an oval germen, which afterwards becomes a ſingle compreſſed ſeed, crowned with briſtles, and ſitting on a naked placenta.

There

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There are two ſpecies, natives of the Eaſt and Weſt Indies.

ELEPHAS, ſee ELEPHANT.

ELETTARI, in the *Materia Medica*, a name uſed by ſome authors for the common ſmall cardamom of the ſhops.

ELEVATIO, in *Proſody*, the ſame as *arſis*. See ARSIS.

ELEVATION, the altitude or height of any thing. See ALTITUDE.

The word is formed from *elevare*, *to raiſe* or *lift up*.

ELEVATION *of a ſtar*, or other point, in the ſphere, is an arch of the vertical circle, intercepted between ſuch ſtar, or other point, and the horizon.

Hence, as the meridian is a vertical circle, a meridian altitude or *elevation*, i. e. the *elevation* of a point in the meridian, is an arch of the meridian, intercepted between that point and the horizon.

ELEVATION *of the pole*, denotes the altitude of the pole above the horizon of any place, or an arch of the meridian, intercepted between the pole and the horizon.

Thus, in *Tab. Aſtronomy, fig.* 4. AQ being ſuppoſed the equator, HR the horizon, HZPN the meridian, and P the pole; PR is the *elevation of the pole*.

In which ſenſe *elevation* ſtands oppoſed to *depreſſion* or depth. See DEPRESSION.

The *elevation of the pole* is always equal to the latitude of the place; that is, the arch of the meridian intercepted between the pole and the horizon, is always equal to the arch of the ſame meridian, intercepted between the equator and the zenith. Thus, the north pole is *elevated* 51° 32′ above the horizon of London; and there is the ſame diſtance, or number of degrees, between London and the equator; ſo that London is likewiſe in 51° 32′ of northern latitude.

To obſerve the *elevation of the pole* of any place, ſee POLE and LATITUDE.

ELEVATION *of the equator*, is an arch of the meridian, leſs than a quadrant, intercepted between the equator and the horizon of the place.

Thus AQ, as before repreſenting the equator, HR the horizon, P the pole, and HZPN the meridian; HA is the *elevation of the equator*. See EQUATOR.

The *elevations of the equator*, and of the pole, together, are always equal to a quadrant; conſequently, the greater the *elevation* of the pole, the leſs the *elevation of the equator*, and *vice verſa*.

Thus, in the figure juſt cited, PA is ſuppoſed by the conſtruction a quadrant; and HA+AP+PR a ſemicircle; conſequently, HA+PR is a quadrant.

ELEVATION *of the equator, to find the*. Find the *elevation* of the pole, after the manner hereafter directed, under the article POLE.

Subtract the *elevation* found from a quadrant, or 90°; what remains is the *elevation of the equator*. Thus, the *elevation* of the pole 51° 32′, being ſubtracted from 90°, leaves the *elevation of the equator* 38° 28′.

ELEVATION, in *Architecture*, denotes a draught or deſcription of the principal face or ſide of a building, called alſo its *upright* or *orthography*. See ORTHOGRAPHY.

ELEVATION is alſo uſed in ſome writers of perſpective for the ſcenography, or perſpective repreſentation of the whole body or building. See SCENOGRAPHY.

ELEVATION, in the *Romiſh religion*, is applied to that part of the maſs wherein the prieſt hoiſts or raiſes the hoſt, with the cup above his head, for the people to adore it, after having firſt conſecrated and adored it himſelf.

The prieſt who officiates at maſs, rings a bell at the *elevation*, to appriſe the people to caſt their eyes upon their new-formed Saviour, and adore him.

St. Lewis decreed, that they ſhould fall on their knees at the *elevation*, in imitation of certain religious whom he does not name. The Chartreux, and the religious de la Trappe, ſtill obſerve this ceremony of proſtrating themſelves at the *elevation*.

ELEVATION, *angle of*, in *Mechanics*, is the angle ARB (*Tab.* III. *Mechanics, fig.* 47.) comprehended between the line of direction of a projectile AR, and the horizontal line AB. See PROJECTILE and ANGLE.

ELEVATION *of a cannon* or *mortar-piece*, is the angle which the chaſe of the piece, or the axis of the hollow cylinder, makes with the plane of the horizon.

ELEVATOR, ELEVATORIUM, in *Surgery*, an inſtrument uſed to raiſe up bones, as thoſe in fractures of the ſkull, when beaten or cruſhed in with blows, or the like.

There are dented *elevators*, and *elevators* with three feet, called *elevators triploides*. See *Tab.* III. *Surgery, fig.* 35. The feet A, A, A, of this inſtrument may be brought nearer or farther from each other, as occaſion requires. Theſe feet are applied to the ſound parts of the head, and the ſcrew BC is made to lay hold of the depreſſed part of the cranium, by turning round the handle DD, after a ſmall hole has been made in the middle of it with a ſharp awl; then, by turning the ſcrew EE, the TREPAN at B is raiſed by degrees, and with it the depreſſed part of the cranium. The method of doing this is repreſented in *fig.* 36. See TREPANNING. The *elevator* made lever-wiſe, is a new invention: its uſe is in drawing teeth. One extremity of it is flat, to reſt on the gum, at the bottom of the tooth; and the other hooked, like one of the branches of a pelican, to lay hold of the tooth.

ELEVATOR, in *Anatomy*, is a name common to ſeveral muſcles, which do the office of raiſing or lifting up the parts they belong to, of equal import with the ATTOLLENS and LEVATOR. Such are the

ELEVATOR *alæ naſi*, a muſcle, or pair of muſcles of the noſe, of a pyramidal figure, very narrow, though fleſhy at its origination, on the fourth bone of the upper jaw, and very broad and thin at its termination on the ſide of the ala naſi. Its action is to pull the ala upwards, and turn it outwards. See *Tab. Anat. (Myol.) fig.* 1. *lit.* o.

It is called by Winſlow the *tranſverſalis* or *inferior naris*, and by Albinus the *compreſſor naris*. Coſſerius has deſcribed it under the name of the *parvus naſi muſculus*, and Fallopius under that of *muſculus alius carneus naſi*, and Riolanus by that of *alius externus naſi*.

ELEVATOR *auris*, or *attollens auriculam*, is in reality no more than a part of the muſcle of the ſcalp, with ſome fleſh-fibres in it, as it deſcends over the temporal muſcles to the upper part of the concha. Its action is ſcarce viſible; the auricles being hardly perceived in men to have ordinarily any motion at all. See *Tab. Anat. (Myol.) fig.* 6. *n.* 3. *fig.* 1. *n.* 13.

ELEVATOR *humeri*, in *Anatomy*, a name given by ſome authors to a muſcle, now generally known under the name of the *deltoides*. See DELTOIDES.

ELEVATOR *labiorum communis*, a muſcle of the lips, ariſing from the fourth bone of the upper jaw, and terminating at the angle of the lips, under the zygomaticus. See *Tab. Anat. (Myol.) fig.* 1. *n.* 4.

ELEVATOR *labii inferioris*, is a muſcle that ariſes from the ſecond bone of the under jaw, below the inciſores. It deſcends, and paſſes under the zygomaticus, and is inſerted into the under lip.

This, aſſiſted by a ſmall, but ſtrong pair of muſcles, ariſing from the gum of the dentes inciſivi, and deſcending directly, is inſerted into the lower part of the ſkin of the chin, and ſerves to pull the ſkin of the chin upwards, and conſequently to thruſt up the lip.

ELEVATOR *labii ſuperioris*, ariſes from the upper part of the ſecond bone of the upper jaw, and deſcending obliquely, is inſerted into the upper lip, above the dentes inciſivi: it draws up the lip. See *Tab. Anat. (Myol.) fig.* 1. *n.* 3. and *n.* 5.

ELEVATOR *oculi*, one of the muſculi recti of the eye, ſerving to draw it upwards. See RECTUS and EYE.

ELEVE, a term purely French, though of late uſed alſo in our language. Literally it ſignifies a diſciple or ſcholar, bred up under any one, being formed from the Italian, *allievo*, *an apprentice* or *novice*.

It was firſt uſed by the French writers, in ſpeaking of painters; ſuch a painter was an *eleve* of Da Vinci, of Raphael, &c. From painting, it came to be applied to ſuch as ſtudied or learned any other art under a maſter. In the Royal Academy of Sciences, there were twenty *eleves*; and in that of inſcriptions, ten *eleves*. The *eleves* are to act in concert with the penſionaries. See ACADEMY.

The denomination *eleve*, however, has been ſince ſuppreſſed, and that of *adjoint* ſubſtituted in its room; becauſe every body did not know the ſenſe affixed to it by the academy: and now the penſionary academiſts have not, as formerly, each of them an *eleve*; but the *eleves* are become *adjoints*, or aſſociates of the academy.

ELEUSINIA, in *Antiquity*, the myſteries of the goddeſs Ceres, or the religious ceremonies performed to her honour; thus called from *Eleuſis*, a maritime town of the Athenians, wherein was a temple of that goddeſs, famous for the celebration of theſe myſteries.

Some writers call the city where the *Eleuſinia* was celebrated, *Eleuſinia* or *Eleuſis*: Harpocration confirms this orthography, in deriving its name from *Eleuſinus*, a ſon of Mercury; to which opinion Pauſanias likewiſe adheres, in his Attics. Others, who write it Ελευσις, *Advent*, ſuppoſe it thus called, becauſe Ceres, after running over the world in ſearch of her daughter, ſtopped here, and put an end to her purſuit. Diodorus Siculus, lib. v. will have the name *Eleuſis* to have been given this city, as a monument to poſterity, that corn, and the art of cultivating it, were brought from abroad into Attica.

The *Eleuſinia* were the moſt ſolemn and ſacred ceremonies in uſe among the Greeks; for which reaſon they were

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were called *myſteries*, by way of eminence. They are ſaid to have been inſtituted by Ceres herſelf, at *Eleuſis*, in memory of the zeal and affection wherewith the Athenians received her.

This is the account Iſocrates gives in his Panegyric; but Diodorus Siculus aſſures us, lib. vi. that the *Eleuſinia* were inſtituted by the Athenians, in gratitude to Ceres, for having inſtructed them to lead a leſs barbarous and ruſtic life: yet the ſame author, in the firſt book of his Bibliotheca, relates the thing in another manner.

A great drought, ſays he, having occaſioned a miſerable famine throughout all Greece: Egypt, which had that year reaped a moſt plentiful harveſt, beſtowed part of the fruits thereof upon the Athenians. It was Erechtheus that brought this extraordinary ſupply of corn; in commemoration of which benefaction, Erechtheus was created king of Athens, who inſtructed the Athenians in theſe myſteries, and the manner of celebrating them.

This account comes near to what we are told by Herodotus and Pauſanias, viz. that the Greeks acquired the knowlege of their gods and their religion from the Egyptians.

Theodoret, lib. i. Græcanic. Affect. writes that it was Orpheus, not Erechtheus, who made this eſtabliſhment, and who inſtituted for Ceres what the Egyptians practiſed for Iſis; which ſentiment is confirmed by the ſcholiaſt on the Alceſtis of Euripides.

Eleuſis, the city where theſe myſteries were celebrated, was ſo jealous of the glory thereof, that, when reduced to the laſt extremity by the Athenians, it would not ſurrender but on this condition, that the *Eleuſinia* ſhould not be taken away; though theſe were no religious ceremonies peculiar to the town, but were held common to all Greece.

The matter of theſe myſteries, as related by Arnobius, and Lactantius, was an imitation, or repreſentation, of what mythologiſts teach of Ceres. They laſted ſeveral days; during which, the people ran about with burning torches in their hands; ſacrificed abundance of victims, not only to Ceres, but alſo to Jupiter; made libations from two veſſels, one of them to the eaſt, and the other to the weſt; marched in pomp to *Eleuſis*, making pauſes from time to time, wherein they ſung hymns, and ſacrificed victims; and this they performed, not only in going to *Eleuſis*, but in returning back to Athens. For the reſt, they were obliged to keep it an inviolable ſecret; and the law condemned to death any one who ſhould dare divulge their myſteries. Tertullian, in his book againſt the Valentinians, relates, that the figure ſhewn in the *Eleuſinia*, and which was ſo expreſly prohibited to be made public, was that of a man's privy parts. Theodoret, Arnobius, and Clemens Alexandrinus, likewiſe make mention of it; but they ſay it was the figure of a woman's privities.

The day after the feaſt, the ſenate aſſembled at *Eleuſis*, apparently to examine whether every thing had been managed according to order.

There were two kinds of *Eleuſinia*, the *greater*, and the *leſs*; thoſe we have been hitherto ſpeaking of were the greater.

The *leſſer* were inſtituted in favour of Hercules; for that hero deſiring to be initiated into the former, and the Athenians not being able to gratify him therein, becauſe the law prohibited any ſtranger being admitted; being loth, however, to give him an abſolute denial, they inſtituted new *Eleuſinia*, in which he aſſiſted. The greater were held in the month Boedromion, which anſwered to our Auguſt; and the leſſer in the month Antheſterion, which happened in our January. People were only brought to partake of theſe ceremonies by degrees; at firſt, they were to be purified; then admitted to the leſſer *Eleuſinia*; and at laſt initiated in the greater. Thoſe, who were yet only at the leſſer, were called *myſtæ*; and thoſe admitted to the greater, *epoptæ*, or *ephori*, i. e. *inſpectors*. They were uſually to undergo a probation of five years, before they paſſed from the leſſer to the greater. Sometimes, indeed, they were contented with a ſingle year; immediately after which, they were admitted to the moſt ſecret religious parts of the ceremony. Meurſius has an expreſs treatiſe on the *Eleuſinia*, where moſt of theſe points are proved.

ELEUTHERIUS, Ελευθερος, in *Antiquity*, a Greek word, ſignifying *liberator*, or *deliverer*. It was uſed by the Greeks as a ſurname, or epithet of Jupiter, given him on occaſion of his having gained them the victory over Mardonius, general of the Perſians, and killed, as they ſay, 300,000 men of his army; and, by that means, delivered them from the danger they were in of being brought under the Perſian yoke.

The word is formed from ελευθερος, *free*.

There were alſo feaſts ſolemniſed on this occaſion, in honour of Jupiter *Eleutherius*, and called *Eleutheria*. They were held every five years, with races of armed chariots, &c. The ſcholiaſt on Pindar, Olymp. Od. 7. ſays they were celebrated at Platea, the place where the victory was obtained.

The Samians had another feſtival of this name, in honour of the god of Love; and ſlaves, when they obtained their liberty, were wont to keep a ſtated holyday in remembrance of the happy day on which they were made free. Potter, Archæol. Græc. lib. ii. cap. xx. tom. i. p. 388.

ELFS, or ELVÆ, called alſo *Fairies*, the name of deities honoured among the Saxons, with a kind of ſacrifice called *Alf-blot*.

ELFS-*arrows*, a name given by the people of ſome parts of Scotland to certain ſtone-weapons which they find, and which had been in uſe before tools and weapons of iron were uſed there. It is not only in Scotland that theſe are found, but in America, and many other places alſo. They are ſtyled by ſome *ceraunia*, and *thunder-bolts*, and are ſuppoſed to have fallen from the clouds in ſtorms of thunder; others, not leſs erroneouſly, ſuppoſe them to be natural foſſils; but their true origin is from the workmanſhip of man, out of common flints, and other ſtones. Woodward's Cat. Foſſ. ii. p. 52.

ELHANNE, in *Botany*, a name given by ſome authors to the liguſtrum Ægyptiacum, or eaſtern privet.

ELICA *poſhnam*, in *Natural Hiſtory*, a name given by the people of the Eaſt-Indies to a kind of red orpiment, found very frequently in that part of the world, and given internally, after calcination, in intermitting fevers.

ELICE, or HELICE, in *Botany*, a name by which the ancient Greek writers have ſometimes called the willow, though its more general name among them is *hea*. Heſychius gives many inſtances of the willow being called *helice*.

ELICHRYSUM, in *Botany*. See CUDWEED.

ELICIT, or ELICITE, in *Ethics*, is applied to an act of the will, immediately produced by, and of the will, and received within the ſame.

Such are willing, nilling, loving, hating, &c. Theſe acts are denominated *elicit*, becauſe, being before in the power of the will, they are now brought forth into act. But they are ſo far intrinſic, that ſome authors conſider them as the will itſelf; and deny they ought to be diſtinguiſhed from it, any more than light is to be diſtinguiſhed from the ſun.

ELIDRION, a word uſed by the early writers in *Medicine*, in ſeveral very different ſenſes; ſome uſing it as the name of maſtic, others of raphontic, and others of crude mercury. Some of the chemical writers have alſo made it expreſs a certain mixed metal, compoſed of three parts; one ſilver, another braſs, and the third gold.

ELIGENDO *Viridario*. See VIRIDARIO.

ELIGIBILITY, in the Romiſh *Canon Law*. A *bull of eligibility* is a bull granted by the pope, to certain perſons, to qualify them to be choſen, or inveſted with an office, or dignity, whereof they were before incapable, by reaſon of want of age, birth, or the like.

The word is formed of the Latin *eligere*, *to chooſe*; whence the word *eligibilitas*, &c.

In ſeveral churches in Germany, a perſon, who is not of the chapter, cannot be elected biſhop, without a bull of *eligibility*.

ELIGII *morbus*, a name given by ſome medical writers to a fiſtula.

ELIGMA, a name given by Nicolaus Myrepſius, and ſome other authors, to that form of medicine now called a *linctus*, or *lambative*.

ELIQUATION, in *Metallurgy*, is a ſeparation of the different parts of mixed bodies, by the different degrees of fire required to melt them. When the nature of ores, or of metallic mixtures is ſuch, that while one part of them melts in the fire, the other, more refractory and difficult of fuſion, remains ſtill ſolid; the firſt, when the maſs is placed in a mild fire, flows out of the interſtices of the other, and is thus ſeparated from it. The perfection of this operation requires a different fluidity of the parts that conſtitute the maſs. Lead, for inſtance, melts into one maſs with copper, by a ſtrong fire, whereas theſe metals cannot diſſolve each other in a moderate one; but if the maſs, compoſed of both theſe, thus blended together, is afterwards expoſed to a mild fire on an inclined plane, the lead alone melts, the copper becoming only brittle and ſpungy, and remaining in its ſolid form, even when the lead has run out of it. This ſeparation, however, is not ſo perfectly made, but that there ever remains ſome lead in the copper, and ſome ſmall part of the copper is alſo carried away with the lead; wherefore, it is neceſſary for this experiment, that the metals are not mixed in too minute proportions; for

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for if one thouſandth part only of lead were to be mixed with copper, or the ſame ſmall proportion of copper with the lead, the ſeparation, by *eliquation*, could not be effected.

It is generally neceſſary alſo, in order to make this operation ſucceed, to add ingredients that are capable either of deſtroying the force by which the different parts cohere together, or of procuring an eaſier flux of the metals; for the mixtures of the other metals will not be ſeparated like thoſe of copper and lead, without the admixture of other ſubſtances. For inſtance, gold, ſilver, and copper, melted together, and perfectly blended by that means with one another, remain in the ſame ſtate in any degree of fire: to make the *eliquation* of the gold and ſilver, therefore, out of ſuch a mixture, the ſame additions muſt be uſed as in the operation of *precipitation by fuſion*. Sulphur added, in this caſe, does indeed diſpoſe the copper to abandon the gold and ſilver; but if theſe two, as it moſt commonly happens, are mixed in a very ſmall quantity with a very large one of copper, then you cannot yet obtain the ſeparation of them; for beſide, that very ſmall quantities are no more to be ſeparated here than in the former inſtance of copper and lead, ſulphur renders the copper fluid by almoſt the ſame degree of fire by which the ſilver and gold are melted; a conſiderable quantity of lead muſt therefore be added in this caſe, that by the help of that addition, the gold and ſilver may be fuſed in a gentle fire, and the copper thus ſeparated from them.

Precipitations, by this method, and by fuſion, are both of infinite uſe in *Metallurgy*; for, by means of them, minute portions of gold and ſilver may, without any great expence, be ſeparated from a large maſs of other metals, which it has not hitherto been found poſſible to effect with advantage by any other method. Cramer, Art. Aſſ. 188.

ELIRE, ſee CONGE *d'elire*.

ELISION, in *Grammar*, the cutting off, or ſuppreſſing a vowel at the end of a word, for the ſake of ſound or meaſure.

Eliſions, excepting in poetry, are but little known in Engliſh; in Latin, French, &c. they are frequent, and conſiſt moſtly in ſuppreſſions of the final *a*, *e*, and *i*: as in *Phillida amo ante alias*. *Si ad vitulum ſpectes*, &c.

In writing, *eliſions* are often marked by an apoſtrophe; as *egon' quem quæram?* for *egone*. *Emin' ego te?* for *emine*. *Veniſtin'* for *veniſtine*, &c. *Cett' eſperance*, for *cette*; *l'homme*, for *le homme*.

In the pronunciation we make frequent *eliſions*, but do not mark them in writing: thus we write *riſque it*, but pronounce *riſq' it*. So the French pronounce *un' ame*, but write *une ame*. In effect, they never mark any *eliſions* but at the end of the monoſyllables *je*, *ne*, *le*, *te*, *ce*, *que*, and *la*. They never elide the *o*, nor *u*, nor *i*, but in the conjunction *ſi* before *il*; nor *a*, but in *la*.

In poetry, the ſyllable where there is a vowel elided, is never reckoned; and great care is taken to avoid the claſhing of ſyllables where there is no *eliſion*, this making what they call a *hiatus* or *chaſm*.

Some reduce the *ecthlipſis* under the head of *eliſions*; as in *monſtrum*, *horrendum*, *ingens*, &c. See ECTHLIPSIS.

ELIXATION, in *Pharmacy*, &c. the infuſing, ſeething, or boiling of any medicine in a proper liquor, gently, and for a conſiderable time; amounting to what, in the dreſſing of meat, we call *ſtewing*.

The word is formed from the Latin, *lixare*, *to boil*, or *boil in water*.

The liquor ordinarily uſed in *elixations*, is ſpring or river water; though on ſome occaſions they uſe ſpirit, milk, whey, beer, or the like.

The ordinary purpoſe of *elixation* is, to extract the virtue out of the medicine, and impart it to the liquor; though it is ſometimes alſo uſed to free the parts of animals, plants, &c. of their crudities, as well as to ſoften and make them tender; to take away from foods or medicaments any diſagreeable taſte, or other ill quality; to ſeparate the earthy, or groſſer parts; and for other intentions.

Decoction is alſo a ſort of *elixation*. See DECOCTION.

ELIXIR, in *Medicine*, a compound tincture, or eſſence, drawn from a mixture of ſeveral ingredients, by infuſing them in a proper menſtruum.

Menage derives the word from the Arabic, *eliçir*, properly ſignifying *fraction*, becauſe *elixirs* have the force of breaking diſeaſes: others, more naturally, derive it from the Arabic, *alecſiro*, an artificial extraction of ſome eſſence; others from the Greek, ελαιον, *oil*, and συρω, *I draw*, q. d. an extract of the oil, which is the eſſential part of mixts; others from the Greek verb, αλεξεω, *I help* or *aſſiſt*, becauſe of the great ſuccours we receive from *elixirs*.

An *elixir* is properly a ſtrong ſpirituous liquor or juice, to be taken inwardly, containing the pureſt, and moſt efficacious parts of ſeveral mixed bodies, communicated to it by infuſion and maceration.

Quincy defines it, a ſtrong infuſion in ſome menſtruum, whereby the ingredients themſelves are almoſt diſſolved, and a liquor thus acquired of a thicker conſiſtence than an ordinary tincture.

Boerhaave conſiders an *elixir* as a compound magiſtery, i. e. a compound of various bodies, changed after the ſame manner as a ſingle body in a magiſtery.

Spirits drawn from vegetables, i. e. the ſtrong or ſpirituous waters of vegetables are uſually the baſis of *elixirs*, and the menſtruum, or diſſolvent, whereby the eſſence of the other ingredients is drawn or ſeparated. Spirit of wine is the beſt and moſt commodious menſtruum of all.

Quacks abuſe the term *elixir*, and apply it to abundance of ſimple extracts, or tinctures, only to put them off at the higher price. Some authors, for *elixir*, uſe the word *quinteſſence*.

ELIXIR *aloes*, a name given in the late London diſpenſatory to the medicine commonly known by the name of *elixir proprietatis*, which is there alſo ordered to be made in the following manner: take tincture of myrrh a quart, powder of aloes, and fine ſaffron, of each three ounces; digeſt them a due time, and then preſs off the tincture, and filter it for uſe. Pemberton's London Diſp. p. 283.

ELIXIR *paregoricum*, a name given in the late London diſpenſatory to the *elixir aſthmaticum* of Quincey, which is there ordered to be made thus:

Take flower of benjamin, and ſtrained opium, of each a dram; camphire, two ſcruples; eſſential oil of aniſeeds, half a dram; rectified ſpirit of wine, a quart: digeſt all together a proper time, and then ſtrain off the ſpirit. This allays tickling coughs, relieves difficult breathing, and is uſeful in many diſorders of children, particularly in the hooping-cough. The doſe for an adult is from 50 to 100 drops. Pemberton's Lond. Diſp. 283.

ELIXIR, *ſacred*, is prepared by infuſing ten drams of rhubarb, cut ſmall; ſix drams of Soccotorine aloes, in powder; and half an ounce of leſſer cardamom ſeeds, in two pints of French brandy, for two or three days, and then ſtraining the liquid. This uſeful ſtomachic purge may be taken from one ounce to an ounce and a half. Buchan's Dom. Med. p. 746.

ELIXIR *ſalutis*. Take of ſena leaves, cleared of their ſtalks, four ounces; of guaiacum chips, of dried elecampane-root, of the ſeed of aniſe, caraway, coriander, and of liquorice-root, of each two ounces; of ſtoned raiſins, eight ounces; and ſteep theſe ingredients in four quarts of French brandy, cold, for four days; and then ſtrain out the ſpirit for uſe. Daffy's *elixir* is ſaid to be little more than this. James. See TINCTURA *Senæ*.

ELIXIR, *ſtomachic*, is prepared by boiling two ounces of gentian-root, one ounce of Curaſſoa oranges, and half an ounce of Virginia ſnake-root, and infuſing them for three or four days in two pints of French brandy, and then ſtraining out the *elixir*. This is an elegant ſtomachic bitter. A ſmall glaſs, twice a day, relieves in flatulencies, indigeſtion, want of appetite, and ſimilar complaints. A large doſe alſo relieves the gout in the ſtomach. Buchan.

ELIXIR *of vitriol.*, *acid*, is prepared by gradually mixing one pint of the *aromatic* TINCTURE with three ounces of oil of vitriol; and after the fæces have ſubſided, filtring the *elixir* through paper in a glaſs funnel. This is an excellent medicine for hyſteric and hypochondriac patients, afflicted with flatulencies, ariſing from a relaxation or debility of the ſtomach and inteſtines. It is to be taken on an empty ſtomach, twice or thrice a day, in a glaſs of wine or water, or of any bitter infuſion; and the doſe may be from 10 to 40 drops. Buchan.

ELIXIR *proprietatis*, is a remedy firſt invented by Paracelſus, compoſed of aloes, myrrh, and ſaffron; the tincture or eſſence whereof is drawn, by putting them to diſſolve or digeſt with ſpirit of ſulphur: ſome add ſpirit of wine to the ſpirit of ſulphur.

Crollius takes this *elixir* to be the balm or balſam of the ancients; adding, that it contains all the virtues of the natural balm. It comforts and fortifies the heart and ſtomach, purifies the blood, and promotes perſpiration.

ELIXIR, among the *Alchymiſts*, is uſed for the philoſophers ſtone, or the powder of projection; and ſometimes for an univerſal medicine, which will cure all diſeaſes, called, by way of excellence, the *grand elixir*.

Thoſe two things moſt alchymiſts take to coincide; ſo that what will make gold, they think, will cure all diſeaſes. See PHILOSOPHERS *ſtone*.

The notion of a *grand elixir* is of a long ſtanding.

ELIXIS, a name given by ſome of the *Old Writers* to that form of medicine now called a LINCTUS.

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ELK, in *Zoology*, a ſpecies of the *cervus* or STAG. The *alce*, or *elk*, is an animal ſo differently deſcribed by the ancients, that it is evident, they either knew very little of it, or elſe different writers have deſcribed different animals under this name. Pliny tells us, that the *elk* reſembles the horſe; but that it is diſtinguiſhed by the length of the neck, and largeneſs of its ears. Solinus ſays, that it reſembles the mule; and both authors add, that its upper lip is ſo large, that it cannot feed without moving backwards. Pliny, from report, affirms the ſame of the machlis, an animal of Scandinavia. Some have compared the *elk* to the goat, and others to the ſtag. Some ſay it was of a duſky yellowiſh colour; but Cæſar, in his Commentaries, repreſents it as variegated with ſpots. Pauſanias tells us, that it reſembled the ſtag kind, but was like the camel in the length of its neck. In the Linnæan ſyſtem, the *elk* is a ſpecies of the *cervus* or DEER, with horns, having ſhort beams ſpreading into large and broad palms; one ſide of which is plain, and the outmoſt furniſhed with ſeveral ſharp ſnags. It has no brow antlers: under the throat it has a ſmall excreſence.

The *elk* is a wild beaſt, found in the foreſts of Muſcovy, Sweden, and Pruſſia; but more abundantly in Canada, and moſt parts of North America.

It is about the ſize and figure of a mule, only its ſnout bigger, its tail ſhorter, its feet cloven; and that it bears a large ramage, or horn, like that of a deer. That anatomized, in the Royal Academy of Sciences, was five feet ſeven inches long. Its hair is brown, about the length of that of a goat; and being very elaſtic, is uſed for matreſſes; its ears nine inches long, and four broad; and its tail not above two inches; its neck ſhort and thick; its ſkin ſtrong and hard, though thin; ſo that, according to Linnæus, it will turn a muſket ball: its fleſh very delicate, eſpecially that of the female: the tongues, eſpecially, are much commended, and are often brought to us from Ruſſia; and the ligaments of its joints exceeding ſtrong, which has occaſioned ſome authors to ſay, that its legs had no joints at all; and that it was this made it ſo ready at ſliding on the ice, to ſave itſelf from the wolves. It neither runs, nor bounds, but its trot is almoſt equal to the ſwifteſt running of a deer. See *Tab.* II. *Quadrupeds*, No. 10.

The hunting of the *elk*, is one of the principal and moſt agreeable employments of the ſavages of Canada, Acadia, &c. They chooſe a time when the ſnow is on the ground, in which the beaſt is apt to ſink and ſtick. When they have killed enough with their fire-arms to feaſt for ſeveral days, they flay them, and ſend the ſkins to the manufacturers, who dreſs them in oil, like the buffalo-ſkin.

The ſavages likewiſe take care to cut off the left hind-foot of each beaſt, eſpecially if it be a female; the hoof of which foot is that applauded remedy for the falling-ſickneſs.

Ancient authors tell us, that to catch the *elk*, the northern people watch the occaſion when it falls down of the epilepſy, which it frequently does; and that they lay hold of it before it can recover ſtrength enough to put its left foot in its ear, which cures it immediately.

And hence it is, that the notion of its virtue in the cure of that diſeaſe had its riſe. The Germans call it *elend*, that is, *miſery*, becauſe of the miſery it is reduced to, in falling ſo often into the epilepſy, though it has its remedy always about it; which has given reaſon to ſuſpect, that the virtue attributed to it is fabulous.

Accordingly, Olaus Magnus ſays, it is the outer hoof of the right foot that the *elk* puts in its ear to cure the epilepſy; which being impoſſible, it ſhould ſeem as if Olaus only ſpoke of it by way of ſneer.

He adds, that the blows which the *elk* deals are ſo ſtrong, that with its hind-feet it will even break the trees; and with its fore-feet pierce the hunters through and through; though they are inoffenſive animals, unleſs they are wounded, or in the rutting ſeaſon.

Pomet gives us the marks to diſtinguiſh the genuine *elks claws*; but as their virtue is very equivocal, not to ſay imaginary, there is no great harm in being deceived.

ELK, in *Ornithology*, a name by which many have called the cygnus ferus, or wild ſwan. See SWAN.

ELKE, is mentioned in our *Statutes*, as a kind of yew to make bows of. 32 Hen. VIII. cap. 9.

ELL, *ulna*, a meaſure, which obtains, under different denominations, in moſt countries.

The *ell* is the ſtandard, or meaſure, whereby cloths, ſtuffs, linens, ſilks, &c. are uſually meaſured, or eſtimated, anſwering, in good meaſure, to the yard of England, the canna of Italy, the vara of Spain, the palm of Sicily, &c.

Servius will have the *ell* to be the ſpace contained between the two hands when ſtretched forth; but Suetonius makes it only the cubit.

The *ells*, which occur moſt frequently in England, are *Engliſh* and *Flemiſh*; the *ell Engliſh* contains three feet nine inches, or one yard one quarter Engliſh meaſure; the *ell Flemiſh* contains twenty-ſeven inches, or three quarters of a yard; ſo that the *ell* Engliſh is to the Flemiſh *ell*, as five to three.

M. Ricard, in his Treatiſe of Commerce, reduces the *ells* thus: an hundred *ells* of Amſterdam are equal to ninety-eight three quarters of Brabant, Antwerp, and Bruſſels; to fifty-eight and an half of England and France; to an hundred and twenty of Hamburgh, Francfort, Leipſic, and Cologne; an hundred and twenty-five of Breſlaw; an hundred and ten of Bergen and Drontheim; and an hundred and ſeventeen of Stockholm.

ELLIPOMACROSTYLA, in *Natural Hiſtory*, the name of a genus of cryſtals. The word is derived from the Greek, ἐλλιπὴς, *imperfect*, μακρὸς, *long*, and ϛυλος, *a column*, and expreſſes an imperfect cryſtal, with a long column. The perfect figure of cryſtal being a column terminated by a pyramid at each end; thoſe which want this character are eſteemed imperfect; and accordingly the bodies of this genus are defined to be imperfect cryſtals, with ſingle pyramids; one end of their column being affixed to ſome ſolid body, and compoſed of thin and ſlender hexangular columns, terminated by hexangular pyramids. Of this genus there are ſeveral ſpecies. See *Tab. of Foſſils*, *Claſs* 3.

ELLIPOPACHYSTYLA, in *Natural Hiſtory*, the name of a genus of cryſtal. The word is derived from the Greek, ἐλλιπὴς *imperfect*, παχὺς, *thick*, and ϛύλος, *a column*, and expreſſes a cryſtal of the imperfect kind, with a thick column. The bodies of this genus are cryſtals, compoſed of an hexangular column, conſiderably thick and ſhort, and affixed irregularly at one end to ſome ſolid body, and terminated at the other by an hexangular pyramid. Of this genus there are only two known ſpecies. See *Tab. of Foſſils*, *Claſs* 3.

ELLIPSIS, in *Geometry*, one of the conic ſections, popularly called an *oval*.

The word is formed from the Greek, ἔλλειψις, *deficiency*, a denomination which the ancient Greek geometricians gave this figure, becauſe, among other properties, this is one, that the ſquares of the ordinates are leſs than, or defective of, the rectangles under the parameters and abſciſſes.

The *ellipſis*, defined it from its form, is a regular continued curve line, including a ſpace that is longer than broad, wherein are two points equally diſtant from the two extremities of the length; from which, two right lines being drawn to any point, aſſumed at pleaſure in the *ellipſis*, their ſum is equal to the length of the *ellipſis*.

Thus, in the *ellipſis* AEBDM, &c. (*Tab. Conics*, *fig.* 21.) the lines F a and f a drawn from the two points F and f, equally diſtant from the two extremes A and B, are equal to AB.

Or, taking the *ellipſis*, as geometricians frequently do, for the ſpace contained or included within this curve line, it is defined a figure, contained under one ſingle oblong line, and having two unequal axes or diameters, AB and DE. The greater axis of the *ellipſis*, or the right line repreſenting the length of the *ellipſis* AB, or of the ſpace included by the *ellipſis*, is called the *tranſverſe axis* or *diameter*; and the leſſer axis, repreſenting the breadth of the *ellipſis* DE, the *conjugate* or *ſecond axis*. The two axes always biſect each other at right angles. See AXIS.

The two axes are the two greateſt diameters of the *ellipſis*; but there are an infinity of other different diameters. See DIAMETER, &c.

ELLIPSIS, *the centre of an*, is the point C, wherein the two axes interſect. See CENTER.

The two points F and f, in the greater axis, equally diſtant from the extremes thereof A and B, are called the *foci*, or *umbilici of the ellipſis*; from which two lines, drawn to the circumference of the *ellipſis*, as already obſerved, are equal to the greater axis. See FOCUS.

The *ellipſis*, conſidering it as a conic ſection, that is, as a curve, ariſing from the ſection of the cone, is beſt defined from its geneſis, or the manner of its production, thus: an *ellipſis* is a curve line, produced by cutting the right cone ABC (*fig.* 21. N° 2.) by a plane, paſſing through both its ſides, in ſuch manner, as that the axis of the ſection DE meets with the diameter of the baſe AB produced to F; or ſo that the cutting plane be not parallel to the baſe, in which caſe the ſection will produce a circle; or again, by cutting an oblique cone in any oblique direction, ſo that the cutting plane be not ſubcontrary to the baſe.

Or,

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Or, defining it from one of its known properties aſſumed, an *ellipſis* is a curve line, wherein the ſquare of the ſemi-ordinate PM is to the rectangle of the ſegments of the axis AP and PB, as the parameter is to the axis.

Thus, if AB=a, the parameter =b, PM=y, AP=x, then will b : a :: y^2 : a $x-x^2$; conſequently $ay^2=abx-bx^2$. See CONIC *ſection*.

Hence, 1. $y^2=bx-\frac{bx^2}{a}$, or $\overline{a\,x-xx}\times\frac{b}{a}$; that is, the ſquare of the ſemi-ordinate is equal to the rectangle of the parameter into the abſciſs, abating another rectangle of the ſame abſciſs into a fourth proportional to the axis, parameter, and abſciſs.

2. ELLIPSIS, *to find the axis, parameter, and ſemi-ordinate of an.* The parameter, abſciſs, and ſemi-ordinate, in an *ellipſis*, being given, the axis is found, by making 1. $b : y :: y : \frac{y^2}{b}$, then 2. $x-\frac{y^2}{b}\left(=\frac{bx-y^2}{b}=\frac{x^2}{a}\right) : x :: x : a$.

3. The axis AB, the abſciſs AP (*fig.* 22.) and the ſemi-ordinate PM, being given, the parameter AG is thus found: make AI=PM; and from A, through M, draw the right line AL. In I erect a perpendicular LI; then, ſince AP : PM :: AI : LI $=\frac{y^2}{x}$. Produce PM to O, till PO=LI$=\frac{y^2}{x}$; and from B, through O, draw the right line BG. In A erect a perpendicular GA, which will be a fourth proportional to PB, PO, or LI, and AB, and therefore $=\frac{a\,y^2}{a\,x-x^2}$: this will be the parameter required.

4. The axis AB, and the parameter AG, being given, we can aſſign every abſciſs, as BP, its ſemi-ordinate PN, by drawing a line GB to the parameter AG, which is perpendicular to the axis AB; then, erecting a perpendicular PN, make PL=PH. Laſtly, on AL deſcribe a ſemicircle.

To find the foci, conjugate axis, ratio of the ordinates, &c. of an *ellipſis*. From B to L (*fig.* 21.) ſet off half the parameter, then will CL$=\frac{1}{2}a-\frac{1}{2}b$. In the centre C erect a perpendicular CK, meeting the ſemicircle deſcribed on AL: thus will CK$=\surd(\frac{1}{4}a^2-\frac{1}{4}ab)$; therefore, making CF=CK, F will be the focus. The latter equation furniſhes us with this theorem.

If the axis AB be cut in the focus F, the rectangle under the ſegments of the axis AF, FB will be ſubquadruple of the rectangle under the parameter and the axis.

5. The parameter and axis AB given, the conjugate axis is eaſily found, as being a mean proportional between the axis and parameter: conſequently, the parameter is a third proportional to the greater and leſſer axis. Add, that the ſquare of half the conjugate axis is equal to the rectangle, under the diſtance of the focus from the vertex, and its complement to the axis or AF×FB (*fig.* 21.)

6. In an *ellipſis*, the ſquares of the ſemi-ordinates PM, pm, &c. are to each other, as the rectangles under the ſegments of the axis: hence, $CD^2 : PM^2 :: CB^2 : AP\times PB$; conſequently, $DC^2 : CB^2 :: PM^2 : AP\times PB$; that is, the ſquare of the leſs axis is to the ſquare of the greater, as the ſquare of the ſemi-ordinate to the rectangle under the ſegments of the axis.

7. The right line FD (*fig.* 24.) drawn from the focus F, to the extremity of the conjugate ſemi-axis, is equal to half the tranſverſe axis AC.

Hence, the conjugate axes being given, the foci are eaſily determined; for, biſecting the greater axis AB in C, from C erect a perpendicular CD equal to the conjugate ſemi-axis; then from D, with the interval CA, the foci F and f are determined.

8. To deſcribe an *ellipſis*. The ſum of two right lines FM, and f M, drawn from each focus of an *ellipſis*, F and f, to the ſame point of the periphery M, being equal to the greater axis AB; the conjugate axes of an *ellipſis* being given, the *ellipſis* is eaſily deſcribed: for, determining the foci F and f, as already directed, and fixing two nails therein, and about theſe nails tying a thread FMf, equal to the length of the greater axis AB, and the diſtance of the foci, the thread being ſtretched, and a ſtyle or pin applied to its extent, the duct or ſweep of the ſtyle or thread about the nails will deſcribe an *ellipſis*. See CONIC *ſection*.

9. The rectangle under the ſegments of the conjugate axis, is to the ſquare of its ſemi-ordinate, as the ſquare of the conjugate axis to the ſquare of the greater axis. Hence, the co-ordinates to the conjugate axis have the ſame relation as there is between the co-ordinates to the greater axis: conſequently, the parameter of the conjugate axis is a third proportional to the conjugate axis and the greater axis.

10. To determine the ſubtangent PT (*fig.* 25.) and ſubnormal PR in an *ellipſis*. As the firſt axis is to the parameter, ſo is the diſtance of the ſemi-ordinate from the centre to the SUBNORMAL.

11. The rectangle under the ſegments of the axis, is equal to the rectangle under the diſtance of the ſemi-ordinate from the centre into the SUBTANGENT.

12. As the diſtance of the ſemi-ordinate from the centre is to half of the axis, ſo is the abſciſs to the portion of the ſubtangent intercepted between the vertex of the *ellipſis* and the tangent.

13. The rectangle under the ſubtangent PT, into the abſciſs PC, is equal to the rectangle under the ſegments of the axis. Hence, the ſquare of the ſemi-axis AC is equal to the rectangle of CT, into PC.

14. The rectangle under the ſubtangent, and the diſtance of the ordinate from the centre, is equal to the difference of the ſquare of this diſtance, and the ſquare of the tranſverſe ſemi-axis.

15. In an *ellipſis*, the ſquare of the ſemi-ordinate to any diameter is to the ſquare of the conjugate ſemidiameter, as the rectangle under the ſegments of the diameter is to the ſquare of the diameter; conſequently, the relation of the ſemi-ordinates to the diameters is the ſame as to the axes; and the parameter of any diameter is a third proportional to that diameter and its conjugate. For other properties of the *ellipſe*, ſee CONIC *ſection*.

Infinite ellipſes are thoſe defined by the equation $a\,y^{m+n}=b\,x^m\times a-x^n$ which ſome call *elliptoides*, if m be greater than 1, or n greater than 1.

In reſpect of theſe curves, the *ellipſis* of the former kind is called the *Apollonian ellipſis*.

It has been long known, that if a parallelogram, circumſcribed about a given *ellipſe*, have its ſides parallel to the conjugate diameters, then will its area be of an invariable or given magnitude, and equal to the rectangle contained by the axes of the figure; but this is only a caſe of a more general propoſition: for if, upon any diameter produced without the *ellipſe*, you take two points, on each ſide of the centre, at equal diſtances from it, and four tangents be drawn from theſe points to the *ellipſe*, thoſe tangents will form a parallelogram, which is always of a given or invariable magnitude, when the *ellipſe* is given, if the ratio of thoſe diſtances to the diameter be given; and when the ratio of thoſe diſtances to the ſemi-diameter is that of the diagonal of a ſquare to the ſide (or of $\surd$ 2 to 1) the parallelogram will have its ſides parallel to the conjugate diameters. Phil. Tranſ. N°. 468. p. 326.

Triangles, trapezia, or polygons, of any kind, may be determined, which, circumſcribed about a given *ellipſe*, are always of a given magnitude. For

If, upon any diameter produced without the *ellipſe*, any number of points be taken on the ſame, or on different ſides of the centre, at diſtances from it, that are each in ſome given ratio to that diameter; and from theſe points tangents be drawn to the *ellipſe*, in any one certain order; the polygon, formed by theſe tangents, is always of a given magnitude in a given *ellipſe*, and is equal to a polygon deſcribed by a ſimilar conſtruction about a circle, the diameter of which is a mean proportional betwixt the tranſverſe and conjugate axis of the *ellipſe*.

The polygons inſcribed in the *ellipſe*, by joining the points of contact (thus formed) and the ſectors, bounded by the ſemi-diameters, drawn to theſe points, are alſo of given or determined magnitudes; and the parts of any tangent, intercepted betwixt theſe interſections of the other tangents with it, or betwixt theſe interſections and the point of contact, are always in the ſame ratio to each other in the ſame figure. See Maclaurin's Fluxions, vol. i. p. 8. who obſerves that there is an analogous property of the other conic ſections.

ELLIPSIS, *quadrature of the.* See QUADRATURE.

ELLIPSE, *rectification of the.* See RECTIFICATION.

ELLIPSIS, in *Grammar* and *Rhetoric*, is a verbal figure, or a figure of ſyntax, wherein ſomething is ſuppreſſed, or left out, in a diſcourſe, and ſuppoſed or underſtood; or, it is a defect or omiſſion of ſome part of a ſentence, which muſt be ſupplied in order to render the conſtruction complete. See on this ſubject the Port Royal Latin Grammar, vol. ii. p. 168, &c. See ZEUGMA.

This chiefly happens, when, being under the tranſport of a violent paſſion, a man is not at leiſure to ſpeak every thing out at length, the tongue being too ſlow to keep pace with the rapid motions of the mind: ſo that on theſe occaſions we only bring forth broken interrupted words and expreſſions, which repreſent the violence of a paſſion better than any conſiſtent diſcourſe.

F. Boſſu conſiders the *ellipſis* as a way of diſguiſing ſentences, by ſuppreſſing the word which ſhould make the particular application, and leaving the whole in a kind of ingenious ambiguity.

Thus,

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Thus, the Trojans, in Virgil, being reduced by Turnus to the laſt extremity, and ready to be deſtroyed, ſpy Æneas coming to aſſiſt them; upon which the poet ſays, *Spes addita ſuſcitat iras.* Which expreſſion ſignifies either, in particular, that the hope they conceive retrieves and augments their courage; or in general, that the hope of aſſiſtance at hand naturally raiſes courage, and gives people new ſtrength.

If the poet had added a word, and ſaid, *Ollis ſpes addita ſuſcitat iras,* the paſſage had been expreſsly reſtrained to the firſt ſenſe, and had ceaſed to be a ſentence, and commenced only the application of a ſentence: the ſuppreſſion of that word makes it a ſentence in form.

This, that excellent critic looks on as one of the fineſſes of the Latin tongue, wherein it had vaſtly the advantage of the modern tongues. Trait. du Poeme Epique, p. 466, &c.

ELLIPTIC, or ELLIPTICAL, ſomething that belongs to an *ellipſis.*

Kepler firſt maintained, that the orbits of the planets are not circular, but *elliptical*; which hypotheſis was afterwards adhered to by M. Bouillaud. Mr. Flamſteed, Sir Iſaac Newton, M. Caſſini, and others, of the later aſtronomers, have confirmed the ſame; ſo that this, which was once, by way of contempt, called the *elliptic hypotheſis,* is now the prevailing doctrine. Sir Iſaac Newton demonſtrates, that if any body revolve round another in an *elliptic* orbit, its centrifugal forces, or gravities, will be in a duplicate ratio; or, as the ſquares of its diſtances from the umbilicus, or focus.

Serlio, Hartman, &c. endeavour to demonſtrate, that the beſt form for arches, or vaults, is the *elliptical.* See ARCH. See alſo CATENARIA.

ELLIPTIC *ſpace,* is the area contained within the circumference, or curve of the *ellipſis.* See ELLIPSIS.

It is demonſtrated, 1. That the *elliptic ſpace* is to a circle deſcribed on the tranſverſe axis, as the conjugate diameter is to the tranſverſe axis.

2. That the *elliptic ſpace* is a mean proportional between two circles deſcribed on the tranſverſe and conjugate axes.

ELLIPTIC *Conoid,* is the ſame with the SPHEROID.

ELLIPTIC *Specula,* or *Mirrors.* See MIRROR.

ELLIPTIC *Winding-ſtairs.* See STAIRS.

ELLIPTIC *Wind-mill.* See WINDMILL.

ELLIPTIC *Compaſſes,* an inſtrument made uſually in braſs, for the drawing any ellipſis or oval, by one revolution of an index.

ELLIPTIC *Dial,* is an inſtrument uſually of braſs, with a joint to fold together, and the gnomon to fall flat, for the ſake of the pocket.

By it are found the meridian, hour of the day, riſing and ſetting of the ſun, &c. See DIAL.

ELLIPTOIDES, an infinite ellipſis, i. e. an ellipſis defined by the equation $a\,y^{m} + {}^{u} = b\,x^{m} \times a - x^{n}$, wherein $m > 1$ or $n > 1$. See ELLIPSIS.

Of this there are ſeveral kinds or degrees; as the cubical *elliptoid,* wherein $a\,y^{3} = b\,x^{2} \times a - x$. A biquadratic or ſurdeſolidal *elliptoid,* or that of the third order, wherein $a\,y^{4} = b\,x^{2} \times a - x^{2}$.

If any other ordinate be called v, and the correſpondent abſciſs z; there will be

$$a\,v^{m+n} = b\,z^{m} \times a - z^{n};$$

Conſequently,

$$a\,y^{m+n} : a\,v^{m+n} :: b\,x^{m} \times a - x^{n} : b\,z^{m} \times a - z^{n};$$

That is, $y^{m+n} : v^{m+n} :: x^{m} \times a - x^{n} : z^{m} \times a - z^{n}$.

ELLISIA, in *Botany,* a genus of the *pentandria monogynia* claſs. Its characters are theſe: the flower has a ſmall cylindrical empalement of one leaf, indented in five parts at the brim. It has one tubulous petal, whoſe brim is cut into five ſegments, which ſpread open; it has four ſtamina, two of which are longer than the other, and a roundiſh germen, which becomes a roundiſh berry, crowned by the empalement, encloſing eight nuts, which have two cells, with one angular ſeed in each. We have but one ſpecies of this genus, which grows naturally in the Weſt Indies.

ELLOTIA, Ελλωτια, among the Greeks, a feſtival in memory of Europa, Agenor's daughter; who was called Ελλωτις by the people of Crete.

ELLYCHNIOTOS, in the medical writings of the *Ancients,* the name of a ſort of tent uſed by the ſurgeons, and made of cotton or lint, rolled up into the form of the wick of a lamp or candle. See the next article.

ELLYCHNIUM, a name given, by the ancients, to that ſort of matter, whatever it was, which ſerved them in common uſe for the wicks of their lamps, and had, beſide this, its uſe in ſurgery. Galen expreſly directs the uſe of the ſofteſt *ellychnium,* ſuch as that of Tarſus, inſtead of ſponge, in chirurgical caſes. But we are far from being aſcertained, at preſent, of what this *ellychnium* of Tarſus was. The commentators have gueſſed differently as to the meaning of the word; and Cornarius ſuppoſes it to ſignify a ſort of ſpongy and light fungus, which, when properly wrought up, might be made to ſerve for the wicks of lamps, being very inflammable, as we well know many of the funguſes to be, particularly that ſort which the people of ſome countries call ſpunck, and uſe inſtead of tinder, to catch fire from the ſparks of flint and ſteel; and when in its natural lax ſtate, might, by its open ſpongy texture, be very well ſuited to imbibe any medicinal fluid, and retain it a long time, while applied to any diſeaſed part. Others have gueſſed it to be the xylon, or cotton of the ancients; but from Galen's propoſing it to be uſed inſtead of ſponge, it ſeems much more probable to have been what Cornarius ſuppoſes. Galen, lib. xiii. and xiv. Cornar. Comment. in 3. Κατ. τοπ.

ELM, *Ulmus,* in *Botany,* a genus of the *pentandria digynia* claſs. Its characters are theſe: the flower has a rough permanent empalement of one leaf, cut into five points, and coloured within; it has no petals, but five awl-ſhaped ſtamina, twice the length of the empalement, terminated by ſhort, erect ſummits, having four furrows, and an orbicular erect germen, ſupporting two ſtyles, which are reflexed, and crowned by hairy ſtigmas. The germen afterward turns to a roundiſh, compreſſed, bordered capſule, including one roundiſh, compreſſed ſeed. There are ſix ſpecies.

All the ſpecies of the *elm* may be propagated either by layers, or by ſuckers taken from the old roots; but as theſe are often taken up with very bad roots, and are therefore very ſubject to miſcarry, the method by layers is much the beſt, and is very eaſy to be practiſed, as a ſmall ſpace of ground would be ſufficient to furniſh nouriſhment for a number of ſtools, or roots for laying, which would annually yield a great number. The beſt ſoil for a nurſery of this kind, is a moderately light and dry hazel loam, and the beſt ſeaſon for laying the branches is autumn. When they have taken root, they ſhould be removed from the old plant, and ſet in rows in nurſery beds, where, after four or five years, they will be ſtrong enough to be tranſplanted into the places where they are to remain. In planting them, great care is to be taken not to bury their roots too deep, which, when the ſoil is moiſt and ſtiff, often deſtroys them. The common *elm* ſeldom produces ſeed in great perfection, but the witch *elm* produces great quantities of good ones, from which ſome people raiſe nurſeries of the trees. Miller. See FECUNDITY.

Elm-trees are proper for hedges near the borders of fields, or for defending houſes or gardens from the violence of winds. *Elm*-wood is uſed in various kinds of waterworks; and the fineneſs of the grain makes it fit for eaving. The bark has been ſometimes commended both for its purgative and aſtringent virtue, but neither appear to have any foundation.

ELMOROSIA, a name given by the Moors to a diſh they are very fond of. It is made of pieces of beef, or of camel's fleſh, ſtewed with butter, honey, and water; ſome add rob of wine to it, and others garlic; but there is always added onions, ſaffron, and ſalt. Phil. Tranſ. N° 253.

ELOANX, a name given by ſome writers to *auripigmentum,* or orpiment.

ELOCUTION, is defined by Tully, the chooſing and adapting of words, and ſentences, to the things, or ſentiments, to be expreſſed. To the *elocution* then properly belongs the *delectus verborum,* or *choice of words.* That which treats of the ſeveral properties and ornaments of language in common, is called *general elocution,* conſiſting of ELEGANCE, COMPOSITION, and DIGNITY; and particular *elocution* conſiders them as they are made uſe of to form different ſorts of ſtyle.

ELOCUTION is ſometimes uſed more reſtrictedly to denote the juſt and graceful management of the voice, countenance, and geſture, in ſpeaking; and in this ſenſe it is the ſame with that in which, in common language, is called a good delivery. As to that part which reſpects the management of the voice, it includes articulation, pronunciation, accent, emphaſis, pauſes, tones, and pitch or key; and the other requiſite of good delivery is GESTURE. See ARTICULATION, &c. Sheridan's Lectures, &c. Lect. 2, &c. &c.

The beauties of *elocution* conſiſt chiefly in the uſe of figures, and figurative dictions or expreſſions, in the periods, and the ſtyle. See FIGURE, PERIOD, and STYLE. Ward's Or. p. 307.

ELODES, in *Botany,* an epithet given to a very ſoft and woolly ſort of St. John's wort, or *hypericum.*

ELODES is alſo uſed, among the ancient writers in *Medicine,* for a ſpecies of fever, attended with profuſe ſweats.

ELOGIUM, ELOGE, a praiſe, or panegyric, beſtowed on any perſon, or thing, in conſideration of its merit.

The word is Latin, but formed of the Greek ευλογια, *commendation;*

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commendation; which is compounded of εν, *well*; and λεγω, *to say*, or *speak*.

The secretary of the Royal Academy of Sciences at Paris composes the *eloges* of such members as die; and delivers them at the next public meeting of the company. Funeral orations are *eloges* of eminent persons deceased.

Extravagant and improbable *eloges* are of the greatest disservice to their own design; and do, in effect, diminish the person whom they pretend to magnify. Any worthy man may pass through the world, unquestioned and safe, with a moderate recommendation: but when he is set off and bedawbed with rhetoric, and embroidered so thick, that you cannot discern the ground, it awakens naturally (and not altogether unjustly) interest, curiosity, and envy; for all men pretend a share in reputation, and love not to see it engrossed, or monopolized; and are therefore apt to enquire (as of great estates suddenly got) whether the person, so commended, came honestly by it, and of what credit the person is that tells the story.

ELOHA, in *Scripture*, the singular of *Elohi*, one of the names of God. See ELOHI.

ELOHI, ELOI, or ELOHIM, in *Scripture*, one of the names of God. But it is to be observed, that angels, princes, great men, judges, and even false gods, are sometimes called by this name. The sequel of the discourse, is what assists us in judging rightly concerning the true meaning of this word. It is the same as *Eloha*; one is the singular, the other the plural. Nevertheless *Elohim* is often construed in the singular number, particularly when the true God is spoken of; but when false gods are spoken of, it is construed rather in the plural. Calmet, Diction. Bibl.

ELOI. See ELOHI.

ELOINE, in our *Laws*, signifies to remove, or send a great way off. Thus it is said, if such as be within age be *eloined*, so that they cannot come to sue personally, their next friends shall be admitted to sue for them. Stat. 13 Edw. I. cap. 15.

ELOME, a name given by some authors to ORPIMENT.

ELONGATA, in *Law*, is a return of the sheriff, that cattle are not to be found, or removed, so that he cannot make deliverance in replevin.

ELONGATION, in *Astronomy*, the digression, or recess of a planet from the sun, with respect to an eye placed on our earth; or it is the angle formed by two lines drawn from the earth to the sun, and from the earth to the planet, or the arc measuring this angle.

The greatest distance of the planet, &c. from the sun, is called the *greatest elongation*; which varies on two accounts, viz. in that both the earth, and the planet, revolve, not in circles, but in ellipses; and the variation is greatest in the orbit of Mercury, which is the most elliptic. In a circular orbit, having the sun for its center, the greatest *elongation* would happen, when the right line joining the earth and planet, touched the orbit of the planet: and this might easily be found, because the tangent to the orbit, and the distances of the earth and of the planet from the sun, form a right angled triangle, in which, having two sides, viz. the distances, the vertical angle, or angle of *elongation*, may be easily found. But in an elliptic orbit it may happen, that the *elongation* from the sun may grow still greater, even after it has left the place where the line joining the earth and planet touches its orbit. For after that, the true distance of the planet from the sun may increase, whilst the distance of the sun and planet from the earth do not increase, but they may rather decrease; and therefore in two triangles, the greater base will subtend the greater angle. If the greatest *elongation* be found by observation, the distance of the planet from the sun, supposed to move in a circular orbit, may be obtained, in respect of the earth's distance from the same. Keil's Astron. p. 157.

The *elongation* is chiefly considered in Venus and Mercury. The *greatest elongation* of Venus is 48 degrees, and that of Mercury 28 degrees; that is, the former never recedes from the sun, or is seen distant from him, above 48°; nor the latter above 28°. Whence it is, that Mercury is so rarely visible; as being usually lost in the light of the sun. See MERCURY, and VENUS.

The *elongation* of the superior planets from the sun may amount to 180°; or they may be in opposition to the sun, as viewed from the earth.

ELONGATION is also used, by some authors, for the difference in motion, between the swiftest and the slowest of two planets; or the quantity of space, whereby the one has overgone the other; called also *superation*.

The swiftest motion of the moon, with regard to the sun, is called the *elongation* of the moon from the sun. We also say, diurnal *elongation*, horary *elongation*, &c.

ELONGATION, *angle of*, or *angle of the earth*, is the difference between the sun's true place, and the geocentric place of a planet. Such is the angle ETR (*Tab. Astron. fig.* 25.) between the place of the sun E, and that of the planet R.

ELONGATION, in *Surgery*, is an imperfect luxation; when the ligament of any joint is so extended, or relaxed, as to lengthen the limb, but yet not to let the bone go quite out of its place. See LUXATION.

ELOPEMENT, in *Law*, is when a married woman, of her own accord, departs from her husband, and dwells with an adulterer; for which, without voluntary reconcilement to the husband, she shall lose her dowry; nor shall the husband, in such case, be compelled to allow her any alimony.

Sponte virum mulier fugiens, & adultera facta,
Dote sua careat, nisi sponso sponte remiscta.

The word is formed from the Belgic, *Ee, matrimony*, and *loopen, to run away*.

However, mere advertising a wife in the Gazette, or other public papers, is not a legal notice to persons in general not to trust her; though a personal notice given by the husband to particular persons is said to be good. An action lies, and large damages are usually given, against a person for carrying away, and detaining another man's wife.

ELOPITINUM, a name given by some of the old chemists to vitriol.

ELOPS, Ελοψ, in *Zoology*, the name of a serpent, otherwise called ELAPS.

ELOPS was also the name of a fish much esteemed among the Greeks, and thought to be the same with the ACCIPENSER. Hofm. Lex. in voc.

ELOQUENCE, the art of speaking, or writing well; so as to move and persuade. See RHETORIC, and ORATORY.

If *eloquence* and rhetoric be distinguished, the latter may be considered as proposing and explaining the theory, and the former as the practice of the art; but they are generally used indiscriminately for each other.

Demosthenes and Cicero are the two patterns of ancient *eloquence*; the one among the Greeks, the other among the Romans. Their manner, however, was exceedingly different; the first being close, strong, nervous, concise, and severe, so that a word could not be spared; the latter copious, florid, and rich, so that a word could not be added.

It was objected to Cicero, that his *eloquence* was Asiatic, that is, redundant, or stuffed with superfluous words and thoughts.

Pericles was called a *torrent of eloquence*, a *thunderbolt of eloquence*. Pedants do not distinguish *eloquence* from the heaping up of figures, the use of big words, and the rotundity of periods.

True *eloquence* depends principally on the vivacity of the imagination. In strictness, it is not that which gives grace and ornament, but life and motion, to discourse.

The authors of the Art of Thinking remark, that the rules of *eloquence* are observed in the conversation of people naturally *eloquent*, though they never think of them, while they practise them. They practise those rules, because they are *eloquent*; not in order to be *eloquent*.

The *eloquence* of the chair, and pulpit, is much more difficult than that of the bar. Sir George Mackenzy has a treatise of the *eloquence* of the bar. Idea Eloquentiæ forensis, &c.

ELOSSITES, in *Natural History*, the name of a stone, mentioned with great respect by the writers of the middle ages; they have left us, however, so short a description of it, that it is impossible to determine what it was; they only say, that it was no very beautiful stone, but that, if worn in the pocket, it had a wonderful virtue in curing pains, and all other diseases in the head.

ELIPS, a name given, by some of the chemical writers, to the scoriæ of silver.

ELPISTICI, ΕΛΠΙΣΤΙΚΟΙ, among the Greeks, a sect of philosophers who made hope the ruling passion of mankind.

ELTHYMUM, in the *Materia Medica of the Ancients*, a name given to the epithymum, or dodder growing upon thyme.

ELUDING, the act of evading, or rendering a thing vain, and of no effect; a dextrous getting clear, or escaping out of an affair, difficulty, embarrassment, or the like.

We say, to *elude* a proposition, &c. The design of chicanery is, to *elude* the force of the laws: this doctor has not resolved the difficulty, but *eluded* it. Alexander, says the historian, in cutting the Gordian knot, either *eluded* the oracle, or fulfilled it: *Ille nequicquam luctatus cum latentibus nodis, Nihil, inquit, interest, quomodo solvatur; gladioque ruptis omnibus loris, oraculi sortem, vel* eludit, *vel implevit.* Q. Curt. 13.

ELVÆ. See ELFS.

ELVELA, in *Botany*, a name given by Linnæus to a genus of funguses, called by Micheli *fungoidaster*, and *fungoides*.

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These differ from all the other kinds of funguſes, in that they are ſmooth both on the upper and under ſide, having no marks of lamellæ, pores, or fibres, in any part.

ELVERS, an Engliſh name for a ſmall ſort of eels, caught in ſome parts of the kingdom, particularly about Glouceſter and Tewkſbury. Theſe are, in reality, young congers, or ſea-eels. They get up into rivers while very ſmall, and as they precede the ſhads, it is conjectured that they ſupply them with food. They are taken in prodigious numbers in the rivers, in dark nights, by a kind of ſieve made of hair-cloth, fixed to a long pole, and are eſteemed a very delicate food. Willughby.

ELUL, one of the Hebrew months, anſwering partly to our Auguſt and September. There are but nine and twenty days in it. It is the twelfth month of the civil year, and the ſixth of the eccleſiaſtical. Upon the ſeventh or ninth day of this month the Jews faſt, in memory of what happened after the return of thoſe who went to view the promiſed land. Numbers, xiii. xiv.

Upon the twenty-ſecond of this month the feſtival of the *xylophori* was obſerved, when wood was carried to the temple. Selden ſays, that it was celebrated on the eighteenth day of the month *Ab*. On the twenty-ſixth of the ſame month, the dedication of the walls of Jeruſalem by Nehemiah was commemorated. Joſeph. lib. ii. cap. 17. p. 811. Nehem. xii. 27, &c. Calmet, Diction. Bibl.

ELUTRIATION, in *Metallurgy*, is the ſeparating the lighter matters from the mixt ores of metals, by means of great quantities of fair water. Solid bodies, not diſſoluble in water, are by this operation ſeparated from each other by water very well ſtirred, ſo that the lighter and finer parts are carried away with the water, and the heavier and more ſolid remain at the bottom of the veſſels.

Some of the ſtones, earths, and other bodies, naturally mixed with the ores of metals, are much lighter than the metalline parts of thoſe ores, and are therefore very eaſily thus ſeparated from the reſt by this operation, either by barely pounding and waſhing, or by firſt calcining, and then extinguiſhing them in water, and afterwards waſhing them.

The kinds of ores proper to be made the ſubjects of this operation, are known from the great ſpecific gravity of the ore, which ſhews us that the metallic maſſes, adhering to their matrix, are firm and ſolid, and combined in large molecules, not ſmall, and ſcattered and diſperſed ſparingly through it; they are known alſo by the comparative lightneſs and brittleneſs of their ſtony matrix; whether this laſt property be naturally inherent in the ſtony matter, or whether it be eaſily brought on by fire in calcination, for in ſuch caſe it renders the comminution of the compound maſs eaſy. In this caſe, however, it is proper, that the ore itſelf be of a nature ſufficiently fixed afterwards in the fire, and doth not fly away in the roaſting.

When ſtones, containing ore in them, are light and brittle, but hold a great quantity of ſulphur, and are interſperſed only with very minute maſſes of the metalline particles, or when theſe are incloſed in a very ponderous and hard matrix, not eaſily affected by fire, this method of ſeparation has no place. Cramer, Art of Aſſ. p. 195.

ELYCHRISUM, in *Botany*. See CUDWEED, and GOLDY *Locks*.

ELYSIUM, Ελυσιος, in the *Ancient Theology*, or rather *Mythology*, a place in the inferi, i. e. in the lower world, or, as we ſometimes render it, in hell; furniſhed with fields, meads, agreeable woods, groves, ſhades, rivers, &c. whither the ſouls of good people were ſuppoſed to go after this life.

Orpheus, Hercules, and Æneas, are ſuppoſed to have deſcended into *elyſium*, in their life-time, and to have returned again. Virgil, lib. vi. ver. 638, &c. Tibullus, lib. i. eleg. 3. gives us fine deſcriptions of the *elyſian fields*.

Virgil oppoſes *elyſium* to tartara; which was the place where the wicked underwent their puniſhment.

Heic locus eſt, partes ubi ſe via findit in ambas:
Dextera, quæ Ditis magni ſub mœnia tendit:
Hac iter elyſium *nobis: at læva malorum*
Exercet pœnas, & ad impia tartara mittit.

He aſſigns *elyſium* to thoſe who died for their country, to thoſe of pure lives, to truly inſpired poets, to the inventors of arts, and to all who have done good to mankind.

Some authors take the fable of *elyſium* to have been borrowed from the Phœnicians; as imagining the name *elyſium* formed from the Phœnician עלץ, *alaz*, or עלץ, *alats*, or עלם, *alas*, *to rejoice*, or *to be in joy*; the letter *a* being only changed into *e*, as we find done in many other names; as in *Enakim*, for *Anakim*, &c. On which footing, *elyſian* fields ſhould ſignify the ſame thing as a place of pleaſure; or,

——Locos lætos, & amœna vireta
Fortunatorum nemorum, ſedeſque beatas. Virg.

Others derive the word from the Greek λυω, *ſolvo*, *I deliver*, *I let looſe*, or *diſengage*, becauſe here mens ſouls are freed, or diſincumbered, from the fetters of the body. Beroaldus, and Hornius, Hiſt. Philoſoph. lib. iii. cap. 2. take the place to have derived its name from Eliza, one of the firſt perſons who came into Greece after the deluge, and the author and father of the Ætolians. Ol. Rudbecks contends, that it was in Sweden the *elyſian* fields were placed.

ELYTROIDES, Ελυτροειδης, in *Anatomy*, one of the proper coats, or tunics, of the TESTICLES.

The word is formed of the Greek ελυτρον, *vagina*, a *ſheath*, and ειδος, *form*.

The *elytroides* is the ſecond proper coat of the teſtes: it reſembles a ſheath, or vagina; whence ſome have alſo called it *vaginalis*.

It is formed of a dilatation of the production of the peritonæum; its inner ſurface is ſmooth and equable; and the outer rough and unequal; which makes it adhere the more ſtrongly to the firſt of the proper coats, called *elytroides*.

ELYTRON, properly a covering of any ſort, and for any ſubſtance. Hippocrates has appropriated the word to ſignify the membranes which involve the ſpinal marrow.

ELZIMAR, a name given, by ſome of the chemical writers, to the flowers of braſs.

EMANATION, the act of flowing, or proceeding, from ſome ſource, or origin. Such is the *emanation* of light from the ſun; or that of effluvia from odorous, &c. bodies; of wiſdom from God, &c.

The word is formed of the Latin *e*, *out of*, and *manare*, *to flow*, or *ſtream*.

EMANATION is alſo uſed for the thing that proceeds, as well as the act of proceeding. The power given a judge is an *emanation* from the regal power; the reaſonable ſoul is an *emanation* from the divinity.

EMANATION is alſo uſed among the ſchoolmen, for the production of a leſſer thing, in order to the production of a greater, by virtue of ſome natural connexion, or dependence, between them.

For, as when ſeveral moveables are joined together, the ſame power that moves the firſt, moves all the reſt (as in pulling up the trunk of a tree, you pull up the roots, branches, &c. or in drawing one link of a chain, you bring forward all the reſt); the ſame is to be underſtood in all conjunct natural effects; viz. that the ſame power, whereby the firſt is produced, does alſo produce all the reſt, naturally connected with it; becauſe, by means of the connexion, the action of the agent is conveyed from one to the other; ſo that the firſt determines the agent to the production of all the reſt.

And hence that is called an *emanative cauſe* (in contradiſtinction to an efficient cauſe) which produces an effect by its mere preſence, without the intervention of any action; as a roſe doth a ſmell, &c. Others, and with good reaſon, deny, that there is any ſuch thing as an *emanative* cauſe, to produce an effect without any action. See CAUSE.

EMANCIPATION, in the Roman *Law*, was the act of ſetting a ſon free from the power and ſubjection of his father.

The word is formed from the Latin *ex*, *of*, and *mancipium*, a *ſlave*.

Emancipation differs from *manumiſſion*; as the latter was the act of a maſter in favour of a ſlave; the former that of a father in favour of his ſon.

The effect of *emancipation* was, that the goods, and moveable effects, which the ſon ſhould thenceforth acquire, ſhould be his ſole property, and not the property of his father; as they were before *emancipation*. Beſides, *emancipation* put the ſon in a capacity of managing his own affairs, and of marrying without his father's conſent, though a minor, or pupil, and under twenty-five years of age.

There were two kinds of *emancipation*; the one *tacit*, which was, by the ſon's being promoted to ſome dignity, or by his coming of age, or by marriage; in all which caſes, the ſon became his own maſter of courſe.

The other *expreſs*, where the father declared before the judge that he *emancipated* his ſon. This was not performed without ſome formality: the father was firſt to ſell his ſon, imaginarily, to another man, whom the lawyers call *pater fiduciarius*, *father in truſt*; of whom being bought back again by the natural father, he manumitted, or ſet him free, by a declaration before the judge.

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This imaginary ſale was called *mancipatio*; and the manumiſſion, conſequent thereon, *emancipatio*.

Emancipation ſtill obtains in France, chiefly, with regard to minors, or pupils, who are hereby ſet at liberty to manage their effects, without the advice, or direction, of their fathers or tutors. It muſt be obſerved, however, that *emancipation* only extends to the ſelling of moveables, and letting of leaſes, &c. of immoveables; not to the ſelling or mortgaging of immoveables; which are only done with the conſent of a curator, ordinarily a perſon appointed, when *emancipated*.

Formerly *emancipation* was performed in the ordinary courts of juſtice, when deſired by the child; but if he were a minor, the king's letter was alſo required. Though there were other ways of *emancipation*, as by marriage; arriving at the age of twenty years; and in ſome provinces, by the death of the mother, becauſe the children were there under the power of the father and mother conjointly; ſo that the death of either of them *emancipated* the child.

Emancipation by marriage, in France, gives a power of marrying again, without the father's conſent, though under age; but among the Romans, Cujas tells us, a widow, under twenty-five years of age, though *emancipated* by her former marriage, returned into the power of the father, and might not marry a ſecond time, without his conſent.

Du-Cange obſerves, that the word *emancipation* was alſo uſed in the monaſteries, in ſpeaking of monks, promoted to any dignity, or removed from under the power of their ſuperiors; as alſo in ſpeaking of monaſteries, chapels, &c. themſelves, when exempted, by the pope, from the juriſdiction of the ordinary.

EMARGINATED *leaf*, among *Botaniſts*. See LEAF.

EMASCULATION, the act of taking from a male thoſe parts which are characteriſtic of his ſex. See CASTRATION.

EMAUX *de l'Eſcu*, in *Heraldry*, the metals and colours of a ſhield, or ſcutcheon.

EMBALMING, the opening a dead body, taking out the inteſtines, and filling their place with odoriferous and deſiccative drugs and ſpices, to prevent its putrefying.

The word is formed from *balm*, which was a principal ingredient in the *embalmings* of the ancient Egyptians.

Dr. Grew, in his Muſeum Regalis Societatis, is of opinion, that the Egyptians boiled their bodies in a large cauldron, with a certain kind of liquid balſam. His reaſon is, that in the mummies preſerved in the collection of the Royal Society, the balm has penetrated not only the fleſhy and ſoft parts, but even the very bones; ſo that they are all as black as if they had been burnt.

The Peruvians had an effectual method of preſerving the bodies of their incas, or kings, *embalmed*.

The way of *embalming* dead bodies among the Egyptians was as follows: when a man died, his body was carried to the artificers, whoſe trade it was to make coffins; they took the meaſure of the body, and made a coffin for it, proportioned to its ſtature, the dead perſon's quality, and the price that people were willing to give. The upper part of the coffin repreſented the perſon who was to be ſhut up in it, whether man or woman. If it was a man of condition, this was diſtinguiſhed by the figure which was repreſented on the cover of the coffin; there were generally added paintings and embelliſhments, ſuitable to the quality of the perſon. Vid. Caſſian. Collat. 15. cap. 3. & Cicero, Tuſc. Quæſt. lib. i. Herodot. lib. ii. cap. 86. Diodor. lib. ii. cap. 5.

When the body was brought home again, they agreed with the *embalmers* at what rate particularly they would have it *embalmed*, for the prices were different; the higheſt was a talent, twenty minæ was a moderate one, and the loweſt price was a very ſmall ſum. The Egyptian talent is ſuppoſed to be worth three hundred pounds ſterling. They immediately ſent for a deſigner, who marked the body, as it lay extended, at the place where it ſhould be opened, on the left ſide, and the length of the inciſion. A diſſector, with a very ſharp Ethiopian ſtone, made the inciſion, and hurried away as faſt as he could, becauſe the relations of the perſon deceaſed, who were preſent, took up ſtones, and purſued him as a wicked wretch, with an intention to ſtone him.

This operation being finiſhed, the *embalmers*, who were looked upon as ſacred perſons, entered to perform their office. They drew all the brains of the dead perſon through his noſtrils, with a hooked piece of iron, provided particularly for this purpoſe, and filled the ſkull with aſtringent drugs; they likewiſe drew all the bowels, except the heart and kidneys, through the aperture which they had made in the ſide. The inteſtines were waſhed in wine from the palm-tree, and in other ſtrong and binding drugs. The whole body was anointed with oil of cedar, with myrrh, cinnamon, and other ſpices, for about thirty days, ſo that it was preſerved entire, not only without putrefaction, but had a good ſcent with it. Αιγυπτιοι δε τα εντερα εξελοντες ταριχευσιν αυτες. And the Perſians, as the ſame author Sextus Empiricus obſerves, were uſed νιτρω ταριχευειν. Sext. Empir. Pyrrhon. Hypoth. lib. ii. cap. 24.

Bodies thus preſerved are called *mummies*, from the Arabic word *mam*, which ſignifies *wax*, this being an ingredient in the preparation.

After this the body was put into ſalt for about forty days; wherefore when Moſes ſays, that forty days were employed in *embalming* Jacob, we are to underſtand him as meaning the forty days of his continuing in the ſalt of nitre, without including the thirty days paſt in performing the other ceremonies above mentioned, ſo that, in the whole, they mourned ſeventy days in Egypt, as Moſes likewiſe obſerves.

Afterwards the body was taken out of the ſalt, waſhed, wrapt up in linen ſwaddling-bands, dipped in myrrh, and rubbed with a certain gum, which the Egyptians uſed inſtead of glue. Then the body was reſtored to the relations, who put it in a coffin, and kept it in their houſes, or in tombs made particularly for this purpoſe. There are ſome found, at this day, in Egypt, in chambers, or ſubterraneous vaults, which fully juſtify the truth of what is here ſaid.

They who were not rich enough to bear this expence, contented themſelves with infuſing, by a ſyringe, through the fundament, a certain liquor extracted from the cedar, and leaving it there, wrapt up the body in ſalt of nitre. This oil preyed upon the inteſtines, ſo that when they took it out, the inteſtines came along with it dried, and not in the leaſt putrefied. The body being incloſed in nitre, grew dry, and nothing remained beſides the ſkin glued upon the bones. They who were too poor to be at any conſiderable expence, did no more than cleanſe the inſide, by ſyringing a liquor into it; this done, they put the body, without farther ceremony, into nitre for ſeventy days, in order to dry it. Calmet, Diction. Bibl. Pococke's Deſcription of the Eaſt, vol. i. p. 230, &c.

The preſent method of *embalming* in Egypt differs very much from the ancient. Maillet informs us, that it is now the cuſtom to waſh the body ſeveral times in roſe-water; then to perfume it with incenſe, aloes, and other odours, in great abundance; the body is afterwards wrapped up in a winding-ſheet, made partly of ſilk, and partly of cotton, moiſtened probably with ſome liquid perfume; this is again covered with another cloth of unmixed cotton, to which is added one of the richeſt ſuits of cloaths of the deceaſed. Letter X. p. 88.

It is no wonder that we find human bodies preſerved without corrupting for many ages, by means of ſpices, and other ingredients, proper to reſiſt putrefaction, applied with the niceſt care; but it is ſtrange that there ſhould be a ſort of *embalming* performed by nature, in ſome places, where bodies are preſerved merely by the virtues of the ſoil in which they lie; yet this is evidently the caſe in ſome inſtances. We have, in the Philoſophical Tranſactions, an account of a man and a woman who were loſt in the great ſnows on the moors of Hope, near the woodlands in Derbyſhire, on the fourteenth of January, 1674. Theſe perſons were not found till the third of the May following, at which time they ſmelt ſo ſtrong, that the coroner prudently ordered them to be buried on the ſpot. Theſe bodies lay buried in the peat-moſs twenty-eight years before they were looked at again, when ſome people of the country, who had heard of the ſtrange virtues of the ſoil thereabouts in preſerving dead bodies, opened the ground, and found them no way altered, the colour of the ſkin being fair and natural, and the fleſh as ſoft as that of perſons newly dead. Phil. Tranſ. N° 434. p. 415.

After this the place was remarked where they lay, and they were ſhewn for a ſight for twenty years, though they were much changed by having been ſo often uncovered in that time.

EMBARCADERO, in *Commerce*, a Spaniſh term, much uſed along the coaſts of America, particularly thoſe on the ſide of the South ſea.

It ſignifies a place which ſerves ſome other conſiderable city farther within land, for a port, or place of ſhipping, i. e. of *embarking*, and *diſembarking* commodities.

Thus Calao is the *embarcadero* of Lima, the capital of Peru; and Arica the *embarcadero* of Potoſi. There are ſome *embarcaderos* forty, fifty, and even ſixty leagues off the city which they ſerve in that capacity.

EMBARGO, a reſtraint or prohibition, laid by a ſovereign on merchant-veſſels, to prevent their going out of port; ſometimes to prevent their coming in; and ſometimes both, for a limited time.

Embargoes are uſual in time of war; in apprehenſions of inva-

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invaſions, &c. One great occaſion of *embargoes* is, that the government may make uſe of the merchant-veſſels, with their equipage, &c. in armaments, expeditions, tranſporting of ſoldiers, &c. another is, to ſtop the communication of intelligence at ſuch critical ſeaſons. *Embargoes* are of very miſchievous conſequence to commerce.

EMBARRAS, EMBARRASSMENT, a French term, though now naturalized; denoting a difficulty, or obſtacle, which perplexes or confounds a perſon, &c.

EMBASIS, in the writings of the *Ancient Phyſicians*, the name of a large veſſel, in which they prepared their medicated baths, and which was capable of holding the perſon to be bathed at his full length.

EMBASSADOR, or AMBASSADOR, a public miniſter, ſent from one ſovereign prince, as a repreſentative of his perſon to another.

The word is derived from the corrupt Latin *ambaſciator*, formed of *ambactus*, an old word borrowed from the Gauliſh, ſignifying *ſervant*, *client*, *domeſtic*, or *officer*. Such is the origin given by Borel, Menage, and Chiflet, after Salmaſius and Spelman.

In Latin we uſually call this kind of miniſter *legatus*, or *orator*; though it is certain the word *embaſſador*, with us, has a much more extenſive ſignification than that of *legatus* among the Romans; and, excepting that they are both under the protection of the law of nations, there is ſcarce any thing in common between them.

Embaſſadors are either *ordinary* or *extraordinary*.

EMBASSADOR *in ordinary* is he who reſides ſtatedly in the court of another prince, to maintain a mutual good underſtanding, look to the intereſts of their maſters, and tranſact ſuch affairs as may occur.

Embaſſadors in ordinary are but of modern invention; it is not above two hundred years ago ſince they were firſt heard of; till then, all *embaſſadors* were *extraordinary*, and retired as ſoon as they had diſpatched the affair they were ſent upon.

EMBASSADOR *extraordinary* is a perſon who is ſent to a prince's court on ſome particular and emergent occaſion; as to conclude a peace, marriage, or to make a compliment, &c.

Indeed there is no eſſential difference between *ordinary* and *extraordinary embaſſadors*; they equally enjoy all the privileges and prerogatives which the law of nations decrees.

At Athens the *embaſſadors* from foreign princes and ſtates always mounted the tribunal, or pulpit, of the public orators, and there opened their commiſſion, and acquainted the people with their buſineſs. At Rome they were introduced to the ſenate, and delivered their commiſſion to them. Among us, they make their addreſs immediately and ſolely to the king.

Athens and Sparta, ſays M. Tourreil, when in all their glory, were never ſo much delighted, as to ſee and hear a number of *embaſſadors*, in their aſſemblies, ſuing for their protection or alliance. It ſeemed to them the nobleſt homage that could be paid them; and that ſtate, which received the moſt embaſſies, were judged to have the advantage over the other.

The name of *embaſſador*, Cicero obſerves, is ſacred and inviolable: *non modo inter ſociorum jura, ſed etiam inter hoſtium tela incolume verſatur*. In Verr. Orat. vi.

The *embaſſadors* of kings ſhould never attend at any public aſſemblies, marriages, interments, or other ſolemnities, unleſs their maſters have ſome intereſt therein; nor muſt they even go into mourning, or the like, on any occaſions of their own, becauſe they repreſent the perſons of their princes; and for this reaſon, they owe no ſubjection to any laws but thoſe of their own country, and their actions are not ſubject to the controul of the private law of that ſtate, in which they are appointed to reſide.

It has been held, both by our common lawyers and civilians, that an *embaſſador* is privileged by the law of nature and nations; and yet, if he commits any offence againſt the law of reaſon and nature, he ſhall loſe his privilege; and therefore, if an *embaſſador* conſpires the death of the king in whoſe land he is, that he may be condemned and executed for treaſon; but if he commits any other ſpecies of treaſon, he muſt be ſent to his own kingdom. However, though theſe principles might formerly obtain, the general practice of this country, as well as of the reſt of Europe, ſeems now to purſue the ſentiments of the learned Grotius, De Jur. Bell. & Pac. p. 18. 4. that the ſecurity of *embaſſadors* is of greater importance than the puniſhment of a particular crime. And, therefore, few, if any, examples have occurred within a century paſt, where an *embaſſador* has been puniſhed for any offence, however atrocious in its nature. With reſpect to civil ſuits, neither an *embaſſador*, nor any of his train or *comites*, can be proſecuted for any debt, or contract, in the courts of that kingdom where he is ſent to reſide. By 7 Anne, cap. 12. an act paſſed in 1708, in conſequence of the arreſt of an *embaſſador* from Peter the Great, czar of Muſcovy, for a debt of 50*l*. all proceſs, whereby the perſon of any *embaſſador*, or of his domeſtic, or domeſtic ſervant, may be arreſted, or his goods diſtrained or ſeized, ſhall be utterly null and void, and the proſecutors be puniſhed at the diſcretion of the lord-chancellor, and the two chief juſtices, or any two of them. However, no bankrupt trader, retained in the ſervice of an *embaſſador*, ſhall be privileged by this act; nor any ſervant, whoſe name is not regiſtered with the ſecretary of ſtate, and tranſmitted to the ſheriffs of London and Middleſex. Theſe privileges are allowed in the courts of law. Blackſtone's Commentaries, vol. i. p. 253, &c.

EMBASSY, or AMBASSY, *Legatio*, a miſſion from one ſovereign prince, or ſtate, to another, of ſome able experienced perſon, to negociate ſome affair, in quality of *embaſſador*.

Fa. Daniel obſerves, that under the ancient French kings, their *embaſſies* conſiſted of a body, or number of perſons, joined together in commiſſion, and who compoſed a kind of council; ſomething like which is ſtill retained at treaties of peace. Thus the French *embaſſy* at Nimeguen, for the peace, conſiſted of three plenipotentiaries; that of Utrecht, of two, &c.

We likewiſe read of *embaſſadreſſes*. Madame the marechale de Guebriant, Wicquefort obſerves, was the firſt, and perhaps the only woman, ſent by any court in Europe in quality of *embaſſadreſs*. Matth. lib. iv. Vie d'Henry IV. tells us, that the king of Perſia ſent a lady of his court on an *embaſſy* to the grand ſignior, during the troubles of the empire.

EMBATTLED, a term in *Heraldry*, when the outline of any ordinary is notched after the manner expreſſed in *Tab.* II. *Heraldry*, *fig.* 59. repreſenting the battlements of a wall, or caſtle. See BATTLEMENT.

None were ſuffered, in ancient times, to embattle their houſes, but thoſe who had great dignities, as the barons, and the like. Camden proves this in his account of Tunſtal's ſeat in England, in which he expreſſes it as a ſignal mark of the royal favour, that he had liberty given to embattle it. The heralds expreſs this embattled line by the term *crenelle*; and when it has the embattling on both ſides, which is the more rare, they call it *bretteſſe*. See BRETESSE.

EMBER-*gooſe*, in *Ornithology*, the COLYMBUS *immer* of Linnæus, is larger than a common gooſe; its head is duſky; the back, coverts of the wings, and tail, are clouded with lighter and darker ſhades of the ſame; the primaries and tail are black; the under ſide of the neck marked with duſky ſpots; the breaſt and belly ſilvery, and the legs black. The ſkin is ſo tough, that it has been uſed in ſome of the northern countries as leather. This ſpecies inhabits the ſeas about the Orkneys; and in ſevere winters viſits the ſouthern parts of Great Britain. See DIVER.

This ſpecies of the wild gooſe is ſaid to hatch her young under her wing. The reaſon of this abſurd opinion is, that none ever ſaw her on the land, or out of the water, and that they have a cavity under one of their wings capable of containing a large egg. Phil. Tranſ. N° 473. § 8.

EMBER-*weeks* are thoſe wherein the *ember*, or *embering-days* fall.

In the laws of king Alfred, and thoſe of Canute, thoſe days are called *ymbren*, that is, *circular days*, from whence the word was probably corrupted into *ember-days*. By the canoniſts they are called *quatuor anni tempora*, the four cardinal ſeaſons, on which the circle of the year turns; and hence Henſhaw takes the word to have been formed, viz. by corruption, from *temper*, of *tempora*.

Mr. Somner thinks they were originally faſts, inſtituted to beg God's bleſſings on the fruits of the earth. Agreeably to which, Skinner ſuppoſes the word *ember* taken from the aſhes, *embers*, then ſtrewed on the head.

The *ember-days* are the Wedneſday, Friday, and Saturday, after Quadrageſima Sunday, or the firſt Sunday in Lent, after Whitſunday, after Holyrood day in September, and after St. Lucy's day in December; which four times anſwer well enough to the four quarters of the year, ſpring, ſummer, autumn, and winter.

Theſe *ember-weeks* are now chiefly taken notice of on account of the ordination of prieſts and deacons; becauſe the canon appoints the Sundays next ſucceeding the *ember-weeks* for the ſolemn times of ordination; though the biſhops, if they pleaſe, may ordain on any Sunday or holiday.

EMBERIZA, in *Ornithology*, a name, with the epithets of white and yellow, expreſſing the bunting and yellow-hammer. In the Linnæan ſyſtem this is a diſtinct genus of *paſſeres*, including a great number of ſpecies. For the

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general characters, see BUNTING. See also REED-*sparrow*, SNOW-*bird*, YELLOW-HAMMER, &c.

EMBLEM, Εμβλημα, a kind of painted ænigma, which, representing some obvious history, with reflections underneath, instructs us in some moral truth, or other matter of knowlege.

The word is pure Greek, formed of the verb εμβαλλειν, *to cast in, to insert*. Suetonius relates, that Tiberius caused the word to be erased out of a decree of the Roman senate, because it was borrowed from another language.

Such is that very significant image of Scævola, holding his hand in the fire; with the words *agere & pati fortia, Romanum est: to do and suffer courageously is Roman.*

The *emblem* is somewhat plainer, and more obvious, than the ænigma. Gale defines *emblem* an ingenious picture, representing one thing to the eye, and another to the understanding.

The Greeks also frequently gave the name *emblems*, εμβληματα, to *inlaid*, or *mosaic* works, and even to all kinds of ornaments of vases, moveables, garments, &c. And the Latins used *emblema* in the same sense. Accordingly, Cicero, reproaching Verres with the statues and fine wrought works he had plundered from the Sicilians, calls the ornaments fixed thereto (and which, on occasion, might be separated from them) *emblemata*. Add, that Latin authors frequently compare the figures and ornaments of discourse to these *emblemata:* thus, an ancient Latin poet, praising an orator, says, that all his words were ranged like the pieces in mosaics,

ut tesserulæ omnes,
Arte pavimenti, atque emblemate *vermiculata.*

We do not use the English word *emblem* in this sense; though the ancient jurisconsulti always retain the Latin *emblema* to express such ornaments; because the Greek εμβλημα literally denotes any thing applied, or added to a body by way of enrichment.

With us, *emblem* ordinarily signifies no more than a painting, basso relievo, or other representation, intended to hold forth some moral or political instruction.

What distinguishes an *emblem* from a *device* is, that the words of an *emblem* have a full, complete sense of themselves; nay, all the sense and signification which they have together with the figure.

But there is yet a farther difference between *emblem* and device; for a device is a symbol appropriated to some particular person, or that expresses something which concerns him particularly; whereas an *emblem* is a symbol that regards all the world alike.

These differences will be more apparent from comparing the *emblem* above quoted with the device of a candle lighted; and the words *juvando consumor, I waste myself in doing good.*

According to lord Bacon, *emblems* are of use in the art of memory, as sensible objects strike the mind stronger than what is intellectual. Thus, it is easier to retain the image of a sportsman hunting a hare, of an apothecary ranging his boxes, an orator making a speech, a boy repeating verses, or a player acting his part; than the corresponding notions of invention, disposition, elocution, memory, and action. Works abr. vol. i. p. 136. vol. ii. p. 475. and vol. iii. p. 106.

EMBLEMATICAL *characters*. See CHARACTER.

EMBLEMENTS, Fr. from *emblaver*, q. d. *semer en blé, to sow with wheat*, a term strictly signifying the profits of lands sown; though sometimes used more largely for any profits arising, and growing naturally from the ground; as grass, fruit, &c.

If a tenant for life sow the land, and die, his executor shall have the *emblements*, and not he in reversion. But if the tenant for years sow the land, and before severance the term expires, there the lessor, or he in reversion, shall have the *emblements*, and not the lessee.

The advantages of *emblements* are particularly extended to the parochial clergy by 28 Hen. VIII. cap. 11.

EMBOLIMÆAN and EMBOLISMIC, *intercalary*, is chiefly used in speaking of the additional months which chronologists insert to form the lunar cycle of 19 years.

The 19 solar years, consisting of 6939 days, and 18 hours; and the 19 lunar years only making 6726 days; it was found necessary, in order to render the 19 lunar years equal to the 19 solar, which make the lunar cycle of 19 years, to intercalate or insert seven lunar months, containing 209 days; which, with the four bissextile days happening in that interval, make 213 days, and the whole, 6939 days. See CYCLE.

By means of these seven *emboliſmic*, or additional months, the whole 6939 days and 18 hours of the solar years are employed in the calendar.

In the course of 19 years there are 228 common moons, and seven *emboliſmic* moons. Their distribution is thus: every 3d, 6th, 9th, 11th, 14th, 17th, and 19th years, are *emboliſmic*, and consequently contain 384 days a-piece. And this was the method of computing time among the Greeks, when they used the enneadecæterides, or cycle of 19 years. But they did not keep regularly to it, as the Jews seem to have done. The Greeks were followed by the Romans till the time of Julius Cæsar.

The *emboliſmic* months, like other lunar months, are sometimes 30 days, and sometimes only 29. See YEAR.

The *emboliſmic epacts* are those between XIX and XXIX; which are thus called, because, with the addition of the epact XI, they exceed the number XXX: or rather, because the years, which have these epacts, are *emboliſmic*; having thirteen moons a-piece, whereof the 13th is the *emboliſmic*.

EMBOLISMUS, Εμβολισμος, in *Chronology*, signifies *intercalation*.

The word is formed of εμβαλλειν, to *insert*. See EMBOLISMIC.

As the Greeks made use of the lunar year, which is only 354 days, in order to bring it to the solar, which is 365 days, they had every two or three years an *emboliſm*, i. e. they added a thirteenth lunar month every two or three years; which additional month they called *embolimæus*, εμβολιμαιος, because *inserted*, or *intercalated*.

EMBOLUS, the moveable part of a pump, or syringe; called also the *piston*, and popularly the *sucker*. See PISTON, PUMP, and SYRINGE.

The pipe, or barrel of a syringe, &c. being close shut, the *embolus* cannot be drawn up without a very considerable force; which force being removed, the *embolus* returns again with violence. This phænomenon the Aristotelians attribute to nature's abhorrence of a VACUUM.

But the modern philosophers finding, that in an exhausted receiver the *embolus* is easily drawn up, though the orifice be stopped, prove that it is the pressure of the atmosphere on the external parts of the *embolus*, that makes the difficulty of drawing it up. See AIR, ATMOSPHERE, and SUCTION.

EMBOSSING, or IMBOSSING, the act of forming, or fashioning works in relievo, whether they be cast, or moulded, or cut with the chissel, &c.

Emboſſing is one great part of sculpture; being that which has to do with figures raised, or prominent from the plain, or ground; the other part, which makes figures, &c. that are indented, or cut in below the ground, is called *engraving*. See ENCHASING.

EMBOWELLING *alive*, in *Law*, is part of the punishment of *High*-TREASON.

EMBRACE *a volt*, in the *Manege*, is used when a horse, in working upon volts, makes a good way every time with his fore-legs. The opposite term to embracing a volt, is beating the dust, which is putting his fore-feet near the place from whence he lifted them.

Embracing the ground is used in the same sense with *embracing* the *volt*. A horse cannot take in too much ground, provided his croupe does not throw out; that is, does not go out of the *volt*. See BEAT.

EMBRACEOR, in *Law*, a person who, when a matter is in trial between party and party, comes to the bar with one of the parties (having received some reward so to do), and speaks in the cause, or privately labours the jury, or stands there to overlook, awe, or put them in fear. The penalty hereof is twenty pounds, and imprisonment at the discretion of the justices.

EMBRACERY, in *Law*, the act or offence of embraceors. See EMBRACEOR.

EMBRASURE, in *Architecture*, an enlargement of the gap or aperture of a door, or window, within-side the wall. See DOOR.

Its use is to give the greater play, for the opening of the door, wicket, casement, &c. or to take in the more light.

The *embraſure* coming sloping inwards, makes the inner angles obtuse. When the wall is very thick, they sometimes make *embraſures* on the outside.

EMBRASURES, in *Fortification*, denote the holes, or apertures, through which the cannons are pointed; whether in casemates, in batteries, or in the parapets of walls. See CANNON, ORDNANCE, BATTERY, &c.

The *embraſures* are generally about fifteen feet apart, from six to nine or ten feet wide without, and from two to three within. Their height from the platform is usually three feet on the inside, and a foot and half on the outside; that so the muzzle, on occasion, may be sunk, and the piece brought to shoot low.

The best *embraſures* are those made with a neck, whereby a part of the opening becomes more contracted, and consequently is better adapted to preserve the gunners and cannon from the enemy's shot, than when the cheeks of the *embraſures* are made strait. It is most desirable to have the axis of the *embraſure* at right angles to the length of the parapet, yet it may be sometimes necessary to

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have them oblique. In this caſe, the inſide of the parapet is notched, or cut away, ſo as to leave room for the front of the platform, that the wheels of the carriage may be drawn up againſt the inner opening, for the axis of the gun to lie in the axis of the *embraſure*; and the outſide of the parapet is to be ſtrengthened, in order to compenſate for that which is cut away within.

They are ſometimes called *cannonieres*, when big enough to paſs the mouth of a cannon through; and *meurtrieres*, when only big enough for muſquets.

When the parapet is ſo low, that the cannon may ſhoot without *embraſures*, it is ſaid to ſhoot *en barbe*.

EMBROCATION, or rather EMBROCHATION, EMBROCHA, Εμβροχη, formed from βρεχω, *irrigo*, *I ſprinkle*, or *moiſten*, in *Pharmacy*, denotes the application of remedies, as oils, ſpirits, decoctions, and other liquids, by ſprinkling, or even rubbing them on the part affected: this is alſo called *irrigation*.

Embrocations are only a kind of lotions; they are uſed to remove obſtructions, and to relieve pains, numbneſs, and palſies. The pumping uſed in natural baths is properly an *embrocation*.

EMBROCATION, *gall.* See GALL.

EMBROIDERY, the enriching of a cloth, ſtuff, or muſlin, by working diverſe figures thereon with the needle, and thread of gold or ſilver.

The word *embroidery* is derived from the French *broiderie*, of *broider*, *to embroider*; which ſome deduce, by tranſpoſition, from *bordeur*, becauſe they formerly *embroidered* only the borders of ſtuffs; whence the Latins alſo call the embroiderers, *limbularii*. Du-Cange obſerves, that they anciently wrote *aurobruſtus* for *embroidered* with gold, or *bruſtus brudatus*, and *brodatus*; whence *broderie*.

That done with ſilk, flax, or the like, is not now called *embroidery*; though anciently, and properly, the word denoted all kind of figuring, or flouriſhing.

The chief uſe of *embroidery* is in church veſtments, cloaths, houſings, guidons, ſtandards, &c. The invention of *embroidery* is attributed to the Phrygians; whence the Latins call embroiderers, *Phrygiones*.

The *embroidery* of ſtuffs is performed in a kind of loom; that of muſlin is done by ſtretching it on a pattern already deſigned; the former kind is the moſt eaſy, but the latter admits of the greateſt richneſs and variety. The thinneſt muſlins are the beſt for this purpoſe; and they are *embroidered* to great perfection in Saxony.

There are diverſe kinds of *embroidery*; as *embroidery on both ſides*, that which appears on both ſides. *Guimped embroidery*, performed either in gold or ſilver. In this work, a ſketch is firſt made on the cloth, then they put on a cut vellum, and afterwards ſew on the gold and ſilver with ſilk thread, interſperſing ſilver and gold cord, tinſel, and ſpangles. *Embroidery on the ſtamp*, where the figures are very high and prominent, being ſupported on wool, cotton, hair, &c. *Low and plain embroidery*, where the figures are low and flat, and without any enrichment between them.

EMBRYO, in *Medicine*, the firſt beginning, or rudiments, of the body of an animal, in its mother's womb, before it hath received all the diſpoſition of parts neceſſary to become animated; which is ſuppoſed to happen to a man on the forty-ſecond day; at which time the *embryo* commences a fœtus.

The word is derived from the Greek εμβρυον, which ſignifies the ſame thing: formed of the prepoſition εν and βρυω, *ſcaturio*, *pullulo*, *I ſpring out*; becauſe of the manner of the firſt growth of the *embryo*, which reſembles that of the firſt ſhoots of a plant, as being a kind of zoophyte, and having only a vegetative life.

The moderns have made abundance of fine diſcoveries on the formation and growth of the *embryo*.

M. Dodart, having an *embryo* of twenty-one days age put into his hands, made a nice examen thereof; to find the order nature obſerves in the formation of the parts, and the firſt riſe of the parts themſelves.

The placenta he found more than half of the whole; and thence concludes, that the nearer the *embryo* is to the moment of its conception, the greater is the placenta with reſpect to the ſecundines, and the fœtus; which circumſtance furniſhes a reaſon why miſcarriages are more dangerous than regular deliveries; notwithſtanding that the fœtus in the former caſe is much leſs than in the latter. For though the *embryo* may have made a way ſufficient for itſelf, it may not for ſo great a placenta, as is to follow it.

The *embryo* itſelf was only ſeven lines long, from the top of the head to the bottom of the ſpina dorſi, where it terminated. The thighs were not yet unfolded; they only appeared like two little warts at the bottom of the trunk; the arms made the ſame appearance on the ſhoulders. The head was juſt one-third of the length of the whole ſeven lines: on this were ſeen two little black points, which would have become eyes. The mouth was very big; which M. Dodart takes for an indication, that the fœtus was fed by the mouth. There was no eminence for the noſe; but two little, almoſt imperceptible, pits for the noſtrils.

The painters uſually make the head one-eighth of the height of a well-proportioned man; and one-fourth of that of a young child: in the *embryo* we are ſpeaking of, the head made one-third part of the whole; whence it follows, that the younger the *embryo*, the bigger the head in proportion to the body. The parts nearer the head are alſo bigger in proportion to the reſt; and the legs and feet the ſmalleſt.

The *embryo* was a little crooked forwards, and bore ſome reſemblance to the maggot of a ſilk-worm; it weighed leſs than ſeven grains, which is an extraordinary lightneſs for a body ſeven lines long. It was ſo ſoft, that no part of it could be touched, without making a change in its figure.

Upon opening it, M. Dodart diſcovered the heart, and the right auricle: all the other parts in the thorax, and lower venter, were only ſimple lineaments, or outlines, and all veſicular, excepting a part on the left-ſide, which may be ſuppoſed to be the ſpleen. There was no appearance of any thing on the right ſide for a liver. Mem. de l'Acad. See FOETUS, and GENERATION.

EMBRYO is alſo uſed by naturaliſts to expreſs the grain, or ſeed of a plant; ſometimes the germ, or firſt ſprout appearing out of the ſeed; becauſe the whole future plant is ſuppoſed to be contained therein. Juſt as the whole chick is ſuppoſed contained in the cicatricula, or treddle of an egg.

EMBRYO-*worms*. It is a matter of no ſmall curioſity, to obſerve the arrangement of the multitudes of the *embryo*-worms, as they are lodged in the bodies of the viviparous two-winged flies.

An accurate diſſection of one of theſe little animals, ſhews very plainly the parts where the *embryo*-worms are incloſed. This diſſection is eaſily made with a pair of fine pointed ſciſſars, taking off the whole upper ſhell of the body from the lower; and that part which covers the belly may be turned back upon the corcelet, without diſturbing the internal parts by the operation; and the form and arrangement of the parts which contain the *embryo*-worms in theſe, will be found very different from that of thoſe which contain the eggs in the common flies. Baker on the Microſcope, p. 115. 416, 417. 428, 430.

EMBRYONATUM *ſulphur*, in the writings of ſome *Chemiſts*, the name of one of the three general claſſes of *ſulphur* which they conſtitute. The firſt of theſe they call the univerſal *ſulphur*, or reſin of the earth; this is never united with any thing. By this they ſeem to mean what Boerhaave, and other late chemiſts, have called the vague acid. The ſecond is this ſame ſulphur united to metals and minerals; and the third is the ſame *ſulphur*, when ſeparated by art from theſe metals and minerals. This laſt ſeems *ſulphur* in its moſt advanced ſtate, and the ſecond kind is what they call the *ſulphur embryonatum*, as it is in the metals, &c. in an embryo-ſtate, and ready to be diſcloſed into its laſt form.

EMBRYOTHLASTES, Εμβρυοθλαστης, an inſtrument wherewith to cruſh the bones of an embryo, or dead child; ſo as to make it eaſier of extraction, and prepare it for the embryulcus, to draw it out of the womb.

EMBRYOTOMY, Εμβρυοτομια, formed of εμβρυον, and τεμνω, *I cut*, in *Surgery*, the operation of cutting off the funiculus umbilicalis, or navel-ſtring, of a child juſt born, and tying it up.

EMBRYULCUS, in *Surgery*, the name of an inſtrument, in form of a ſort of crotchet, or hook, uſed for drawing out the fœtus in difficult labours. See FORCEPS.

EMBRYULKIA, or EMBRYOLKIA, Εμβρυελκια, or Εμβρυοελκια, formed of εμβρυον, *fœtus*, and ελκειν, *to draw*, in *Surgery*, an operation of extracting the child out of the mother's womb. See CÆSAREAN.

What the Greeks call *embryolkia*, the Latins call *Cæſarean ſection*; which latter name, M. Dionis obſerves, has taken place, and prevailed over the former; as being more eaſy of pronunciation.

EMENDALS, an old term ſtill uſed in the accounts of the Inner Temple; where, ſo much *in emendals* at the foot of an account ſignifies ſo much in the bank, or ſtock of the houſe, for reparation of loſſes, and other occaſions.

EMENDATIO *panis & cereviſiæ*, the aſſize of bread and beer; or the power of ſuperviſing and correcting the weights and meaſures belonging to them. See ASSIZE.

EMERALD, a precious ſtone, when in its greateſt perfection green and tranſparent; and as to hardneſs nearly equal to the ruby.

The word is formed from the French *eſmeraude*, and that from the Latin *ſmaragdus*, which ſignifies the ſame. Others derive it from the Italian *ſmeraldo*, or the Arabic *zomorrad*.

Pliny

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Pliny reckons up twelve kinds of *emeralds*; and denominates each from the provinces, or kingdoms, where he supposed them to be found; as Scythian, Bactrian, Egyptian, Persian, &c.

But the modern naturalists and jewellers only know of two fine kinds, viz. Oriental and Peruvian. And if we may credit Tavernier, in his treatise of coloured stones found in the Indies, inserted in the second volume of his Voyages, these two should be farther reduced to one, viz. the Peruvian.

In effect, he pretends that there is not, nor ever was, any mine of *emeralds* in the East Indies; and that all that are there found, were brought from Peru by the way of the South-sea; which was a method of commerce carried on by the Peruvians before the discovery of America by the Spaniards. But as the point of such commerce is not sufficiently proved, we must keep to the ancient division.

The Oriental *emerald* is harder, more brilliant, and transparent, than the Peruvian; which has generally clouds found in it, and sparkles less. Beside, that there are such quantities brought from Peru, by the way of Carthagena, that they are much sunk in value and reputation. There are also European *emeralds*, but they are little other than coloured crystal.

Some authors say, that *emeralds* are usually taken out of iron mines; and Pomet assures us, he had one to which the iron ore was still sticking. To which, all we have to say, is, that it could not be a Peruvian, because there is no iron mine in the country.

The *emerald* is supposed to grow more and more perfect in the mine like the ruby; and to arrive at its greenness by slow degrees, as the fruit comes to maturity on trees.

It is a common opinion, that the *emerald* grows in the jasper; and it is certain there are some jaspers so perfectly green and fine, that many have taken parts of them for *emeralds*.

But the proper matrix or marcasite of this stone is the *preme d'emeraud*, which is held among the coarser precious stones; being hard, semi-pellucid, and often intermixed with yellow, green, white, and blue, &c.

The genuine *emerald*, when in its most perfect state, is perhaps the finest and most beautiful of all the gems. It is found of various sizes, but usually small. Multitudes are met with of about the sixteenth of an inch in diameter, and they are found from this up to the size of a walnut. We have accounts of some of immense size among the ancients; but they were evidently not *emeralds* but jaspers, or other green stones. The large specimens at present are very scarce; and whether they are Oriental or Occidental, are of very great value.

The *emerald* is naturally of different figures, like the diamond, and many of the other gems. It is sometimes found in a roundish, or pebble-like form, but much more frequently in a columnar, or angular one, resembling common crystal. The pebble *emeralds* are always the hardest and brightest, but are seldom found exceeding the size of a pea, very rarely coming up to that of a horse-bean. The crystalliform usually grow several together, and are often considerably large. The pebble *emeralds* are found loose in the earth of mountains, and in the sands of rivers; the columnar are usually found adhering to, or bedded in a white, opake, crystalline matter, and sometimes to the jasper, or to the prasius; which last has been therefore called by some the mother of the *emerald*.

The rough *emerald*, of whatever form, is usually of a very bright, and naturally polished surface, and is ever of a pure and beautiful green, without the least admixture of any other colour. It is of all the various shades of green, from the deepest to the palest, and doubtless is sometimes wholly colourless; but it is then esteemed a sapphire; all the harder gems, when colourless, being called by our jewellers *white sapphires*.

With a moderately strong heat the *emerald* becomes blue, but recovers its original green colour when cold. *Emeralds*, by being exposed to condensed solar heat, have been rendered white, and of various colours, and soon afterwards fused, by which operation they lost part of their weight and hardness. But M. d'Arcet could not fuse an *emerald* in the intense and long continued heat of a porcelain furnace, although the colour and transparency of it were thereby altered. *Emeralds* have the property of shining in the dark, after having been heated.

They are the fourth in degree of hardness from DIAMONDS; and yet are susceptible of impression from a file.

The Oriental *emeralds* are very scarce, and are at present found only in the kingdom of Cambay: very few of them have of late been imported into Europe, insomuch, that some have supposed that there were in nature no Oriental *emeralds*; but within these few years some have been brought from Cambay into Italy, which greatly exceed all the American ones in beauty, as well as hardness.

The American *emeralds*, which as they are the finest that come to us, are called by our jewellers Oriental, are found principally about Peru, in the earth of some mountains. The European *emeralds* come principally from Silesia, though there are of them in other places; and the coloured crystals, which are what we usually meet with under the name of Occidental *emeralds*, are obtained from the mines of Germany.

The ancients made amulets of *emeralds* against all kinds of sorcery; and supposed them effectual against a thousand different diseases. At present, when we have more experience, or less credulity, they are valued for their beauty, not their virtue; though there are still some who suppose, that when reduced into an impalpable powder, and mixed with rose-water, they may be of some use in medicine.

We read in authors of several *emeralds* of incredible magnitude. Roderigo de Toledo tells us, that when the Saracens took that town, king Tarik had for his share of the plunder a table three hundred and sixty-five feet long, and all of a piece, which he maintains to be an *emerald*. After this, the reader will not wonder at that pretended to have been seen by Theophrastus, in a temple in Egypt, four cubits long, and three broad; nor even at an obelisk of *emerald* forty feet high. But these were not properly *emeralds* in our sense of the name, but only green marble, or other such stones.

In the Dictionnaire de Commerce, we have a very curious and accurate estimate of the values of the different kinds of Peruvian *emeralds*; which the reader will not be displeased to find transcribed here.

Those of the first and coarsest sort, called *plasmes*, for grinding, are worth 27 shillings sterling the marc, or 8 ounces. The demi-morillons, 8*l.* sterl. per marc. Good morillons, which are only little pieces, but of fine colour, from 13*l.* to 15*l.* per marc. *Emeralds*, larger than morillons, and called *of the third colour, or sort*, are valued at from 50*l.* to 60*l.* the marc. *Emeralds*, called *of the second sort*, which are in larger and finer pieces than the preceding, are worth from 65*l.* to 75*l.* per marc. Lastly, those of the first colour, otherwise called *negres cartes*, are worth from 110*l.* to 115*l.*

EMERALDS *ready cut, or polished, and not cut, being of good stone, and a fine colour, are worth,*

	£.	s.
Those weighing one carat, or four grains	0	10
Those of two carats ——	1	7
Those of three carats ——	2	5
Those of four carats ——	3	10
Those of five carats ——	4	10
Those of six carats ——	7	10
Those of seven carats ——	15	0
Those of eight carats ——	19	0
Those of nine carats ——	23	0
Those of ten carats ——	33	0

EMERALD, *counterfeit*. The manner of making *counterfeit emeralds* in paste is this: take crystal prepared, two ounces; common minium, or red-lead, four ounces; mix these well together, then add of good verdegris two penny-weights, and crocus martis made with vinegar, eight grains. Mix all these well together, and set the whole in the hottest part of a potter's furnace, as long as the fire lasts. It must be put into a strong crucible, and covered with a lute. When it is cold take off the lute, and, if it is baked enough, it will be clear to the bottom; otherwise relute the pot, and put it into the furnace again. Twenty-four hours commonly is sufficient for making this; sometimes it requires a little more. The paste, thus made, is harder than ordinary, and is of a fine colour, and capable of a good polish. Neri's Art of Glass, p. 128.

If the paste be desired of a very deep *emerald* colour, take prepared crystal, one ounce; red-lead, six ounces and a half; of verdegris, three penny-weights and thirteen grains; and of crocus martis, made with vinegar, ten grains. This requires a longer baking than the other, and is less hard, though of a deeper colour.

The proportions of these ingredients may be varied at pleasure, and the colour be made of all degrees of deepness; but the more lead is added, the more baking is required, and, after all, the paste will be so much the softer.

EMERALD-*colour*, in the *Glass Trade*. The way of giving this beautiful dye to glass is this: in the pots of melted metal, made of polverine, and without manganese, when the matter is well purified, put a little crocus martis calcined with vinegar. About three ounces of this crocus is enough for a hundred weight of glass; let it stand till thoroughly mixed, then put into every hundred weight of metal two pound of calcined brass; this must be added at six different times, letting the metal stand two hours every time. When this is all in, make a proof of the metal;

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metal; and if it has any bluiſhneſs, add more crocus martis, a ſmall quantity at a time. When the whole is of a fine leek green, let it ſtand twenty-four hours to mix thoroughly, and then work it. Neri's Art of Glaſs, p. 51.

EMERALD, or EMERAUD, in *Heraldry*, is uſed in lieu of vert, or green, in blazoning the arms of dukes, earls, &c.

EMERGENT *year*, in *Chronology*, is the epocha, or date, whence we begin to account our time.

Our *emergent year* is ſometimes the year of the creation; the Jews uſe that of the deluge, or the Exodus, &c. The *emergent year* of the Greeks was the eſtabliſhment, or at leaſt reſtoration, of the Olympic games by Iphitus. The Romans accounted their years from the building of the city, AB U. C. that is, AB URBE CONDITA. See EPOCHA.

EMERSION, in *Phyſics*, the riſing of any ſolid above the ſurface of a fluid ſpecifically heavier than itſelf, into which it had been violently immerged, or thruſt.

It is one of the known laws of hydroſtatics, that a lighter ſolid, being forced down into a heavier fluid, immediately endeavours to emerge; and that with a force, or moment, equal to the exceſs of a weight of a quantity of the fluid above that of an equal bulk of the ſolid.

Thus, if a ſolid be immerged in a fluid of double its ſpecific gravity, it will emerge again, till half its bulk, or body, be above the ſurface of the fluid.

EMERSION, in *Aſtronomy*, is when the ſun, moon, or other planet, begins to re-appear, after its having been eclipſed, or hid by the interpoſition of the moon, earth, or other body.

The difference of longitude is ſometimes found by obſerving the immerſions and *emerſions* of the firſt of Jupiter's ſatellites.

The immerſions are obſerved from the time of Jupiter's being in conjunction with the ſun, to his oppoſition; and the *emerſion*, from the oppoſition to the conjunction; which two intervals are uſually ſix months a-piece, and divide the year between them.

But when Jupiter is in conjunction with the ſun, and fifteen days before and afterwards, there is nothing to be obſerved; the planet, with his ſatellites, being then loſt in the light of the ſun.

EMERSION is alſo uſed when a ſtar, before hid by the ſun, as being too near him, begins to re-appear, and to get out of his rays.

EMERSION, *ſcruples*, or *minutes of*, an arch of the moon's orbit, as TQ (*Tab. Aſtron. fig.* 46.), which the moon's center paſſes over, from the time ſhe begins to emerge out of the ſhadow of the earth to the end of the eclipſe.

EMERUS, in *Botany*. See *Scorpion* SENA.

EMERY, a ſort of metallic ſtone, found in ſeveral mines of metals; but chiefly in thoſe of iron, being properly an iron ore.

The word comes from the French *emeril*; formed from the Latin *ſmyris*, and that from the Greek σμυρις, which ſignifies the ſame thing; and which Lemery derives from the verb σμαω, *I clean, ſcour*.

We uſually diſtinguiſh three kinds of *emery*; the Spaniſh, *red*, and *common emery*. The firſt is found in the gold-mines of Peru, and other provinces of the Spaniſh America; it is judged a kind of ore of that rich metal; being ſtreaked with little veins, and ſpecks of gold. It is for this reaſon the king of Spain prohibits its being exported, which renders it exceeding rare among us; to the great regret of the ſeekers of the philoſophers ſtone, who have formed great hopes from the tranſmutation of this precious metal. The Spaniſh *emery* ſeems to be no other than the metal now called PLATINA; and the European *emeries* may probably participate of the ſame metal. The *red emery* is found in copper-mines; the little we have of it comes from Sweden and Denmark.

The *common emery* is taken out of iron mines; and is almoſt the only ſort uſed among us. The conſumption hereof is very conſiderable among the armourers, cutlers, lockſmiths, glaziers, lapidaries, maſons, &c. ſome of whom uſe it to poliſh and burniſh iron, and ſteel works; others, to cut and ſcollop glaſs, marble, and precious ſtones.

This *emery* is of a browniſh colour, ſometimes bordering a little on red; exceedingly hard, and of conſequence difficult to pulverize. The Engliſh are the only people that have acquired the art of making it into powder; which they do chiefly by means of certain mills contrived for that purpoſe; and thus ſend it in powder to their neighbours.

Pounding it in mortars were in vain; it being ſo hard, that it would pierce or break the mortar, before it would break itſelf.

Of the powder, the moſt ſubtile and impalpable is the beſt; as to the ſtone, it ſhould be choſen of a high colour, and as free of the rock as poſſible.

Emery fuſed with lead, and iron, hardens them. It is alſo ſaid to increaſe and heighten the weight and colour of gold. It is uſual to mix a little of it with the gold from Madagaſcar, which is naturally pale and ſoft. See GOLD.

Emery is ſaid to have a corroding and almoſt cauſtic quality; but this is without any juſt foundation. It is recommended by the ancients as an aſtringent and dentrifice. In this laſt intention, however, it muſt be uſed with great caution, as its hardneſs and ſharpneſs are ſuch, that it will be apt to wear off the enamel of the teeth.

EMERY, *putty of*, is a kind of a dirty matter, found on the lapidaries wheels; containing part of the powder of *emery* which they uſe.

EMETIC, from εμεω, *I vomit*, in *Medicine*, a remedy that excites vomiting; or that purges the ſtomach by the mouth.

Of theſe there is a great variety; as *ipecacuanha*, *carduus benedictus*, &c. The uſe of *emetics* is indicated by a foulneſs of the mouth in a morning, reaching, loathing, gnawing of the ſtomach, gradual loſs of appetite, ſpontaneous vomiting, &c.

Vomiting is raiſed by irritating the ſpirits with the preſence of ſomething loathed; by an unuſual agitation, as falling, &c. by tickling the fibres of the fauces and pharynx with a feather dipped in oil; by drinking quantities of warm water, &c. by any thing ſharp and viſcous; as the flowers and ſeeds of dill, leaves of groundſel, &c. crocus, and glaſs of antimony; the flowers and regulus thereof; mercurius vitæ, mineral turbith, and mercury ſharpened any way with acids.

The ancient phyſicians were very fond of *emetics*, as preſervatives againſt diſeaſes; and Hippocrates, in particular, has recommended the giving them twice a month, during winter, and in the ſpring. His *emetics* were very eaſy, ſimple, and gentle ones. One very common preſcription, to this purpoſe, was a decoction of hyſſop, with an addition of ſo much vinegar and ſalt as would make the patient nauſeate it. This was to be taken by ſtrong and robuſt people, in the morning, faſting, and, by the more weakly, after dinner or ſupper. Diodorus Siculus has aſſured us, that the great practice of the ancient Egyptian phyſicians conſiſted in glyſters, vomits, and abſtinence. Aſclepiades, who was a great enemy to purges, yet often ordered his patients gentle vomits after ſupper.

The *emetic* medicines are of two very different kinds, ſome being naturally mild and gentle, others harſh and rough; of the former kind, warm water with butter, or the water of the naturally warm mineral ſprings, are often capable of doing very great ſervice. The medicine of moſt general uſe at preſent, ipecacuanha, ſeems of a happy middle nature between theſe and the more rough ones, of which the vegetable kingdom afford us a great number, as aſarabacca, white hellebore, gamboge, and all the purges in too large doſes. The mineral world, however, affords much more numerous and more violent ones; ſuch are all the preparations of copper, and of the vitriols, the antimonial vomits, and the mercurial ones.

The ancients, in violent diſeaſes, ſuch as madneſs, epilepſies, and ſome other diſorders, not attended with a fever, gave the white hellebore root as an *emetic*, with great ſucceſs; but we now uſe remedies leſs dangerous, as death has been ſometimes known to have been the effect of this medicine. Our ipecacuanha is a celebrated remedy for fluxes; nor is the obſervation new, that vomits are the greateſt of all remedies in theſe caſes. Celſus, lib. i. cap. 3. affirms, that vomits in general ſtop fluxes, yet always keep the body open. The country people, with us, frequently uſe aſarabacca as a ſucceda-neum for the ipecacuanha. It is rougher, indeed, than that medicine, but, if taken in decoction, the boiling carries off its acrid and too pungent quality, and it retains its *emetic* power in a more gentle degree, and, with it, has a balſamic and corroborating virtue, and has been known to cure inveterate quartans, and to do great ſervice in jaundices and dropſies. Among the antimonial vomits, the beſt is the *emetic* tartar, prepared from the crocus metallorum, not from the glaſs of antimony, for that makes it doubly rough and harſh in its operation. Three or four grains of this alone, or yet leſs of it, mixed with ipecacuanha, are often given with great ſucceſs; and when the intention is to purge and vomit at the ſame time, then three grains of this *emetic* tartar, added to a ſolution of manna, prove an excellent medicine. In aſthmatic and pituitous caſes, the oxymel of ſquills is a very efficacious and perfectly ſafe medicine; but all the preparations of copper, and the rougher antimonial vomits, are to be rejected, as being very dangerous and very uncertain, working either too little, or greatly too much, according to the ſtate of the humours in the ſtomach. The ſtronger *emetics* before mentioned, as ſafe ones, are often neceſſary in caſes of poiſon, eſpecially of the narcotic

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cotic kind, and the infectious particles received from the effluvia of perſons in contagious diſeaſes, which being ſwallowed into the ſtomach with the ſpittle, would otherwiſe infallibly create the ſame diſeaſe. In diſorders ariſing from a vitiated or thick bile, formed, as it were, into a kind of viſcid coagulum, and ſtopping up the biliary ducts, as is the caſe in jaundices, and ſome other complaints, *emetics* are frequently uſed with great ſucceſs, after all the common methods have failed. In anaſarcas alſo, and leucophlegmaſies, and œdematous ſwellings of the parts, and in a curable aſcites, *emetics*, exhibited in large doſes, uſually carry off by ſtool, though rarely by vomit, the aqueous ſerum from the liver, and the ducts and glands of the inteſtines, meſentery, and pancreas; nor are theſe the only caſes in which *emetics*, properly adminiſtered, are capable of doing very ſingular ſervice; but there ſtill requires great care and caution in giving them, as it is an infallible rule, that the medicine which can do great good, may alſo do great harm. Hoffm. Medic. Rational. Syſtem.

It is proper, in order to make *emetics* work the more eaſily, always to give them in a liquid form, or in a ſufficient quantity of ſome moiſtening, relaxing, and fatty vehicle; for vomiting not only requires a ſtrong contraction of the pylorus, and bottom of the ſtomach, but alſo a relaxation of the ſuperior orifice of the œſophagus. During the operation of *emetics*, and after it is over, the patient muſt be carefully guarded againſt the cold, and abſtain from all cold liquors, from all hot or ſtimulating medicines, and from all violent emotions of the mind; and about four hours after the operation of a vomit is over, it is extremely proper to drink half a pint of aſſes milk, if it can be readily had.

Whenever bleeding and vomiting are both neceſſary, bleeding ſhould always be done firſt.

The ancients, in general, have recommended the giving vomits in tertians and quartans, before the acceſs of the fit; and Alexander Trallian has been very earneſt in recommending them on this occaſion. The practice is highly conſonant with reaſon, and all the known rules, and may be of great advantage, not only in theſe, but in many other caſes, in which it is not at preſent thought of.

Dr. Harris has obſerved of the antimonial vomits, that they are very ſafe in the heat of ſummer, but very dangerous in colder ſeaſons. This author alſo recommends a decoction of the herb digitalis, or fox-glove, as a very ſafe, though powerful *emetic*; and there is an account of another plant, uſually eſteemed of the dangerous kind, that is, the common creeping meadow-crowfoot, from which a very ſafe and efficacious *emetic* is to be prepared, that has been adminiſtered in many parts of England with great ſucceſs. The method of preparing it is only by diſtilling, in the common way, a ſimple water from the plant; this is very acrid and pungent to the taſte, and requires to be lowered, either by drawing a very large quantity from a little of the herb, or elſe by mixing common water with it. The method of giving it is this: let the patient drink about a quart of warm water, then give an ounce of this diſtilled water, and the whole will be immediately brought up with great eaſe; and the whole operation is then over for that doſe, and the water and medicine are again to be repeated as often as is judged neceſſary. Harris's Diſſertation.

If vomits operate too violently, common ſalt is a well known remedy. This ſeldom fails to check or ſtop them. Mild aromatics and opiates alſo have the ſame effect; and corroborating medicines, either taken internally, or applied by way of cataplaſm, or embrocation, to the region of the ſtomach.

Dr. Shaw thinks, the moſt ſafe, gentle, and agreeable *emetic* yet known, is an infuſion of the ipecacuanha-root in white wine, without heat. This is made by putting two drams of the root, in fine powder, into half a pint of white Liſbon wine, and, after ſtanding two days, adding a freſh quantity of wine to the remaining powder, when this is poured clear off. Theſe wines are to be mixed together, and given in a doſe ſuited to the ſtrength of the patient. This is greatly preferable to the vinum benedictum, *emetic* tartar, and all the medicines of a like kind, which are attended with danger and uncertainty in their operation; and while we have this, there is no reaſon why all the violent *emetics* ſhould not be wholly diſcarded from the practice of phyſic. Shaw's Lectures, p. 221.

The EMETIC *wine*, *vinum* EMETICUM, is only white-wine, wherein is infuſed ſome crocus metallorum, or glaſs of antimony.

Small doſes of *emetic* wine have been recommended as deobſtruent and ſudorific in ſlow fevers, in many chronical diſeaſes, and eſpecially in an obſtinate rheumatiſm. See Medic. Eſſ. Edinb. abr. vol. i. p. 170. and Huxham, Obſ. de Aere & Morb. epidem.

The EMETIC *powder*, called alſo *powder of Algaroth*, from the name of its author, is a precipitate of antimony; or butter of antimony ſweetened and ſoftened by repeated lotions.

EMETIC *tartar* is prepared from equal parts of crocus metallorum, and cream of tartar, boiled together in water, afterwards filtrated and cryſtallized. See CRYSTAL.

The operation of *emetic* medicines is thus accounted for by Dr. Quincy: the particles of the *emetic*, wedging themſelves into the orifices of the emiſſaries of the glands, placed adjacent to the ſurface of the ſtomach, do dilate the ſame (which by ſome extrinſic cauſe had been contracted); and after the ſame manner do diſſolve (at leaſt in ſome degree) the coheſion of the ſtagnant morbific matter; rendering it more fluid, and conſequently making its reſiſtance leſs.

Now the natural and conſtant action of the glands being ſecretion, and the impediment (by the dilatation of the orifice, and the attenuation of the fluid) being taken away, or at leaſt made leſs than the natural momentum of the glands; the matter muſt naturally flow into the cavity of the ſtomach, till it be heaped up in ſuch quantity (which not being to be done in an inſtant, muſt require ſome time) as is ſufficient, by its ſtimulus, to vellicate and force the fibres of the ſtomach, abdomen, and diaphragm, by communication of the firſt with the two laſt, into a violent contraction, and thereby throw all out by the œſophagus; and this makes all quiet for a time, till a new and ſufficient quantity be excerned from theſe glands to produce the aforeſaid contraction.

Thus there happen fits of vomiting and quiet alternately, till either all the morbific matter be thrown out, or the force of the *emetic* be ſo diluted, that it is no longer able to draw out the morbific matter from the glands.

And the ſtrong contraction in ſo many muſcles, and muſcular canals, as are at work in the action of vomiting, and the violent concuſſion which is produced all over the whole body by a power, which, by juſt computation, is not inferior to 26,000 lb. weight, may, and often does, take away the obſtruction in many other canals, beſides thoſe which are adjacent to the ſtomach and gullet; as we plainly ſee, by thoſe vaſt ſweats, which urgent fits of vomiting occaſion.

Emetic and purgative medicines differ only in this, that the particles of the latter do not immediately vellicate the fibres of the ſtomach, dilate the orifices, and attenuate the matter contained in the glands of the ſtomach; but act gently, and aſſiſt the natural motion of digeſtion, and ſo are carried down into the guts; and how they operate there, ſee PURGATIVE.

EMEU, in *Zoology*, the common name of the CASSOWARY, a large bird of the oſtrich kind.

EMINENCE, in *Geography*, a little hillock, or aſcent, above the level of the adjoining champaign.

EMINENCE is alſo a title of honour given to cardinals.

The decree of the pope, whereby it was appointed, that the cardinals ſhould be addreſſed under the quality of *eminence*, bears date the tenth of January, 1630. They then laid aſide the titles of *illuſtriſſimi*, and *reverendiſſimi*, which they had borne before.

The grand maſter of Malta is likewiſe addreſſed under the quality of *eminence*.

The popes John VIII. and Gregory VII. gave the ſame title to the kings of France. The emperors have likewiſe borne it.

Eminentiſſimus, the ſuperlative of *eminent*, has of late been attributed to the cardinals.

EMINENTIAL *equation* is uſed by ſome algebraiſts in the inveſtigation of the areas of curvilinear figures; for a ſort of artificial equation, containing another equation *eminently*. Hayes, Flux. p. 97.

EMINENTLY, EMINENTER, in the *Schools*, is uſed in contradiſtinction to *formally*, and in the ſame ſenſe with *virtually*, viz. to denote that a thing poſſeſſes, or contains, any other in a more perfect or higher manner than is required to a formal poſſeſſion thereof.

Thus an angel is ſaid to have prudence *eminently*; as he has it in a higher and more perfect degree than it is in man, in whom it is formally.

For one thing to contain another *eminently*, there are uſually required two conditions. 1. That the containing be of a more excellent nature than the contained. 2. That the leſs excellent be ſome way contained in the more excellent; viz. either as in its productive cauſe, or by ſome ſimilitude, or as to the manner and order of acting, &c.

EMIR, a title of dignity, or quality, among the Turks and Saracens, attributed to ſuch as are relations or deſcendants of their great prophet Mahomet.

The word is Arabic, and literally ſignifies *prince*. It is formed of the verb אמר, *amar*, which is originally Hebrew;

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Hebrew; and in both theſe languages ſignifies *to ſay*, and *to command*.

The *emirs* are held in high veneration, and have alone the privilege of wearing a green turban. On the borders of the Holy Land, there are ſeveral *emirs* ſovereign princes; as the *emir* of Gaza, and the *emir* of Terabea, over whom the grand ſeignior has but little authority.

The title *emir*, at firſt, was only given to the caliphs: in Perſia they were alſo called *emir zadeh*, q. d. prince's ſon; whence, by abbreviation of *emir*, they formed *mir*; and of *emir zadeh*, *mirza*. In after-times, when the caliphs had aſſumed the title of ſultans, that of *emir* remained to their children, as that of Cæſar did among the Romans.

At length, the ſame title of *emir* came to be attributed to all who were judged to deſcend from Mahomet by his daughter Fatimah, and who wear the green turban.

EMIR, is alſo a title, which, being joined to ſome other word, frequently denotes an office or employ; as, the *emir al omera*, *commander of commanders*, who, in the time of the caliphs, was chief of the councils and armies.

The appellation *emir* is alſo applied by the Turks, to all viziers and baſhaws, or governors of provinces. See BASHAW, &c. Add, that *emir akhor*, vulgarly *imrahor*, is maſter of the horſe to the grand ſeignior.

Emir alem, vulgarly *miralem*, ſtandard-bearer and director of all the ſtandards of the empire.

Emir bazar, the provoſt, or ſuperintendent of the markets, who regulates the prices of proviſions.

The *emir hagge*, or prince conductor of the pilgrims of Egypt to Mecca, is baſhaw of Jeruſalem, and is named yearly from Conſtantinople, though he is generally left two years in his office, to make amends for his great expence in equipage in the firſt; and ſometimes, if he has capacity and intereſt at the porte, he is continued ſix years, but rarely longer; for if they conduct the caravan ſeven years, the grand ſeignior preſents them with a collar of gold; and it is ſaid, that their perſons, after this, become ſacred, and they cannot be publicly cut off. This officer has command over the eſtates that go to Mecca. The perquiſites of his office, beſide what he is allowed by the porte, conſiſt in having a tenth of the effects of all the pilgrims who die in the journey. Pocock's Egypt, p. 165.

Emir al moſlemin, or *emir al moumenin*, i. e. commander of the faithful, or the believers, was a title aſſumed by the Almoravides and Almohades, who reigned in Africa and Spain.

EMISSARIUM, in *Antiquity*, a fluice, or drain, to draw off the water uſed in watering gardens, fields, &c.

EMISSARY, formed of *e* and *mitto*, q. d. *I ſend out*, a truſty, dextrous, able perſon, ſent ſecretly, to ſound the ſentiments and views of another, to make him ſome propoſal or overture; or to ſpread reports, watch the actions, motions, and countenance, of a contrary party or perſon, in order to make advantages of them all. See SPY.

The leaders of parties have abundance of emiſſaries employed in their ſervice, who inform them of what paſſes everywhere, that they may take their meaſures accordingly.

EMISSARY *of a gland*, the ſame with *excretory duct*, being the common canal, or pelvis, in which all the little ſecretory tubes of a gland terminate.

EMISSION, the act of throwing, or driving a thing, particularly a fluid, from within, outwards. The ancients took viſion to be performed by the *emiſſion* of viſual rays from the eye.

But the term *emiſſion* is chiefly applied among us, to the expulſion or EJACULATION of the ſeed.

EMITES, in *Natural Hiſtory*, the name uſed by ſome authors for the chermites, a beautiful ſpecies of white marble, of which the tomb of Darius, and many other of the great works of antiquity, were made. It was valued for its fine poliſh.

EMMELIA, Εμμέλεια, in *Antiquity*, a dance peculiar to tragedy, which had all the gravity and dignity that were ſuitable to the action then repreſenting, and was deſigned to inſpire the audience with ſentiments of compaſſion and benevolence for the unfortunate and oppreſſed, with indignation againſt the guilty, and with the love of virtue, and abhorrence of vice.

The movements of ſuch a dance as this muſt have been very ſolemn and majeſtic, and have bore a great affinity to the action of an orator; it was the only one, excepting the military dances, that had the approbation of Plato. Mem. Acad. Inſcript. vol. ii. p. 160. See DANCE.

EMMENAGOGUES, Εμμηναγωγα, in *Medicine*, ſuch remedies as promote the menſes.

They are thus called from εν, *in*, μην, *month*, αγω, *duco*, *I lead*, becauſe their natural periods of flowing are once a month.

Emmenagogues either act by giving a greater force to the blood in its circulation, whereby its momentum againſt the veſſels is increaſed; or by making it thinner, whereby it will more eaſily paſs through any outlets.

The former intention is helped by chalybeats, which give a greater weight and momentum to a languid heavy blood, and all other ſubſtances of the like gravity and elaſticity; and ſuch is the caſe of a leuco-phlegmatic habit, or, as it is commonly called, the green-ſickneſs, and its cure.

But in the latter caſe, where the blood is florid, and too high, attenuating alteratives and detergents are the only remedies, becauſe fitteſt to render the blood more thin, and to give it ſuch a property, as will better carry it through thoſe little apertures deſtined for its diſcharge into the uterus.

EMMIELLURE, in the *Manege*, a kind of compoſition of honey, and other ingredients, uſed for ſprains and ſhoulder-ſplaits of horſes. See CHARGE.

The word is French, derived from *miel*, *honey*, which is a part of the compoſition.

EMODIA, Αιμωδια, of αιμα, *blood*, and οδους, *tooth*, in *Medicine*, a word uſed by ſome authors to expreſs a ſtupor of the teeth.

EMOLLIENTS, in *Medicine* and *Pharmacy*, remedies uſed to ſoften and looſen indurations or conſtrictions of the belly, or thoſe of tumours and ſwellings: ſuch are mallows, mercurials, lily-roots, linſeed, butter, wax, gum ammoniac, &c.

The term *emollient* is applied to external as well as internal remedies. We ſay, a laxative, anodyne, and *emollient* clyſter; an *emollient* emplaſter, an *emollient* cataplaſm, &c. Freſh cherries are an *emollient* food, though when dry, they rather conſtringe than relax, as wanting a great part of the phlegm which rendered them *emollient*. Ripe grapes, from being aſtringent, which they were before, become laxative and *emollient*. Hogs lard, applied externally, is reſolutive and *emollient*.

Quincy defines *emollients* to be ſuch things as ſheathe and ſoften the aſperities of the humours, and relax and ſupple the ſolids at the ſame time; for it is eaſy to conceive how theſe ſhould be both effected by the ſame medicine, thus: by what means ſoever (whether in the ſtomach, or any other parts) the juices have obtained a ſharpneſs or aſperity, ſo as to vellicate and render uneaſy the fibres and nervous parts, which often happens; thoſe things which are ſmooth, ſoft, and yielding, cannot but wrap up their points, and render them imperceptible, whereby they may gradually, by the proper courſe of circulation, be brought to ſome convenient emunctory, without doing any injury by the way.

Such ſharpneſs of parts, likewiſe, draws the fibres into ſpaſms, keeps them too tenſe, and frequently thereby occaſions obſtructions of the worſt kind.

In all ſuch caſes, therefore, *emollients* lubricate and moiſten the fibres, ſo as to relax them into their proper dimenſions; whereupon, ſuch diſorders ceaſe.

EMOLUMENT, is properly applied to the profits ariſing daily from an office or employ.

The word is formed of the Latin, *emolumentum*, which, according to ſome, primarily ſignifies the profits redounding to the miller from his mill; of *molo*, *molere*, *to grind*.

The patent, or other inſtrument, whereby a perſon is preferred to an office, gives him a right to enjoy all the dues, honours, profits, and *emoluments*, belonging thereto.

In our law books, *emolument* is uſed in a ſomewhat greater latitude, for profit, or advantage, in the general.

EMPALEMENT, or IMPALEMENT, a cruel kind of puniſhment, whereby a ſharp pale or ſtake, is thruſt up the fundament, and through the body.

The word comes from the French, *empaler*, or the Italian, *impalare*; or rather, they are all alike derived from the Latin, *palus*, *a ſtake*, and the prepoſition *in*, *in*, *into*.

We find mention of *empaling* in Juvenal. It was frequently practiſed in the time of Nero, and continues to be ſo in Turkey.

EMPALEMENT, in *Botany*, denotes the cup, or outmoſt part of the flower of a plant, or that incompaſſing the foliation of the attire.

It is compounded of the three general parts of all plants, the ſkin, the cortical, and the woody bodies; each empaler being (whether conſiſting of one or more pieces) as another leaf, and deſigned to be a guard and a band to the flower, where it is weak and tender; ſo that ſuch plants as have flowers, with a firm and ſtrong baſis, as tulips, &c. have no *empalement*, nor need any. See CALYX.

EMPANELLING, or IMPANELLING, in *Law*, ſignifies the writing and entering into a parchment ſchedule, or roll

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roll of paper, by the ſheriff, the names of a jury ſummoned by him to appear for the performance of ſuch public ſervice as juries are employed in.

EMPARLANCE, or IMPARLANCE, in *Law*, a deſire, or petition in court, of a day to conſider, or adviſe, what anſwer the defendant ſhall make to the action of the plaintiff.

The civilians call it *petitio induciarum*. Kitchin mentions *emparlance general*, and *ſpecial*; the firſt ſeems to be only that made in one word, or in general terms; *emparlance ſpecial*, is where the party requires a day to deliberate, adding theſe words, *Salvis omnibus advantagiis tam ad juriſdictionem curiæ, quam ad breve & narrationem.*

Briton alſo uſes *emparlance* for the conference of a jury upon a cauſe committed to them.

EMPASMA, Εμπασμα, from εμπασσω, *I ſprinkle*, in *Pharmacy*, a powder thrown or ſprinkled over the body, to correct ſome ill ſmell thereof, or to prevent unneceſſary ſweats.

EMPASTING, or IMPASTING, a term uſed in *Painting*, for the laying on of colours thick and bold, or applying ſeveral lays of colours, ſo that they may appear thick. See COLOURING.

It is formed of the *French*, *empaſter*, which has the ſame ſignification of *paſte*, or *pâte*, *paſte*.

A painting is ſaid to be well empaſted with colours, when the colours are beſtowed plentifully, or it is well ſoaked, and ſaturated with colours.

The term is alſo uſed when the colours are laid diſtinct, and aſunder, and not ſoftened or loſt in each other: e. g. this head is not painted, it is only empaſted.

EMPATTEMENT, French, from *empater*, *to thicken*, in *Fortification*, a term uſed by ſome to denote the ſame with TALUS.

EMPERESS, EMPRESS, *Imperatix*, the feminine of emperor, applied either to an emperor's wife, or to a woman who rules ſingly over an empire, with all the authority of an emperor; as the *empreſs* of Ruſſia. See EMPEROR, QUEEN, &c.

EMPERESS, is alſo uſed in the *Ancient French Poetry*, for a particular kind of rhime, thus denominated by way of excellence.

The *rhime emperiere* was a ſort of crowned rhime, wherein the ſyllable that made the rhime was immediately preceded by two other like ſyllables of the ſame termination, which made a kind of echo, called the *triple crown*; and which, to the ſhame of the nation (as ſome of their late authors expreſs it) their beſt ancient poets took for a wonderful beauty and excellence.

Fa. Mourgues, in his treatiſe of French poetry, gives us an inſtance very proper to raiſe contempt of the miſerable taſte of that age, which knew no way of expreſſing that the world is impure, and ſubject to change, ſo excellent, as by ſaying,

Qu'es tu qu'un immonde, monde, onde.

EMPERICHORESIS, ſee CIRCUMINCESSION.

EMPEROR, *imperator*, among the *Ancient Romans*, ſignified a general of an army, who, for ſome extraordinary ſucceſs, had been complimented with this appellation. Thus Auguſtus, having obtained no leſs than twenty famous victories, was as often ſaluted with the title *emperor*; and Titus was denominated *emperor* by his army, after the reduction of Jeruſalem.

Afterwards, it came to denominate an abſolute monarch, or a ſupreme commander of an empire; a Roman *emperor*, &c. In this ſenſe Julius Cæſar was called *emperor*, and the title deſcended with the dignity to Octavius Auguſtus, Tiberius, and Caligula; and afterwards it became elective.

In ſtrictneſs, the title *emperor* does not, and cannot add any thing to the rights of ſovereignty; its effect is only to give precedence and pre-eminence above other ſovereigns; and as ſuch, it raiſes thoſe inveſted with it to the ſummit of all human greatneſs.

The *emperors*, however, pretend, that the imperial dignity is more eminent than the regal; but the foundation of ſuch prerogative does not appear: it is certain, the greateſt, moſt ancient, and abſolute monarchs, as thoſe of Babylon, Perſia, Aſſyria, Egypt, Macedonia, &c. were called by the name of *kings*, in all languages, both ancient and modern. See KING.

It is diſputed, whether or not *emperors* have the power of diſpoſing of the regal title. It is true, they have ſometimes taken upon them to erect kingdoms; and thus it is that Bohemia and Poland are ſaid to have been raiſed to the dignity; thus alſo, the *emperor* Charles the Bald, in the year 877, gave Provence to Boſon, putting the diadem on his head, and decreeing him to be called *king*, *Ut more priſcorum imperatorum regibus videretur dominari.*

Add, that the *emperor* Leopold erected the ducal Pruſſia into a kingdom, in favour of the elector of Brandenburg; and though ſeveral of the kings of Europe refuſed for ſome time to acknowledge him in that capacity, yet by the treaty of Utrecht, in 1712, they all came in.

In the Eaſt, the title and quality of *emperor* are more frequent than they are among us; thus, the ſovereign princes of China, Japan, Mogul, Perſia, &c. are all *emperors* of China, Japan, &c.

In the year 1723, the czar of Muſcovy aſſumed the title of *emperor of all Ruſſia*, and procured himſelf to be recognized as ſuch by moſt of the princes and ſtates of Europe.

In the Weſt, the title has been a long time reſtrained to the *emperors* of Germany. The firſt who bore it was Charlemagne, who had the title *emperor* conferred on him by pope Leo III. though he had all the power before. The imperial prerogatives were formerly much more extenſive than they are at preſent. At the cloſe of the Saxon race, A. D. 1024, they exerciſed the right of conferring all the eccleſiaſtical benefices in Germany; of receiving the revenues of them during a vacancy; of ſucceeding to the effects of inteſtate eccleſiaſtics; of confirming or annulling the elections of the popes; of aſſembling councils, and of appointing them to decide concerning the affairs of the church; of conferring the title of king on their vaſſals; of granting vacant fiefs; of receiving the revenues of the empire; of governing Italy as its proper ſovereigns; of erecting free cities, and eſtabliſhing fairs in them; of aſſembling the diets of the empire, and fixing the time of their duration; of coining money, and conferring the ſame privilege on the ſtates of the empire; and of adminiſtering both high and low juſtice within the territorries of the different ſtates: but in the year 1437, they were reduced to the right of conferring all dignities and titles, except the privilege of being a ſtate of the empire; of *preces primariæ*, or of appointing once during their reign a dignitary in each chapter, or religious houſe; of granting diſpenſations with reſpect to the age of majority; of erecting cities, and conferring the privilege of coining money; of calling the meetings of the diet, and preſiding in them. Pfeffel Abregé de l'Hiſtoire d'Allem. p. 160 & 507.

To which ſome have added, 1. That all the princes and ſtates of Germany are obliged to do them homage, and ſwear fidelity to them. 2. That they, or their generals, have a right to command the forces of all the princes of the empire, when united together. 3. That they receive a kind of tribute from all the princes and ſtates of the empire, for carrying on a war which concerns the whole empire, which is called the *Roman month*. For the reſt, there is not a foot of land, or territory, annexed to his title: but ever ſince the reign of Charles IV. the *emperors* have depended entirely on their hereditary dominions as the only ſource of their power, and even of their ſubſiſtence. See DIET and ELECTORS.

The kings of France were anciently alſo called *emperors*, at the time when they reigned with their ſons, whom they aſſociated to the crown; thus, Hugh Capet, having aſſociated his ſon Robert, took the title of *emperor*, and Robert that of king; under which titles they are mentioned in the Hiſtory of the Council of Rheims, by Gerbert, &c. King Robert is alſo called *emperor* of the French, by Helgau of Fleury. Louis le Gros, upon aſſociating his ſon, did the ſame. In the Firſt Regiſter of the King's Charters, fol. 166, are found letters of Louis le Gros, dated in 1116, in favour of Raymond, biſhop of Maguelonne, wherein he ſtyles himſelf, *Ludovicus, Dei ordinante providentia, Francorum imperator Auguſtus.*

The kings of England had likewiſe anciently the title of *emperors*, as appears from a charter of king Edgar: *Ego Edgarus Anglorum baſileus, omniumque regum inſularum oceani quæ Britanniam circumjacent*, &c. *imperator & dominus.*

Add, that we ſay the king of England, *Omnem habet poteſtatem in regno ſuo quam imperator vendicat in imperio*; whence the crown of England has been long ago declared in parliament to be an imperial crown.

EMPEROR, among *Hebrew Grammarians*, is an appellation given to a ſpecies of accents, ſerving to terminate a ſenſe completely, and anſwers to our point. See ACCENT.

EMPEROR *elect*, ſee ELECT.

EMPETRON, in *Botany*, a name by which ſome authors, as Dodonæus, &c. have called the kali or glaſs-wort. Ger. Emac. Ind. 2. See KALI.

EMPETRUM, in *Botany*, ſee *Berry-bearing* HEATH.

EMPETRUM, is alſo a name uſed by ſome authors for the alypum, commonly called herb-terrible.

EMPHASIS, in *Rhetoric*, a force, ſtreſs, or energy, in expreſſion, action, geſture, or the like, which performs the ſame office in ſentences as the accent does in words. The word is Greek, εμφασις, which ſignifies the ſame. See ENERGY.

Some

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Some conſider *emphaſis* as a figure, whereby a thing is repreſented in the fineſt and ſtrongeſt terms; ſuch, e. gr is that of Auguſtus, *Forum aleatorium calefecimus*; which is much more energetical, than if he had ſaid, *Studioſe multumque luſimus alea.*

The neceſſity of obſerving propriety of *emphaſis* is ſo great, that the true meaning of words cannot be conveyed without it.

Emphaſis is of two kinds, ſimple, or complex. The former ſerves to point out the plain meaning of any propoſition; the latter alſo marks ſome affection or emotion of the mind, by the uſe of which a diſcourſe receives life and ſpirit, and is rendered capable of producing the nobleſt effects. See Sheridan's Lectures on Elocution, lect. 11.

EMPHATICAL, is uſed by the *Ancient Philoſophers*, to expreſs thoſe apparent colours which are often ſeen in clouds before the riſing, or after the ſetting of the ſun; or thoſe in the rainbow, &c.

Theſe, becauſe they are not permanent and laſting, they will not allow to be true colours; but, ſince theſe *emphatical* colours are light modified chiefly by refraction, and with a concurrence of reflexions, and ſome other accidental variations; and ſince they are the proper objects of ſight, and capable as truly to affect it as other permanent colours are, there is no reaſon for excluding them from the number of true and genuine colours, ſince all other colours are only modifications of light, as theſe are.

EMPHEREPYRA, in *Natural Hiſtory*, a genus of *ſiderochita*, compoſed of various cruſts or coats, ſurrounding a nucleus of the ſame matter and ſtructure with themſelves. See SIDEROCHITA.

Of this genus we have five ſpecies. Hill's Hiſt. Foſſils, p. 532.

EMPHRACTIC, in *Pharmacy*, the ſame with *emplaſtic.*

The word is formed from the Greek, εμφρατ]ω, *I ſtop.*

EMPHRAXIS, in *Medicine*, an obſtruction in any part.

EMPHRUE, in *Botany*, the name given by the people of Guinea to a ſpecies of tree, the leaves of which they boil in wine, and give as a great reſtorative in caſes of weakneſs and decay. Its leaves are exactly of the ſhape of thoſe of the common mulberry, but they are not indented at the edge. Petiver has thence called it *arbor Guineenſis mori folio non crenato.* Philoſ. Tranſ. N° 232.

EMPHYSEMA, Εμφυσημα, from φυσαω, *I inflate*, in *Medicine*, a windy ſwelling, or bloating, of the whole outer habit of the body, like that in the parts of divers animals when blown up, after they are killed.

This word, though appropriated by ſome writers to a ſoft tumour, ariſing from air contained in the cavities of the membrana celluloſa, is uſed by Hippocrates to expreſs an inflation of the belly; and in ſome parts of his writings, in a more general ſenſe, for any tumour.

The wind, or air, which is the matter of the *emphyſema*, is lodged under the cutis, and principally in the cellulæ adipoſæ.

Hence the ſeat of the *emphyſema*, or the place wherein the wind is chiefly lodged, is in the adipoſe cells, under the ſkin covering the thorax. The ordinary occaſion is, ſome wound in the thorax, whereby the pleura is pierced, or the lungs are lacerated. Putridity is alſo a cauſe of this diſorder, as is ſeen in mortifications of the external parts, and in many inſtances of putrid fevers.

Mr. Littre accounts for it thus: when a perſon is wounded in the breaſt, there enters air in at the wound: now, it may happen, either from the narrowneſs of the wound, or the fleſh's cloſing again readily, or ſome other cauſe, that the air thus admitted cannot readily get out again, at leaſt not all of it; and thus air comes to be incloſed in the capacity of the breaſt.

Now, at every inſpiration, the lungs are to fill this capacity, by their ſwelling with the air which is naturally received; but here they cannot ſwell without preſſing upon the other extraneous air: the conſequence of which is, that this latter is made to ſlip between the interſtices of the fleſhy fibres, and perhaps to enter the little oſcula of the minuteſt veins, or lymphatics; immediately, another force comes to take place, contrary to that of inſpiration, viz. expiration: in this, the breaſt contracting itſelf, preſſes the extraneous air ſtill more than the lungs had done in their dilatation; and the two oppoſite moments, or actions, conſpire to the ſame effect.

M. Mery and Dr. Hunter are of opinion, that the air is forced into the cellular membrane only during expiration.

The air, thus continually impelled, will be propagated along the paſſages it firſt opened for itſelf, till at length it meets, and becomes collected in ſome place: now this place muſt be the cellules of the fat, rather than anywhere elſe, becauſe of the thinneſs and flexibility of their membranes; and as the air came from within the cavity of the breaſt, it will be in the fat that covers the breaſt under the ſkin; rather than elſewhere, that the windy tumor, or *emphyſema*, will lie.

Now, ſuch tumor cannot be very conſiderable, when only formed by the air received in at a wound; but if we ſuppoſe the wound to have pierced the ſubſtance of the lungs; then, beſide the air taken in by the wound, there will be part of that taken in by inſpiration; ſo much as was contained in the bronchiæ, or veſiculæ, thus perforated or opened, eſcaping into the cavity of the breaſt, and driven along with the former into the fleſh; and as a freſh quantity of this is ſupplied every moment, there will be a continual acceſſion, ſo long as the wound of the lungs remains open.

Hence, an *emphyſema*, from a wound in the lungs, ſometimes poſſeſſes the whole habit, the air being carried to all the parts of the body.

M. Littre ſuppoſes, that the air of an *emphyſema* from wounded lungs may be partly air taken up by the pulmonary veſſels, and thrown from the arteries into the cellular membrane by a kind of ſecretion; but Dr. Hunter obſerves, that this is in the higheſt degree improbable; and that there is no occaſion for having recourſe to ſuch winding and obſcure paſſages.

When theſe tumours happen in putrid diſorders, fomentations, with equal parts of ſharp vinegar and rectified ſpirit of nitre, may be applied to them; but if they are cauſed by a wound, bleeding is neceſſary, which ſhould be repeated whilſt the breathing is quick and laborious: punctures, or ſmall inciſions may be made into the cellular membrane, or in different parts of the body, with a lancet; by which operation the air will be excluded, if the tumour is gently preſſed. When the air is thus evacuated, a compreſs may be dipped in vinegar, and applied to the part which is ſuppoſed to be wounded: this may be ſecured by a tight bandage, and the patient ordered to lie on the injured ſide, in order to prevent a freſh afflux of air. Internal ſuppurations may be prevented by nitre, and pectoral emulſions. When the air is lodged in the cavity of the breaſt, Mr. Hewſon propoſes to diſcharge it by a ſmall opening made with a knife on the fore-part of the cheſt, between the fifth and ſixth ribs, on the right ſide, becauſe the integuments are thin; or between the ſeventh and eighth, or eighth and ninth ribs, on the left ſide, to avoid wounding the pericardium. Mem. Acad. Sc. 1713. Lond. Med. Obſerv. &c. vol. ii. art. 2. p. 17, &c. and vol. iii. p. 28. 33. 372. 397.

EMPHYTEUSIS, in the *Civil and Canon Law*, the letting out of poor barren lands for ever, or at leaſt for a long term of years, on condition of the tenants cultivating, meliorating, or mending them, and paying a certain yearly conſideration.

The word is formed of the Greek, εμφυτευσις, which ſignifies *an engraftment*, and by metaphor, a *melioration* or *amendment*; for as we only graft trees to mend them, ſo a man only alienates his land by *emphyteuſis*, on condition of having it amended.

Emphyteuſes are a kind of alienations, differing from ſales, in that they only transfer the *dominium utile*, the benefits of the ground, not the property, or fee-ſimple. Among the Romans they were at firſt temporary, afterwards perpetual.

The twentieth canon of the council of Carthage prohibits the biſhop's ſeizing the church's *emphyteuſis* out of the hands of private perſons, unleſs they have been three years without paying rent.

EMPIRE, the territory or extent of land under the command and juriſdiction of an emperor. See EMPEROR.

We ſay, the Roman *empire*, the *empire* of the Eaſt, the *empire* of the Weſt, or the weſtern *empire*, the *empire* of the Great Mogul, &c.

Antiquaries diſtinguiſh between the medals of the *upper* and *lower*, or *bas empire*: The curious only value thoſe of the upper *empire*, which commences with Cæſar or Auguſtus, and ends in the year of Chriſt 260.

The lower *empire* comprehends near 1200 years, reckoning as low as the deſtruction of Conſtantinople, in 1453. They uſually diſtinguiſh two ages, or periods, of the lower *empire*; the firſt beginning where the upper ends, viz. with Aurelian, and ending with Anaſtaſius, including 200 years; the ſecond beginning with Anaſtaſius, and ending with the Palæologi, which includes 1000 years. See MEDAL.

In ancient hiſtory we read of four great monarchies or *empires*, viz. that of the Babylonians, Chaldeans, and Aſſyrians; that of the Medes and Perſians; that of the Greeks; and that of the Romans. The firſt ſubſiſted from the time of Nimrod, who founded it in the year of the world 1800, according to the computation of Uſher, to Sardanapalus their laſt king in 3257, and conſequently laſted above 1450 years. The *empire* of the Medes commenced under Arbace, in the year of the world 3257,

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and was united to that of the Babylonians and Perſians under Cyrus, in the year 3468, and it cloſed with the death of Darius Codomannus in 3674. The Grecian *empire* laſted only during the reign of Alexander the Great, beginning in the year of the world 3674, and terminating with the death of this conqueror in 3681, his conqueſts being divided among his captains. The Roman *empire* commenced with Julius Cæſar, when he was made perpetual dictator, in the year of the city 708, and of the world 3956, forty-eight years after Chriſt. The ſeat of the *empire* was removed to Byzantium by Conſtantine, in the year of our Lord 334: the Eaſt and Weſt were then united under the title of the Roman *empire*, till the Romans proclaimed Charlemagne emperor, A. D. 800. From this epocha the Eaſt and Weſt formed two ſeparate *empires*; that of the Eaſt, governed by Greek emperors, commenced A. D. 802; and being gradually weakened, terminated under Conſtantine Palæologus in 1453. The weſtern *empire* was afterwards known by the appellation of the *empire* or German *empire*.

EMPIRE, or *the* EMPIRE, uſed abſolutely, and without any addition, ſignifies the *empire* of Germany, called alſo in juridical acts and laws, the *holy Roman empire*, *S. R. I.* q. d. *ſacrum imperium Romanum*, which conſtitutes what we otherwiſe call the *Germanic body*.

The *empire* had its beginning with the ninth century; Charlemagne being created firſt emperor by pope Leo III. who put the crown on his head in St. Peter's church on Chriſtmas-day, in the year 800.

Authors are at a loſs under what form of government to range the *empire*; ſome of them will have it a monarchical ſtate, becauſe all the members thereof are obliged to aſk the inveſtiture of their ſtates of the emperor, and to take an oath of fidelity to him.

Others maintain it a republic, or ariſtocratic ſtate, becauſe the emperor cannot reſolve or determine any thing, without the concurring ſuffrages of the princes. It is added, that if they require inveſtiture from, and ſwear fealty to him, it is only as head of the republic, and in the name of the republic, and not in his own; juſt as at Venice, every thing is tranſacted in the name of the doge. See DOGE.

Laſtly, others will have the *empire* to be a monarcho-ariſtocratic ſtate, i. e. a mixture of monarchy and ariſtocracy; becauſe, though the emperor in many caſes ſeems to act ſovereignly, yet his decrees and reſolves have no force, in caſe the ſtate refuſe to confirm them.

In fine, we ſhould rather chooſe to call it an ariſtodemocratic ſtate, becauſe the diet, wherein the ſovereignty is lodged, is compoſed of princes, and the deputies of the cities; and is divided into three orders, or bodies, called *colleges*, viz. the college of electors, the college of princes, and the college of cities.

We ſay, diet of the *empire*, circles of the *empire*, fiefs of the *empire*, princes of the *empire*, eſtates of the *empire*, members of the *empire*, capitulations of the *empire*, receſſus of the *empire*, &c. See DIET, CIRCLE, PRINCE, CAPITULATION, and RECESSUS.

The ſtates or eſtates of the *empire* are of two kinds, *mediate* and *immediate*. The *immediate* ſtates are thoſe who hold immediately of the *empire*, whereof, again, there are two kinds; the firſt, ſuch as have ſeats and voices in the imperial diet; the ſecond, ſuch as have none. The *mediate* ſtates are thoſe who hold of the *immediate*.

The ſtates which now compoſe the *empire* are the princes of the *empire*, the counts of the *empire*, the free barons of the *empire*, the prelates of the *empire*, the princeſſes or abbeſſes of the *empire*, the nobles of the *empire*, and the imperial cities.

EMPIRIC, a name given by antiquity, to ſuch phyſicians as formed for themſelves rules and methods on their own practice and experience, and not on any knowledge of natural cauſes, or the ſtudy of good authors; and who preſcribed, without inquiring into the nature of the diſeaſe, or the properties and virtues of their medicines; depending wholly on the authority of ſome general experienced remedies.

The word is formed of the Greek, εμπειρικος, and that of εμπειρος, *knowing*, *able*; but particularly, knowing and learned by experience; the root being πειρα, *eſſay*, or *experiment*.

Medicine was almoſt altogether in the hands of *empirics* till the time of Hippocrates, who firſt introduced reaſon, and the uſe of theory therein; and hence there aroſe a new ſect, called *theoretici*.

Pliny relates, that the ſect of *empirics* had its riſe in Sicily; the firſt who profeſſed it, he ſays, were Apollonius and Glaucias; others ſay, Acron Argentinus. They and their followers made great oppoſition to the diſſection of human bodies; and particularly to that practiſed by Herophilus and Eraſiſtratus, on living bodies of criminals who were condemned to death: but the word *empiric* is now more odious than ever, being confounded with that of *charletan* or *quack*, and applied to perſons who practiſe phyſic at random, without a proper education, or underſtanding any thing of the principles of the art.

Indeed it is poſſible, the word may be abuſed even on this ſide of the queſtion; for thoſe of the phyſicians ſervilely attached to the train and method of the ſchools, the reaſonings of Hippocrates and Galen, and the ſtatutes of the faculty, we all know, have been ever forward to treat thoſe who think more freely, and are leſs ſtifly devoted to antiquity, cuſtom, and the reigning practice or mode, as *empirics*, charletans, and quacks. See MEDICINE.

EMPIS, in *Natural Hiſtory*, the name given by authors to a large ſpecies of gnat, found about rivers and ponds; it is diſtinguiſhed from all other kinds, by a circle of white paſſing round the middle of its body.

EMPLASTER, popularly called PLASTER, a medicine of a ſtiff, glutinous conſiſtence, compoſed of divers ſimple ingredients, ſpread on leather, or linen, and applied externally.

The word is formed from the Greek, εμπλαττω or εμπλασσω, *to put in a maſs*, or *to ſmear over*, becauſe the *emplaſter* is made of divers kinds of ſimple drugs, worked up into a thick tenacious maſs; or becauſe it covers over the piece of leather or linen to be applied on the part affected.

Emplaſters are made up in a ſtrong ſolid body, that by remaining a long time on the part, the medicinal ingredients they are chiefly compoſed of, may have time enough to produce their effect.

The drugs uſed to give a body and conſiſtence to *emplaſters*, are uſually wax, pitch, gums, fats, litharge, and other preparations of lead.

There are *emplaſters* of divers kinds, and uſed with divers intentions; ſtomachic *emplaſters*; cephalic, ſtyptic, hepatic, diaphoretic, reſolutive, deterſive, emollient, incarnative, aſtringent, conglutinative, &c. *emplaſters*.

In the preſcription of extemporaneous *plaſters*, the greateſt regard is to be had to that particular conſiſtence which the part can moſt conveniently bear, whereupon the application is to be made. Thus, plaſters to the breaſt and ſtomach, eſpecially in the intention of emollients or diſcutients, ſhould be yielding and ſoft, as in the officinal *emplaſtrum ſtomachicum*; but to the loins, or any of the limbs, where warm diſcutients and ſtrengtheners are to be applied, an higher and more adheſive conſiſtence is to be ſought for. The emollient plaſters likewiſe ſhould be laid on thick, and frequently repeated, if the ſymptoms continue, becauſe their better parts are ſoon ſpent. Diſcutients alſo applied to hard tumours, require repetition; but the ſtrengtheners, which are purpoſely contrived of a ſtrong adheſive conſiſtence, are permitted to lie on till they grow dry, and come off ſpontaneouſly. In ſome flatulent tumours, where *a plaſter* alone will not prevail, they are at intervals taken off, and diſcutient fomentations or lotions made uſe of; ſuch as are compoſed of bitters, carminatives, comprehending alſo lixivial ſalts or alcaline ſpirits.

EMPLASTRUM *adhæſivum*, *adheſive plaſter*, is prepared by melting together half a pound of the common plaſter with a quarter of a pound of Burgundy pitch. The black ſticking-plaſter, called the lady's court-plaſter, is formed by diſſolving twelve ounces of the gum benjamin in twelve ounces of rectified ſpirit of wine, and ſtraining the ſolution. In a ſeparate veſſel, diſſolve a pound of the beſt iſinglaſs in five pints of pure water; and after ſtraining this ſolution, mix it with the former, and let them ſtand in a narrow veſſel, that the groſſer parts may ſubſide: when the liquor is cold, it will become a jelly, which will melt near the fire when it is to be ſpread. This quantity will be ſufficient for ſpreading on ten yards of half-yard wide ſilk; in order to which, the ſilk muſt be ſtretched in a frame, and the mixture may be ſpread upon it with a ſponge or bruſh, which ſhould be done near a fire. As each ſpreading dries, it muſt be repeated to the tenth or twelfth time, and then touched lightly with the bruſh to give it a gloſs. The following more ſimple preparation may be ſubſtituted for the former: diſſolve a pound and a quarter of fine iſinglaſs in five pints of water, and before it cools ſpread it on ſilk in the manner above directed.

EMPLASTRUM *anodynum*, *anodyne plaſter*, is prepared by melting an ounce of the adheſive plaſter; and, whilſt it is cooling, mixing with it a dram of powdered opium, and the ſame quantity of camphor, previouſly rubbed up with a little oil. This plaſter gives relief in acute pains, eſpecially of the nervous kind.

EMPLASTRUM *attrahens*, the *drawing-plaſter*, a plaſter ordered in the late London Pharmacopœia, to ſupply the

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place of the melilot-plaſter, in the dreſſing of bliſters. The college are ſatisfied, that the herb is of no ſort of uſe in the compoſition; and that very groſs abuſes are practiſed to give the green colour to the plaſter; for which reaſon they have ordered the plaſter to be now made in this manner: take yellow reſin, and yellow wax, of each three pounds; tried mutton-ſuet, one pound; melt all together, and ſtrain the mixture while it is hot. Pemberton's Lond. Diſp. p. 351.

EMPLASTRUM *commune*, a name given in the new London Pharmacopœia, to what has been long called *diachylon-plaſter*. The apothecaries had been long uſed to make this by a ſhorter way than has been preſcribed them; and the college has now authorized that method, ordering it to be made of only a gallon of oil of olives, and five pounds of litharge, boiled together, with about a quart of water, to keep them from burning, till they are perfectly mixed, and have the conſiſtence of a plaſter. Pemberton's Lond. Diſp. p. 352.

This plaſter is generally applied to ſlight wounds and excoriations of the ſkin; it keeps the part ſoft and warm, and defends it from the air, which is all that is neceſſary in ſuch caſes.

EMPLASTRUM *ex ammoniaco cum mercurio*, a form of medicine in the late London Diſpenſatory, ordered to be prepared in the following manner:

Take gum ammoniacum, ſtrained, a pound; quickſilver, three ounces; ſimple balſam of ſulphur, a dram: rub the quickſilver with the balſam of ſulphur till it no longer appear; then add by degrees the gum ammoniac melted, and almoſt cooled again, and make the whole into a plaſter. Pemberton's Lond. Diſp. p. 351.

This plaſter is recommended in pains of the limbs, ariſing from a venereal cauſe. Indurations of the glands, and other violent tumours, are likewiſe found ſometimes to yield to it.

EMPLASTRUM *gummi*, *gum-plaſter*. Take of the common plaſter, four pounds; gum ammoniac and galbanum, ſtrained, of each half a pound; melt them together, and add ſix ounces of Venice turpentine. This is uſed as a digeſtive, and for diſcuſſing indolent tumours.

EMPLASTRUM *roborans*, the *ſtrengthening-plaſter*, a form preſcribed in the London Diſpenſatory, and ordered to be made thus: take of the common plaſter, two pounds; of frankincenſe, half a pound; of dragon's blood, three ounces; melt the plaſter, and then add to it the other ingredients in powder. Pemberton's Lond. Diſp. p. 358.

EMPLASTRUM *ſtomachium*, *ſtomach plaſter*. Take of gum-plaſter, half a pound; camphorated oil, an ounce and a half; black pepper, or capſicum, one ounce: melt the plaſter, and mix with it the oil; then ſprinkle in the pepper, reduced to a powder. An ounce or two of this plaſter, ſpread on ſoft leather, and applied to the region of the ſtomach, will be of ſervice in flatulencies, ariſing from hyſteric and hypochondriac affections; a ſmall quantity of the expreſſed oil of mace, or a few drops of the eſſential oil of mint, may be rubbed upon it before it is applied. Buchan's Domeſtic Med. p. 737.

EMPLASTRUM *veſicatorium*, *bliſtering-plaſter*. Take of Venice turpentine, ſix ounces; yellow wax, two ounces; Spaniſh flies, in fine powder, three ounces; powdered muſtard, one ounce: melt the wax; and while it is warm, add the turpentine, taking care that it be not too much evaporated by heat. After the turpentine and wax are ſufficiently incorporated, ſprinkle in the powders, continually ſtirring the maſs till it be cold. Buchan. p. 736. See BLISTER.

EMPLASTICS, in *Pharmacy*, are ſalves, or medicines, which ſtop up and conſtipate the pores of the parts they are applied on; otherwiſe called *emphractics*.

The word is formed from the Greek, εμπλασσειν, *to ſtop up*.

Such are fats, mucilages, wax, the whites of eggs, &c.

EMPLASTRA *amyntica*. See AMYNTICA.

EMPNEUMATOSIS, from εμπνεω, *I inflate*, in *Medicine*, a word uſed by ſome writers to ſignify an inflation of the ſtomach; but by others, in a more general ſenſe, for inflations of the womb, or of any other part.

EMPORETICA *charta*. See CHARTA and PAPER.

EMPORIUM, in *Medicine*, is often uſed for the common ſenſory in the brain. See BRAIN.

EMPRIMED, among *Sportſmen*, a term applied to a hart, when he forſakes the herd.

EMPRION, from πριω, *to ſaw*, in the *Medical Writings of the Ancients*, a word uſed to denote a peculiar pulſe, in which the artery is felt to be diſtended in one part more than another at every ſtroke, and by that means is made to reſemble any ſerrated body, or the light teeth of a fine ſaw.

EMPROSTHOTONOS, in *Medicine*, a kind of tonic convulſion, wherein the head is drawn forwards, till the chin touch the breaſt.

The word is Greek, compoſed of εμπροσθεν, *before*, and τονος, *tenſion, ſtiffneſs*, of the verb τεινω, *I ſtretch*.

Sometimes too, it is ſo general, that the whole body is bent forward, and makes a kind of bow; and even ſometimes a kind of circle, the knees meeting the head.

The cauſe of this diſorder is a contraction of the anterior muſcles, particularly thoſe of the head, called *maſtoides*.

EMPTOR *familiæ*, *buyer of a family*, in the *Roman Law*, one who purchaſed the inheritance of a perſon, or the privilege of being appointed his heir by will.

This was done with the ceremony of ſcales and weights, before five witneſſes, with the uſe of a peculiar formula of words.

Such *buyer* differed from the heir, *hæres*, as the teſtator in ſome meaſure alienated the right to the former during his own life-time, whereas the latter had only a right by his death. Briſſon. de Formul. lib. vii. p. 585. Pitiſc. Lex. Ant. tom. i. p. 713, voc. *Emptor*.

EMPTOR *fiduciarius*, *fiduciary buyer*, one who receives a thing in the way of pledge, till the money he has advanced be repaid. Salmaſ. de Mod. Uſur. cap. 14. Pitſc. Lex. Ant. tom. i. p. 713. voc. *Emptor*.

EMPUSA, Εμπουσα, among the ancients, a kind of hob-goblin, or bugbear, under the direction of Hecate, who uſed to ſend it to frighten people who laboured under misfortunes. Hofm. Lex. in voc.

EMPYEMA, in *Medicine*, a collection of pus, or purulent matter, in the cavity of the breaſt, diſcharged thither upon the burſting of ſome abſceſs or ulcer in the lungs, or membranes that incloſe the breaſt; or formed from that inſpiſſated ſerum, which Dr. Hunter obſerves is found in large quantities in the cavities of the breaſt, belly, &c. Lond. Med. Obſ. &c. vol. ii. p. 61.

The word is formed of the Greek, εν, *in*, and πυον, *pus*, the letter ν being here changed into μ, a thing often done when the *n* happens to come in compoſition before the labials *b p*; as in the words *embamma*, *emblema*, *emporium*, &c.

The *empyema* ſometimes ſucceeds a quinſey, ſometimes a peripneumony, but more uſually than either, a pleuriſy, as being ordinarily the effect of a peripneumonic or pleuritic abſceſs.

It uſually comes fifteen or twenty days after thoſe diſeaſes. Sometimes, alſo, it is generated of extravaſated blood, iſſued out of a burſten, broken, or putrified vein; it is diſtinguiſhed by a difficulty of breathing, a dry cough, a heavineſs about the diaphragm, a noiſe, and fluctuating of the matter upon moving; a ſlow fever, ruddy cheeks, hollow eyes, the tips of the fingers hot, and a ſwelling of the abdomen.

The cure is difficult, from the difficulty of abſorbing or evacuating ſuch extravaſated matter: if nature ſhews any endeavour to throw it off by vomiting, or urine, or the like, ſhe muſt be ſeconded, and aſſiſted therein. Thus, if the urine be purulent, adminiſter diuretics; if the ſtools, laxatives; if the ſpitting, expectorants, or even emetics; otherwiſe, recourſe muſt neceſſarily be had to a PARACENTESIS, or tapping.

In order to this, an aperture muſt be made in the thorax, by a proper inſtrument, on the ſide affected, between the third and fourth ſpurious ribs on the right ſide; but on the left, between the ſecond and third, and about half or two-thirds of the diſtance from the ſternum to the vertebra, becauſe here the muſcles are thinneſt, the artery is concealed under the rib, and the diaphragm is at a due diſtance; and through this the pus muſt be ſlowly drawn.

This operation takes its name from the diſeaſe, *empyema*.

There is alſo a kind of *ſpurious*, or *baſtard empyema*, proceeding from a pituitous, or ſerous humour, brought by ſome duct or paſſage into the thorax; where corrupting, it degenerates into a matter like pus.

An *empyema*, in courſe of time, breeds a phthiſis; and death is often the conſequence.

EMPYREUM, among *Divines*, denotes the higheſt of the heavens, where the bleſſed enjoy the beatific viſion; called alſo *empyrean heaven*, and *paradiſe*.

The word is formed of εν and πυρ, *fire*, becauſe of its ſplendour.

EMPYREUMA, Εμπυρευμα, in *Chemiſtry*, &c. a ſmell or taſte of burning; a quality, or change in bodies that have been burnt, or much ſcorched with fire, ſenſible to the taſte and ſmell; or perhaps it may be ſome extraneous matter impreſſed, or added by the fire, and remaining on the burnt or ſcorched part, that gives the new offenſive ſmell and flavour.

The word is formed of the Greek, εμπυρευειν, *to inflame, kindle*.

The term is chiefly uſed when in boiling or diſtilling any thing,

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thing, it ſticks and burns to the bottom of the veſſel, or alembic; the offenſive ſmell and taſte whereof are expreſſed by the word *empyreuma*. This term properly denotes the ſmell of burnt oils; and no other but oily ſubſtances can produce it; and it is peculiar to burnt animal and vegetable matters. The *empyreumatic* ſmell is therefore made a teſt of the exiſtence of oil in the ſubſtances which emits it.

EMPYREUMA, is alſo uſed for the heat remaining upon the declenſion of a fever.

EMRODS, or rather *Hæmorrhoids*. See HÆMORRHOIDS.

EMULATION, is a generous ardour kindled by the brave examples of others, which impels us to imitate, to rival, and, if poſſible, to excel them. This paſſion involves in it eſteem of the perſon whoſe attainments or conduct we emulate, of the qualities and actions in which we emulate him, and a deſire of reſemblance, together with a joy ſpringing from the hope of ſucceſs.

The word comes originally from the Greek, αμιλλα, *diſpute, conteſt*; whence the Latin, *æmulus*, and thence our *emulation*.

Plato obſerves of *emulation*, that it is the daughter of envy; if ſo, there is a great difference between the mother and the offspring; the one is a virtue, and the other a vice. *Emulation* admires great actions, and ſtrives to imitate them; envy refuſes them the praiſes that are their due; *emulation* is generous, and only thinks of ſurpaſſing a rival; envy is low, and only ſeeks to leſſen him.

Perhaps, therefore, it would be more juſt to ſuppoſe *emulation* the daughter of admiration: admiration, however, is a principal ingredient in the compoſition of it.

EMULGENT, in *Anatomy*, an epithet beſtowed on thoſe arteries which bring the blood to the kidneys, and thoſe veins which carry back what is ſuperfluous to the cava. See *Tab. Anat. (Angeiol.) fig.* 1. *n.* 49. *fig.* 6. *lit. s. s.*

The *emulgent* arteries ſpring from the deſcending trunk of the aorta; and the *emulgent* veins terminate in the aſcending trunk of the cava.

EMULSION, from *emulgere, to milk*, in *Medicine*, a ſoft liquid remedy, of a colour and conſiſtence reſembling milk. It is compoſed of oleaginous ſeeds, kernels, or fruits, gum reſins, and gummy or reſinous juices, pounded in a mortar, and diſſolved in diſtilled waters, or light decoctions, and afterwards expreſſed, or ſtrained or ſweetened with ſugar or ſyrup.

Emulſions ſerve to temper, dilute, and ſoften acrimonies of the breaſt; to moderate the heat of the kidneys; ſoften the ſharpneſs of the urine, and give the patient reſt and eaſe. They ſerve likewiſe as vehicles for certain ſubſtances which could not otherwiſe be conveniently taken in a liquid form. The common *emulſion* is made by blanching an ounce of ſweet almonds and a dram of bitter almonds, and beating them in a marble mortar; adding gradually the quantity of two pints of water, and ſtraining the liquid. If two ounces and a half of the mucilage of gum arabic are added to the almonds whilſt they are pounded in the mortar, we ſhall have the arabic *emulſion*. Theſe *emulſions* may be uſed as ordinary drink, in caſes which require ſoft cooling liquors. The camphorated *emulſion* is prepared by grinding half a dram of camphor, and half a dozen ſweet almonds together in a ſtone mortar, and adding by degrees eight ounces of mint water; ſtraining the liquor, and diſſolving in it half an ounce of white ſugar. A table-ſpoonful of this *emulſion* may be taken in fevers, and other diſorders which require the uſe of camphor, every two or three hours. The *emulſion* of gum ammoniac is made by grinding two drams of the gum with eight ounces of water poured gradually upon it till it is diſſolved.

This *emulſion* is uſed for attenuating viſcid phlegms, and promoting expectorations. In obſtinate coughs, two ounces of the ſyrup of poppies may be added to it. It may be adminiſtered in a doſe of two table-ſpoonfuls, three or four times a day. The oily *emulſion*, prepared by mixing ſix ounces of ſoft water with two drams of volatile aromatic ſpirit, and an ounce of Florence oil, and half an ounce of ſimple ſyrup, is ſerviceable in recent coughs: in more obſtinate coughs, it will be better to ſubſtitute for the aromatic ſpirit the paregoric elixir of the Edinburgh Diſpenſatory. A table-ſpoonful of it may be taken every two or three hours. Buchan's Dom. Med. p. 716, &c.

EMUNCTORY, from *emungere, to wipe away*, or *drain off*, in *Anatomy* and *Medicine*, a part of the body deſtined for the ſeparation of ſome humour judged uſeleſs, or even hurtful to the animal, after its having circulated ſome time with the blood.

The term *emunctory* alſo implies a cavity adjoining to the part that ſeparates, wherein the excrementitious humour is collected, and preſerved in readineſs for evacuation.

The kidneys, urinary bladder, and miliary glands of the ſkin, are *emunctories*; the parotides are not properly *emunctories*, becauſe deſtined to ſeparate the ſaliva, which is no uſeleſs or excrementitious humour, but neceſſary for the digeſtion of the food.

Some, without much propriety, confine *emunctory* to the receptacle into which the ſecreted excrement is diſcharged; as the pituitous humour of the brain into the noſtrils, the cerumen into the ears, the excrements into the inteſtines, &c. though theſe laſt have not undergone any circulation.

ENÆMON, Εναιμων, from αιμα, *blood*, an external medicine which ſtops or ſtanches the blood; or which, by binding, cooling, or drying, cloſes the paſſages of the veſſels before open, or diminiſhes the fluidity and motion of the blood. See STYPTIC.

ENÆOREMA, Εναιωρημα, from αιωρεω, *to exalt*, expreſſes ſuch contents of the urine as float about in the middle, reſembling a cloud; and thence alſo called NUBECULA. See URINE.

ENALLAGE, in *Rhetoric*, a figure whereby we change and invert the order of the terms in a diſcourſe, againſt the common rules of language.

The word is derived from the Greek, εναλλαγη, formed of εναλλαττειν, which ſignifies *to change*, as well as the ſimple verb αλλαττειν.

The grammarians too, have a kind of *enallage*, whereby one part of ſpeech, or one accident of a word, is put for another.

Such is the change of a pronoun, as when a poſſeſſive is put for a relative, e. gr. *ſuus* for *ejus*; or of a verb, as when one mood or tenſe is put for another.

ENALURON, in *Heraldry*, is uſed by Guillim to expreſs a bordure charged with birds; as an *enaluron* of martlets, &c. but Mackenzie charges this as a miſtake ariſing from ignorance of the French tongue; *enaluron* properly ſignifying orle, or in manner of a bordure, and being applicable to a bearing of any thing in that form.

ENAMEL *of the teeth*. See TEETH.

ENAMEL, popularly AMEL, a kind of metalline colour, by the Latins called *encauſtum*; uſed in enamelling, and painting in *enamel*.

Enamels are glaſſes containing ſome opake ſubſtance, that is either unvitrifiable or incapable of being vitrified with the degree of heat requiſite for the fuſion of ordinary glaſs. They are generally compoſed of glaſs, mixed with metallic calxes.

The common matter, which is the baſis of all *enamels*, is thus made: take fine lead, thirty pounds; and the ſame quantity of fine tin; calcine theſe together in a kiln, then ſift them; boil this powder in water, in clean earthen veſſels, and pour off the water, which will carry with it the finer part of the calx; put freſh water on the remainder, boil it again, and pour off in the ſame manner: do this ſo long as the water will carry off any part of the calx. Re-calcine the remaining matter, and waſh off its finer part in the ſame manner again, then evaporate all the waters which have waſhed off the finer calx, and keep the fire low towards the end of the operation, that the calx may not be waſted: this will be found at the bottom, of an extreme fineneſs.

Take of cryſtal frit, made with tarſo, and of this fine calx, each fifty pounds; white ſalt of tartar, eight ounces; powder and ſift theſe, and mix them well. Put this mixture into a new earthen-pot, give it a fire for ten hours, then powder it, and keep it in a dry covered place.

This is the common plain *enamel*, or matter of which all the other *enamels* are to be made. In making theſe, the following general cautions are neceſſary to be obſerved. 1. That the pots muſt be glazed with white glaſs, and muſt be ſuch as will bear the fire. 2. That the matter of *enamels* muſt be very nicely mixed with the colours. 3. When the *enamel* is good, and the colour well incorporated, it muſt be taken from the fire with a pair of tongs. 4. The general way of making the coloured *enamels* is this: powder, ſift, and grind all the colours very nicely, and firſt mix them well with one another, then with the common matter of *enamels*; then ſet them in pots in a furnace; and when they are well mixed and incorporated, caſt them into water; and when dry, ſet them in the furnace again to melt; and when melted, take a proof of them. If too deep coloured, add more of the common matter of the *enamel*; and if too pale, add more of the colour.

We may diſtinguiſh three kinds of *enamel*; the firſt intended for the counterfeiting and imitating of precious ſtones; the ſecond, for painting in *enamel*; and the third uſed by the enamellers, jewellers, and goldſmiths, on gold, ſilver, and other metals; with which laſt kind, particularly the white, it is that the makers of the Dutch ware give the gloſs to their works.

The *enamels* uſed in imitating precious ſtones, and thoſe for painting, are uſually prepared by the workmen themſelves,

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ſelves, employed in thoſe arts; the reſt are brought from Venice and Holland. The compoſition is the ſame in the main in all the three kinds; all the difference conſiſts in giving the colour or tranſparency.

ENAMELS *for painting.*

ENAMEL, *azure blue.* To make this, take of the common matter of *enamels*, four pounds; zaffer prepared, two ounces; braſs thrice calcined, or calcined copper, forty-eight grains: mix all theſe well together, and melt them in the furnace in the uſual way. Neri's Art of Glaſs, p. 150.

ENAMEL, *turquois blue*, is prepared by a mixture of ſix pounds of the baſis of *enamels*, with three ounces of calcined copper, ninety-ſix grains of zaffer, and forty-eight grains of magneſia.

ENAMEL, *black.* To make the black *enamel*, take of the common matter of *enamels*, four pounds; tartar, four ounces; magneſia, two ounces: grind and mix theſe powders well with the matter of the *enamel*, then ſet them in a furnace in a large pot; when melted and refined, caſt them into water; and putting them again into the furnace, let them refine.

Or an excellent black *enamel* may be prepared by mixing equal quantities of magneſia, zaffer, and ſcales of iron, and adding one part of this mixture to fifteen or twenty of the baſis of *enamels*. Lewis's Com. Ph. Tech. p. 442.

ENAMEL, *the ruddy brown*, is made with fæces of vitriol and ſalt-petre, or with iron ruſt, well ground on an agat, with oil of ſpike.

ENAMEL, *green.* To make this, take of the common matter of *enamels*, four pounds; melt it, and caſt it into water; return it again to the furnace, and when purified, add braſs thrice calcined, or calcined copper, two ounces; crocus martis, made with vinegar, or ſcales of iron, forty-eight grains. Mix theſe firſt in fine powder, and put this in at three ſeveral times; when all is well incorporated, take it from the fire.

ENAMEL, *milk-white.* To make this uſeful colour in *enamels*; take of the common matter of *enamels*, ſix pounds; magneſia, prepared, forty-eight grains; melt them in the furnace, caſt the whole into water, and afterwards return it again into the furnace; and when refined, uſe it. See DELF-*ware*.

ENAMEL, *purple.* To make this, take of the common matter of *enamels*, ſix pounds; of magneſia, three ounces; braſs, thrice calcined, or calcined copper, ſix ounces; mix all well together, and ſet them in a furnace, let them refine, then caſt them into water; return the matter to the furnace again, and when thoroughly melted, take it out for uſe.

This mixture, with a ſmall proportion of braſs, makes the red *enamel.*

Vermilion red is made with vitriol calcined between two crucibles, luted together; then waſhed in aqua fortis, and afterwards in fair water: the fire is to be moderate, and to remain about half an hour.

The *lake red* is compoſed of fine gold, diſſolved in aqua regia, with ſal ammoniac, or common ſalt. The diſſolution being completed, it is put in a cucurbit with ſpring-water and mercury, over hot ſand for twenty-four hours. Some uſe a ſolution of pure block-tin, in aqua regia; and others crude tin, to precipitate the gold. The powder remaining at the bottom of the cucurbit, when the water is poured off, is ground up with double its weight of flower of ſulphur, and put in a crucible over a gentle fire; and when the ſulphur which takes fire, is exhaled, the red powder remaining is ground with rocaille.

ENAMEL, *violet-coloured.* The method of making the violet-coloured *enamel* is this: take of the common matter of *enamels*, ſix pounds; of magneſia, prepared, three ounces; of thrice calcined braſs, or calcined copper, forty-eight grains: mix the two powders well together; then mix the whole, put them into the furnace, and when refined, caſt them into water, return the water again to the furnace, and when refined take it out. Neri's Art of Glaſs, p. 157.

ENAMEL, *yellow.* To make this, take of the common matter of *enamels*, ſix pounds; of tartar, three ounces; of magneſia, ſeventy-two grains: mix all well together, and put them into the furnace in a large pot; when refined, caſt them into water, then return them to the furnace again; and when melted, take it out for uſe.

Laſtly, white copperas, calcined, makes a colour much like the amber-colour uſed by limners. See a Collection of Receipts for making ſeveral Kinds of *Enamel* of different Colours and Teints in, Doſſie's Handmaid to the Arts, vol. i. § 6. p. 336, &c. and Neri's Art of Glaſs, with Merret's Notes, and a Commentary by Kunkel, from which moſt of the above receipts are extracted.

ENAMELS, uſed by the jewellers, goldſmiths, and enamellers. Theſe, we have obſerved, come chiefly from Venice and Holland; they are in little thin cakes of different ſizes, uſually four inches in diameter, and half an inch thick. Every cake has the maker's mark ſtruck on it with a puncheon. The moſt uſual marks are the name Jeſus, a ſiren, monkey, ſun, &c.

Thoſe brought from Venice are chiefly white, ſlate-colour, ſky-blue, carnation, yellow, green, and a deep blue, called a *falſe lapis.* Theſe ſeven are the principles of all the others, which ariſe out of the mixture of theſe; and the white, in particular, is, as it were, the baſis of all the other ſix principal colours.

White is made, as already obſerved, of cryſtal glaſs, tin, and lead, calcined by a reverbatory fire: and this *enamel* is uſed not only by the jewellers and enamellers on metal, but alſo by the painters in *enamel*, the makers of Dutch ware, &c. By adding azure thereto, it becomes a ſlate-colour; by adding copper and Cyprus vitriol, it makes a ſky-blue; by perigueux, a fleſh-colour; and, by iron-ruſt, a yellow: to make a green, they add copper-filings, &c.

ENAMELLING, the art or act of applying *enamels* of various colours on metals, &c. either in the way of painting, or by the lamp. It has been thought, that this is the ſame with the encauſtic painting of the ancients; but modern diſcoveries have evinced the contrary. See ENCAUSTIC *Painting.*

Painting in ENAMEL, is a method of painting with *enamels*, or metalline colours, ground, reduced to powder, and uſed like other colours with a pencil; then fuſed, baked again, and vitrified by force of fire.

The art of *painting in enamel*, or at leaſt of giving colours to glaſs, whence this method of painting was derived, is very ancient, and appears to have been firſt practiſed on earthen veſſels, or potters-ware. As early as in the age of Porſenna, king of Tuſcany, we hear of beautiful vaſes made in his territories, enamelled with various figures, though far ſhort of thoſe afterwards made at Faenza, and Caſtel Durante, in the duchy of Urbino, in the time of Raphael and Michael Angelo. There are ſtill ſome of thoſe vaſes extant in the cabinets of antiquaries; in all which, the deſign, or drawing of the figures, is much better than the colouring; for they were at that time only acquainted with two colours, viz. black and white, either for earthen or metal works, excepting a faint kind of carnation for the faces and other parts.

In the time of Francis I. of France, the art was retrieved in that country, particularly at Limoges, where there were produced abundance of very valuable pieces, in the manner of the ancients; that is, well performed as to the draught, and the clair-obſcure chiefly in two colours.

There are two ways of *painting in enamel*; the one with clear and tranſparent, and the other with thick and opake colours. To uſe the firſt, they are only ground up with water; the ſecond are ground up with oil of ſpike. The firſt are laid on the metal flat, and bordered, or edged with a rim of metal, to keep the colours aſunder; though we have ſeen pieces laid on contiguous, and without any partition, which is very difficult to practiſe, becauſe the tranſparent colours in melting are apt to run into each other, eſpecially in the ſmaller works.

The invention of opake colours is much later, and is greatly preferable to that of tranſparent ones. All metals, however, will not equally admit of both kinds: copper, for inſtance, which bears all the opake colours, will not bear the tranſparent ones; but to employ theſe latter upon copper, they are forced firſt to cover it with a layer or couch of black *enamel*; over which they lay a ſilver leaf, and on this apply the other ſuitable colours; that is, the colours or *enamels* proper for ſilver, which itſelf does not allow of all kinds.

Thoſe which ſuit it beſt are purple, green, azure, and aqua-marina; but gold receives all the kinds and colours, both opake and tranſparent, perfectly well. It muſt be added, however, that only the fineſt gold muſt be uſed herein; for the tranſparent colours being laid on a baſe gold, grow dim and livid; there being a kind of ſmoke that ſettles on it, not unlike black lead.

Of tranſparent *enamels*, the hardeſt are always the beſt; though there is a difference even among theſe; ſome loſing their colour in the fire, and others retaining it. As to the reds, they are only red by accident, being yellow when made, and applied on the gold, and becoming red in the furnace. The beſt tranſparent reds are thoſe made of calcined copper, iron-ruſt, orpiment, and calcined gold, melted, with the due proportions of ſand and ſalt of glaſs.

But it is the method of painting with opake or thick *enamel*, to which we owe all our fine modern pieces of *enamel*, particularly thoſe curious ones on gold, repreſenting portraits, to as much perfection as the beſt painting in oil; and even ſome hiſtory-pieces; with this great advantage, that their beauty and luſtre never decay,

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decay, being equally ſecure from injuries of time and weather.

This art we are indebted for to the French; nothing of the kind having been attempted before the year 1632, when James Toutin, a goldſmith, of Chaſteaudun, and a great maſter in the common way of painting with tranſparent *enamel*, firſt applied himſelf to find a way to uſe thick colours of different teints, which ſhould melt with fire, and yet retain their luſtre, purity, &c.

Toutin ſucceeded in his attempt; and having got the ſecret, communicated it to his fellow-artiſts, who, in their turns, contributed to the bringing it to perfection: the firſt who diſtinguiſhed himſelf was Dubie, a goldſmith, who wrought in the galleries of the Louvre. After him came Moliere, a native of Orleans, who applied himſelf chiefly to the painting on rings and watch-caſes. His diſciple, Robert Vauquer, of Blois, exceeded them all, both in his deſigns and his colours. After him, Pierre Chartier of Blois applied himſelf to the painting of flowers, wherein he ſucceeded to admiration.

By this time the Engliſh were fallen into the way; who, as is allowed by foreigners themſelves, ſeem to have been the firſt who applied it with ſucceſs to the painting of portraits.

M. Eelibien obſerves, that the firſt, and moſt finiſhed portraits, and thoſe in the fineſt colours, were brought into France by Petitot and Bordier, from England. This occaſioned Louis Hance and Louis de Guernier (two good painters in miniature) ſoon after to attempt the like; in which the latter ſucceeded beyond every body. He likewiſe invented ſeveral new teints for the carnations; and, had he lived, had probably merited the glory of carrying the art to its laſt perfection.

This kind of painting, to be in perfection, muſt be on plates of gold; for copper, beſide that it emits a fume which tarniſhes the colours, is apt to ſcale and crackle; and ſilver turns the whites yellow; though it is often performed on plates of copper, enamelled with the white *enamel*.

Theſe plates are made a little hollow one ſide, and raiſed on the other, either in a circular or oval manner, to prevent the gold's fretting by the fire, and making the colours crack and fly; nor muſt they be made too thick; it is ſufficient they can bear the colours, though it is uſual to ſtrengthen them all round with a circle ſomewhat thicker.

The plate being hammered very evenly throughout, they apply a white *enamel* on both ſides, though the deſign be only to paint on one of them: the intent of this is to prevent any ſwelling and warping by the fire; for, otherwiſe, in large pieces, and eſpecially if the colours be laid on any thing unequally, they are apt to riſe up in puffs or bliſters. Now, this firſt lay, which is white, remaining ſmooth and uniform, ſerves as a ground for all other colours. The compoſition of the white *enamel*, with the other opake colours, is already delivered under the article ENAMEL.

The gold plate, thus enamelled in white, the draught or deſign to be painted muſt be chalked thereon, and afterwards the whole accurately drawn out in a ruddy brown. The draught or out-line thus finiſhed, the piece is ſet to the fire, and then painted with the colours above preſcribed.

The white ground they paint on ſerves all the colours for white: the method being to ſpare the ground, from firſt to laſt, in the places where the lights are to be, after the ſame manner as in miniature, though they have another white to lay over the other colours when there is occaſion to raiſe them. Add, that as the painters in oil retouch their painting ſeveral times, and let them dry; ſo in this ſort of painting they touch the piece as often as they pleaſe, ſetting it each time to a reverberatory fire, and taking it away again as ſoon as they perceive that the *enamel* has got its full poliſh.

The reverberatory fire is made in a little furnace, wherein there is fire both a-top and all round, on a void place in the middle, where the piece is to be put for the *enamels* to neal. The colours are laid on with the tip or point of the pencil as in miniature, with this only difference, that they uſe oil of ſpike to dilute them inſtead of gum-water. See MINIATURE.

The workers in *enamel* muſt be very cautious of the good or bad qualities of the oil of ſpike they employ to mix their colours with; it is a thing very ſubject to adulterations; ſometimes with ſpirit of wine, ſometimes with oil of turpentine. In the firſt caſe, it wants body, as there is uſually too much ſpirit added; and in the latter, the ſmoak of the turpentine, when heated, ſpoils the colours. A ſmall mixture of ſpirit of wine does well; and the beſt method for the nice artificer, is to refine the oil, and afterwards add to it ſuch a quantity of ſpirit as is found beſt.

ENAMELLING *by the lamp, method of.* The works of this kind are all performed by the flame of a lamp; wherein, in lieu of oil, is put horſe's greaſe, by ſome called caballine oil. The lamp is of copper, or whited iron, and conſiſts of two parts, the box and the lamp; in the latter of theſe, which is a kind of flat oval, is put the oil, and out of this riſes the wick: all the uſe of the box is to receive the oil, which the ebullition occaſioned by the intenſe heat might throw abroad.

This lamp, or even where two or three artiſts work together, two or three more lamps, are placed on a table of a proper height, &c. under which, about the middle of its height, is a double-bellows, like thoſe of an organ, which one of the workmen raiſes and depreſſes with his foot to encreaſe and quicken the flame of the lamp, which is by ſuch means excited to a degree of vehemence almoſt incredible.

The wind of the bellows is conveyed to the ſeveral lamps, however many, by means of grooves cut along the thickneſs of the table, and covered with parchment, extending from the bellows, to a tube or pipe placed before each lamp. Theſe tubes are of glaſs; and, that the enamellers may not be incommoded with the heat of the lamp, each tube is covered, at about ſix inches diſtance, with a piece of tin called a fan, which is fixed in a hole of the table. In works that do not take up much time, they content themſelves with a glaſs blow-pipe to heighten the flame of the lamp.

Applying their cake of *enamel* to the flame of this lamp, they draw it out into threads inconceivably fine. Thoſe made uſe of in artificial plumes of feathers are ſo very ſlender, that they may be wound on a reel like ſilk or thread.

The factitious jets of divers colours, ſometimes uſed in embroideries, are alſo made of *enamel*, and that with ſo much art, that each piece has its hole to paſs the ſilk through wherewith it is ſewed. Theſe holes are made by blowing them in long pieces, which are afterwards cut off with a proper tool. See the proceſs of drawing out the *enamel*, illuſtrated under DUCTILITY *of glaſs*.

It is rare that the Dutch or Venetian *enamels* are uſed pure; the common way is to melt them in an iron ladle, with an equal quantity of glaſs or cryſtal; and when the two matters are in perfect fuſion, they draw it out into threads of different ſizes as occaſion requires, by taking a quantity between two pipe-ſtopples held in the two hands, and removing them aſunder as far as the arms will reach. If the thread is to be longer than the workman can ſtretch, a ſecond perſon takes one of the ends, and continues to draw it out, while the firſt continues to keep the *enamel* to the flame. All the threads drawn after this manner are round; ſo that if the nature of the work require them to be flat, they are afterwards drawn through a pair of pinchers while yet hot. They have another iron inſtrument, in manner of plyers, to draw out the *enamel* by the lamp, when it is to be worked or diſpoſed in figures or otherwiſe. Laſtly, they have glaſs tubes, of various ſizes, ſerving to blow the *enamel* into various figures, and preſerve the neceſſary vacancies therein, as alſo to ſpare the ſtuff, and form the contours.

When the enameller goes to work, he ſeats himſelf before his lamp, with his foot on the treddle, and holding in his left hand the piece of work he is to *enamel*, or the braſs or iron wires his figures are to be formed with; with his right hand he draws out the thread from the *enamel* held to the lamp; and this is done with a dexterity and patience equally ſurpriſing.

There is nothing but may be thus repreſented in *enamel*; and there are figures ſo finely finiſhed of this kind, that one would take them to have come out of the hands of the ableſt ſculptors.

ENARGIA, Εναργεια, in *Rhetoric*, a figure, which paſſing from the narrative ſtyle, points out, and as it were, ſets the ſubject before the eyes of the audience. Voſſ. Rhet. lib. iii. p. 361.

ENARTHROSIS, Εναρθρωσις, a ſpecies of DIARTHROSIS. Such is that of the huckle-bone, &c. See ARTICULATION.

ENCÆNIA, Εγκαινια, a Greek term, ſignifying *reſtauration* or *renovation*, being compounded of the prepoſition εν and καινος, *new*.

ENCÆNIA, is more particularly uſed for the name of a feaſt celebrated by the Jews on the twenty-fifth of the ninth month, in memory of the dedication, or rather purification of the temple, by Judas Maccabæus, after its having been polluted and plundered by Antiochus Epiphanes.

The Jews had alſo two other *Encænia*, viz. the dedication of the temple by Solomon, and that by Zorobabel, after the return from the captivity.

ENCÆNIA, is likewiſe applied in the *Fathers*, and *Church-Hiſtory*, to the dedication of Chriſtian churches.

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St. Auguſtine aſſures us, that in his time the uſe of the word *Encænia* was even tranſferred to profane matters; and that they called it *Encæniare*, when they put on a new ſuit of clothes.

Our tranſlators of the Bible do not retain the word *Encænia*, in St. John, x. 22. where mention is made thereof; in lieu of that, they call it *Feaſt of the Dedication*, which is leſs proper. In effect, it is not the feaſt of the dedication, but of the purification or re-conſecration of the temple profaned, that is there ſpoken of.

ENCAMPMENT, in the *Military*. See CAMP.

ENCANTHIS, in *Medicine*, denotes a tumour of the caruncula lachrymalis, in the great canthus, or angle of the eye.

The word is Greek, εγκανθις, formed of the preposition εν and κανθος, *corner of the eye*.

It is oppoſed to rhyas, which is a diminution or conſumption of the ſame caruncle. See RHYAS.

This tubercle grows either out of the caruncula lacrymalis, or from the adjacent red ſkin, and is ſometimes ſo large, as not only to obſtruct the puncta lacrymalia, but alſo part of the ſight, or pupilla of the eye itſelf. In this diſorder the tears continually run down the cheek, which not only greatly deform the eye and face, but often give riſe to an ophthalmy.

The *encanthis* is of two kinds, the one mild, and without hardneſs or pain, and the other malignant, livid, and painful; this laſt tends, in ſome degree, to a cancerous nature.

In the beginning of the mild *encanthis*, it is beſt to ſcarify, and apply a mild cauſtic, as burnt alum, or vitriol, mixed with ſugar. This powder may be ſprinkled into the tumor, and carefully waſhed out of the eye afterwards with warm milk or water; but, if this is not ſufficient, it may be carefully touched with the common cauſtic; and, to give a turn to the humour, internal medicines, as purges, and the like, muſt be given, and iſſues, or ſetons, muſt be made. Heiſter's Surgery, p. 343.

If theſe methods take no effect, and the tubercle is of a malignant kind, it is to be drawn out either with a hook, or a pair of plyers, or, if very large, by a threaded needle paſſed through it, taking hold of both ends of the thread, and gently raiſing it till it can be cut off; but, in this, great care is to be taken not to wound the lacrymal caruncle. If the tubercle appear livid and cancerous, it is by all means to be let alone, as the irritating ſuch with medicines is always of very bad conſequence.

The *encanthis* is occaſioned by a deſluxion on that part; or an ulcer therein, not ſpeedily enough dried.

ENCARDION, from καρδια, *heart*, in *Botany*, a name given by the Greeks to what the Latins properly call the mediata in trees, the heart of the wood, or central hard part of it.

ENCATHISMA, from εγκαθημαι, *I ſit in*, in the *Medical Writings of the Ancients*, a term uſed to expreſs a ſort of bath, in which the patient was only to be plunged up to the belly.

ENCAUMA, from καιω, *I burn*, in *Surgery*, a name given, by ſeveral writers, to the puſtule, or excoriation, owing to a burn. The ſame word is uſed alſo by ſome as the name of a peculiar kind of ulcer in the eye. Aëtius ſays, that the ſuperficial exulcerations of the eyes, which are owing to defluxions of humours, are called, by the authors who wrote in early times, by three names, according to their differences. 1. A *caligo*: this is a ſuperficial ulcer, of a bluiſh colour, formed in the black of the eye, and covering moſt of it; when the pupil itſelf is affected by this, the ſight is uſually much impaired. 2. The *nubecula*: this was a ſmaller, deeper, and whiter ulcer, formed alſo in the black of the eye. 3. The *epicauma*: this was a roughneſs of the whole black of the eye, in which it appeared parched, or burnt, and was of a greyiſh colour over the entire ſurface. 4. The laſt of theſe diſorders was the *encauma*: by this name they expreſſed an ulcer, which produced an impure and ſolid cruſt, either in the black or white of the eye, and uſually was produced by a fever. And the corroſion of the matter of this ſort of ulcer was ſo ſharp, that the coats of the eyes were not unfrequently eaten through, and the humours fell out. Aëtius, Tetrabibl. 2. cap. 3.

ENCAUMA, in the *Old Writers on Medicine*, is alſo uſed to expreſs the ſcoriæ of ſilver.

ENCAUSTIC *Painting*, Εγκαυστικη, from εγκαιω, *inuro*, *I burn in*, is a ſpecies of painting with burnt wax, practiſed by the ancients, and lately revived. Pliny has given the following brief account of the invention and nature of this art: *Ceris pingere ac picturam inurere, quis primus excogitaverit, non conſtat: quidam Ariſtidis inventum putant, poſtea conſummatum à Praxitele; ſed aliquanto vetuſtiores* encauſticæ *picturæ extitere, ut Polygnoti, & Nicanoris, & Arceſilai, Pariorum. Lyſippus quoque, Eginæ, picturæ ſuæ inſcripſit* ενεκαυσεν; *quod profectò non feciſſet, niſi* encauſtica *inventa. Pamphilus quoque Apellis præceptor non pinxiſſe tantùm* encauſtica, *ſed etiam docuiſſe traditur Pauſiam Sycionium, primum in hoc genere nobilem.* Lib. xxxv. cap. 11. From this paragraph we learn, that the method of painting in wax, and burning in the picture, was very ancient; nor is it improbable that in former times, when they were unacquainted with dry oils, and tranſparent varniſhes, they ſhould make uſe of this method for preſerving their colours from damps and heats; though ſome imagine, that by *ceris* is meant a compoſition, different from wax, and capable of bearing the fire; and that burning the picture denotes merely enamelling. Pliny in the ſame chapter informs us, that there were anciently two methods of *encauſtic* painting in uſe: Encauſto *pingendi duo fuiſſe antiquitùs genera conſtat, cerâ & in ebore*, ceſtro, i. e. viriculo; *donec claſſes pingi cæperè. Hoc tertium acceſſit, reſolutis igni ceris, penicillo utendi; quæ pictura in navibus nec ſole, nec ſale, ventiſque corrumpitur.* Dr. Parſons maintains, that the *ceſtrum* was a pointed tool uſed in modelling or carving upon ivory or wax; and he ſuppoſes that there is a contraſt between the uſe of the *ceſtrum*, and painting ſhips with a bruſh, and therefore that the term *pingendi* cannot be underſtood to mean the laying on of paint. However, there is a paſſage in Vitruvius, lib. vii. cap. 9. which ſerves to aſcertain the nature of the ancient *encauſtic* painting. *At ſi quis ſubtilior fuerit, & voluerit expolitionem miniaceam ſuum colorem retinere*, &c. i. e. if any one is more wary, and would have the poliſhing, or painting, with vermilion hold its colour, when the wall is painted and dry, let him take Carthaginian wax, melted with a little oil, and rub it on the wall with a hair-pencil; and afterwards let him put live coals into a chafing-diſh, and hold it cloſe to the wax; when the wall, by being heated, begins to ſweat, let it be made ſmooth; afterwards let him rub it with a candle, and clean linen rags, in the ſame manner as they do the naked marble ſtatues. This the Greeks call καυσις. The coat of Carthaginian wax is ſo ſtrong, that it neither ſuffers the moon by night, nor the ſun-beams by day, to deſtroy the colour. From this paſſage we learn the ancient method of painting in wax by inuſtion, more obſcurely expreſſed by Pliny; though Pliny, in another paſſage, expreſly informs us, that they uſe coloured wax: *Ceræ* (he ſays) *tinguntur iiſdem his coloribus, quæ inuruntur*; that they employed a pencil to lay on the melted wax; *reſolutis igni ceris, penicillo utendi*; that the picture was fixed by inuſtion, *picturam inurere*. And we learn from Vitruvius, that the whole was cleaned and poliſhed with linen rags. This ancient art, after having been long loſt, was reſtored by count Caylus, a member of the Academy of Inſcriptions in France; and the method of painting in wax was announced to the Academy of Painting and Belles Lettres, in the year 1753; though M. Bachelier, the author of a treatiſe De l'Hiſtoire & du Secret de la Peinture en Cire, had actually painted a picture in wax in 1749; and he was the firſt who communicated to the public the method of performing the operation of inuſtion, which is the principal characteriſtic of the *encauſtic* painting. The count kept his method a ſecret for ſome time, contenting himſelf with exhibiting a picture at the Louvre in 1754, repreſenting the head of Minerva, painted in the manner of the ancients, which excited the curioſity of the public, and was very much admired. In the interval of ſuſpence, ſeveral attempts were made to recover the ancient method of painting. The firſt ſcheme adopted was that of melting wax and oil of turpentine together, and uſing this compoſition as a vehicle for mixing and laying on the colours. But this method did not explain Pliny's meaning, as the wax is not burnt in this way of managing it. In another attempt, which was much more agreeable to the hiſtorian's deſcription of *encauſtic* painting, the wax was melted with ſtrong lixivium of ſalt of tartar, and with this the colours were ground. When the picture was finiſhed, it was gradually preſented to the fire, ſo as to melt the wax; which was thus diffuſed through all the particles of the colours, ſo that they were fixed to the ground, and ſecured from the acceſs of air or moiſture. But the method of count Caylus is much more ſimple: the cloth, or wood, which he deſigned for the baſis of his picture, is waxed over, by only rubbing it ſimply with a piece of bees-wax; the wood, or cloth, ſtretched on a frame, being held horizontally over, or perpendicularly before a fire, at ſuch a diſtance, that the wax might gradually melt, whilſt it is rubbed on, diffuſe itſelf, penetrate the body, and fill the interſtices of the texture of the cloth, which, when cool, is fit to paint upon; but as water-colours, or thoſe that are mixed up with common water, will not adhere to the wax, the whole picture is to be firſt rubbed over with Spaniſh chalk or white, and then the colours are applied to it; when the picture is dry, it is put near the fire, whereby the wax melts, and abſorbs all the colours.

Mr. J. H. Muntz, in a treatiſe on this ſubject, has propoſed

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poſed ſeveral improvements in the art of *encauſtic* painting. When the painting is on cloth, he directs it to be prepared by ſtretching it on a frame, and rubbing one ſide ſeveral times over with a piece of bees-wax, or virgin's wax, till it is covered with a coat of wax of conſiderable thickneſs. In fine linen, this is the only operation neceſſary previous to painting; but coarſe cloth muſt be rubbed gently on the unwaxed ſide with a pumice ſtone, to take of all thoſe knots, which would prevent the free and accurate working of the pencil. Then the ſubject is to be painted on the unwaxed ſide with colours prepared, and tempered with water; and when the picture is finiſhed, it muſt be brought near the fire, that the wax may melt and fix the colours. This method, however, can only be applied to cloth, or paper, through the ſubſtance of which the wax may paſs; but in wood, ſtone, metals, or plaſter, the former method of count Caylus muſt be obſerved.

Mr. Muntz has alſo diſcovered a method of forming grounds for painting with crayons, and fixing theſe, as well as water-colours, employed with the pencil. On the unwaxed ſide of a linen cloth, ſtretched and waxed as before, lay an even and thick coat of the colour proper for the ground: having prepared this colour, by mixing ſome proper pigment with an equal quantity of chalk, and tempering them with water. When the colour is dry, bring the picture to the fire that the wax may melt, paſs through the cloth, and fix the ground. An additional quantity of wax may be applied to the back of the picture, if that which was firſt rubbed on ſhould not be ſufficient for the body of colour; but as this muſt be laid on without heat, the wax ſhould be diſſolved in oil of turpentine, and applied with a bruſh, and the canvas be again expoſed to the fire, that the freſh ſupply of wax may paſs through the cloth, and be abſorbed by the colour; and thus a firm and good body will be formed for working on with the crayons. If cloth and paper are joined together, the cloth muſt be firſt fixed to the ſtraining frame; and then the paper muſt be paſted to it with a compoſition of paſte made with wheaten flour, or ſtarch and water, and about a twelfth part of its weight of common turpentine. The turpentine muſt be added to the paſte when it is almoſt ſufficiently boiled, and the compoſition well ſtirred, and left to ſimmer over the fire for five or ſix minutes; let wax be diſſolved in oil of turpentine to the conſiſtence of a thin paſte; and when the cloth and paper are dry, let them be held near a fire; and with a bruſh lay a coat of the wax and turpentine on both ſides the joined cloth and paper, in ſuch a degree of thickneſs, that both ſurfaces may ſhine throughout without any appearance of dull ſpots. Then expoſe the cloth to the fire or to the ſun; by which means the oil will evaporate, and the wax become ſolid, and be fit to receive any compoſition of colour for a ground, which is to be laid on as above directed in the caſe of cloth without paper.

Almoſt all the colours that are uſed in oil-painting may be alſo applied in the *encauſtic* method. Mr. Muntz objects, indeed, to brown, light pink, and unburnt *terra di Sienna*; becauſe theſe, on account of their gummy or ſtony texture, will not admit ſuch a coheſion with the wax as will properly fix them; but other colours, which cannot be admitted in oil-painting, as red-lead, red orpiment, cryſtals of verdegris, and red precipitate of mercury, may be uſed here. The crayons uſed in *encauſtic* painting are the ſame with thoſe uſed in the common way of crayon painting, excepting thoſe that in their compoſition are too tenacious; and the method of uſing them is the ſame in both caſes.

The *encauſtic* painting has many peculiar advantages; though the colours have not the natural varniſh or ſhining which they acquire with oil, they have all the ſtrength of paintings in oil, and all the airineſs of water-colours, without partaking of the apparent character or defects of either; they may be looked at in any light and in any ſituation, without any falſe glare; the colours are firm, and will bear waſhing; and a picture, after having been ſmoaked, and then expoſed to the dew, becomes as clean as if it had been but juſt painted. It may alſo be retouched at pleaſure, without any detriment to the colours; for the new colours will unite with the old ones, without ſpots, as is the caſe in common ſize painting; nor is it neceſſary to rub the places to be retouched with oil, as in oil pictures; it is not liable to crack, and eaſily repaired, if it ſhould chance to ſuffer any injury. The duration of this painting is alſo a very material advantage; the colours are not liable to fade and change; no damp can affect them, nor any corroſive ſubſtance injure them; nor can the colour fall off in ſhivers from the canvas. However, notwithſtanding all theſe and other advantages enumerated by the abbé Mazeas, and Mr. Muntz, this art has not yet been much practiſed. Many of theſe properties belong to a much higher ſpecies of *encauſtic* painting lately diſcovered in England, the colours of which are fixed by a very intenſe heat; nor are the colours, or grounds, on which they are laid, liable to be diſſolved or corroded by any chemical menſtruum, nor, like the glaſſy colours of enamel, to run out of the drawing on the fire. See on this ſubject, Phil. Tranſ. vol. xlix. art. 100. p. 652. art. 101. p. 655. Id. vol. li. art. 8. p. 40. art. 9. p. 53. Muntz's *Encauſtic* Eloge of count Caylus, in the Hiſt. de l'Acad. Roy. des Inſcript. & Belles Lettres, vol. xxxiv. Handmaid to the Arts, &c. vol. i. ch. ix. p. 245. 261.

ENCAUSTICE has been ſometimes uſed to denote the art of ENAMELLING.

ENCAUSTUM *cæruleum*, is a name given to powder BLUE.

ENCAUSTUM *ſacrum*, a name given, by many authors, to that fine red colour, uſed for illuminating the capital letters in ſome old manuſcripts. Procopius calls it *baphe*, ſome have called it coccus, and ſome cinnabar. It is ſaid that it was made of the purple colour, extracted from the murex, or purple fiſh, with ſome other additions. It is to be obſerved, that however well this colour, when laid on the parchment, or paper, might reſemble the colours of enamel, yet it was as improper to call it *encauſtum*, which ſignifies a *colour burnt in*, as in enamelling it would have been to have called it atramentum, or ink.

ENCEINTE, Fr. from *enceindre*, *to ſurround*, in *Fortification*, the wall, or rampart, which ſurrounds a place, ſometimes compoſed of baſtions and curtains either faced or lined with brick, or ſtone, or only made of earth.

The *enceinte* is ſometimes only flanked by round or ſquare towers, which is called a Roman wall.

ENCEPHALI, in *Medicine*, an epithet applied to worms generated in the head; where they occaſion violent pains, inſomuch as, ſometimes, to produce diſtraction.

The word is compounded of the prepoſition ἐν, *in*; and κεφαλη, *head*.

There are four kinds of *encephali*; thoſe properly ſo called, which are found in the brain; the narenarii, in the noſe; auriculares, in the ears; and the dentales, in the teeth.

The *encephali*, properly thus called, are rare; but there are certain diſeaſes wherein they ſwarm; and we are told of peſtilential fevers, that have ariſen wholly from them. In one of theſe fevers, the phyſicians, having opened the perſon it had carried off, found a little, ſhort, red worm in the head. Hereupon, they tried various medicines, to find what might deſtroy it; but all in vain, till Malmſey wine, wherein horſe-radiſh had been boiled, was applied; this was no ſooner thrown on the worm, than it died. The ſame remedy was afterwards tried on the ſick, and it recovered them almoſt all. The like worms have alſo been taken out by trepanning, and the patient recovered.

ENCEPHALITES *lapis*, in *Natural Hiſtory*, the name given, by authors, to a ſort of coarſe ſtone, ſuppoſed, in ſome degree, to reſemble the human brain. We have, in the foſſile world, many ſtones, named from the parts of animals, which they have, in reality, been formed from, or owed their original to; and theſe are properly enough called by names denoting the things whoſe forms they wear; but it is a very wrong practice, from ſome ſlight external reſemblances, to give ſuch names to things that never can have been ſuppoſed to be ſo entitled to them. No one can be ſo abſurd as to imagine a human brain can be petrified, though a ſtone may accidentally ſomewhat reſemble its form. The perſon poſſeſſed of ſuch an accidental ſpecimen, ſhould have ranked it among the ſtones to which it properly belonged as a ſtone, whether a flint, a pebble, or a nodule, and have named, as an accident only, this form of it; and not have given it a peculiar denomination, as if it were a new ſpecies.

ENCEPHALOS, in *Phyſiology*. See BRAIN.

ENCEPPE', in *Heraldry*, denotes chained, or girt round the middle; as is uſual with monkeys, &c.

ENCERIS, in *Pharmacy*, a word uſed by Galen to ſignify ſmall concretions of wax, which formed themſelves in melted plaſters, of which wax was one of the ingredients. As they cooled, the wax cooling firſt, and collecting itſelf into little grumes, ſpoiled the conſiſtence and form of the whole compoſition.

ENCHANTERS *Nightſhade*. See NIGHTSHADE.

ENCHANTMENT, of *in*, and *canto*, *I ſing*, denotes certain words and ceremonies uſed by magicians in the practice of their pretended and deluding art; thus called, becauſe the *formulæ* of their *enchantment* were generally compoſed in verſe, and deſigned to be ſung. See CHARM, FASCINATION, MAGIC, SORCERY, and WITCHCRAFT.

ENCHASING, INCHASING, or CHASING, the art of enriching and beautifying gold, ſilver, and other metal-works, by ſome deſign or figures repreſented thereon, in low relievo. See SCULPTURE, RELIEVO, &c.

Chaſing is only practiſed on hollow, thin works; as watch-caſes, cane-heads, tweezer-caſes, or the like. It

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is performed by punching or driving out the metal to form the figures from within-side, ſo as to ſtand out prominent from the plane or ſurface of the metal.

In order to this, they have a great number of fine ſteel blocks, or puncheons, of divers ſizes; and the deſign being drawn on the ſurface of the metal, they apply the inſide upon the heads or tips of theſe blocks, directly under the lines or parts of the figures. Then, with a fine hammer, ſtriking on the metal ſuſtained by the block, the metal yields, and the block makes an indenture or cavity on the inſide; correſpondent to which, there is a prominence on the outſide, which is to ſtand for part of the figure.

Thus the workman proceeds to *chaſe* and finiſh all the parts, by ſucceſſive applications of the block and hammer to the ſeveral parts of the deſign.

And it is ſurpriſing, with what beauty and juſtneſs, by this ſimple piece of mechaniſm, the artiſts in this kind will repreſent foliages, groteſques, animals, hiſtories, &c.

ENCHEIRESIS, Ἐγχείρησις, from ἐν, *in*, and χερ, *a hand*, in *Anatomy*, denotes manual operation; as diſſection.

ENCHELIDES, in *Zoology*, the name of a genus of animalcules, containing the capillary eels, whether of pepper-water, vinegar, &c. See ANIMALCULE and PEPPER, VINEGAR, and EEL.

ENCHELUS, Ἔγχελυς, in *Ichthyology*, the name given by Ariſtotle, Appian, and all the Greek writers, to the EEL.

ENCHESON, a French word, uſed in our *Law-books* and *Statutes*, ſignifying the occaſion, cauſe, or reaſon, wherefore any thing is done. Stat. 5 Edw. III. cap. 3.

ENCHYMA, of ἔγχυω, *I pour in*, in the *Medical Writings of the Ancients*, a word uſed in ſeveral ſenſes. Some have made it expreſs only an *infuſion*; others have uſed it for what the modern phyſicians call *plethora ad vaſa*, that is, a fulneſs of the veſſels, ſimply conſidered, as relative to themſelves; and others have made it the name of certain forms of liquid medicines, to be injected into the ears, into the thorax, or any other part.

ENCHYMOMA, of ἔγχυμος, from ἐγχυω, in the *Writings of the Ancient Phyſicians*, a word uſed to expreſs that ſudden effuſion of blood into the cutaneous veſſels, which ariſes from joy, anger, ſhame, or any other violent emotion of the mind, and is what we uſually call BLUSHING; which, according to Dr. Hunter, is a nervous affection.

ENCHYMOMA, is alſo an afflux of the blood, whereby the external parts are rendered black and blue, as in the ſcurvy, blood-ſhot eyes, &c.

ENCHYMONITES, in *Natural Hiſtory*, the name of a kind of ſtone found in Macedonia, and ſome other places, which was alſo called *pæonites* and *pæanites*: it was ſuppoſed to be of great virtue to aſſiſt women in labour. See CEANIDES.

ENCHYSMA, the ſame with CLYSTER or enema.

ENCHYTA, in the *Medical Writings of the Ancients*, a name given to ſuch medicines as were injected into the eyes, or into any part.

Some alſo have uſed the ſame word to expreſs a ſort of funnel, contrived to convey the fumes of medicines to any part of the body.

ENCÆLIA, of ἐν, *in*, and κοιλια, *belly*, a word uſed by many of the ancient medical writers, to expreſs the viſcera contained in the abdomen, or lower belly.

ENCLAVE', in *Heraldry*, is where one thing is let into another, particularly where the jointure is ſquare.

ENCLITICA, of ἐγκλινω, *I incline*, in the *Greek and Latin Grammar*, certain particles, united ſo cloſely to the preceding word, that they only ſeem to form one word therewith; and the word which ſuſtains them does generally likewiſe bear the accent that governs them, eſpecially when the *enclitic* is a monoſyllable; as in *dominuſque*, κυριος τε.

There are three *enclitic* particles in the Latin, viz. *que*, *ne*, and *ve*; but in the Greek many, as τε, μη, μοι, με, συ, σοι, σε, πως, πω, τε, γε, φημι, ειμι, ποτε, and others.

ENCONDRUS, of ἐν, *in*, and χονδρος, *grain*, in the *Old Greek Writers*, a word uſed to expreſs any thing made up of a great number of ſmall pieces, or flakes, or ſmall grains of any thing. The manna of the ancients was not in large flakes, as we have it at preſent, but it was formed of a vaſt number of ſmall granules, and was therefore called by Dioſcorides, and ſome others of the Greeks, by this name. The word manna alſo ſignified with them the ſame thing; and they not only expreſſed the ſubſtance by it which we at preſent call ſo, but any other thing that was in ſmall flakes, or pieces, was called manna. Thus the manna thuris, ſo much talked of among the old Greeks, was only a collection of thoſe pieces which flew off from frankincenſe in the breaking. See MANNA *libanotis*.

ENCOPE, of ἐν and κοπτω, *I cut*, in *Surgery*, an inciſion of any part; as in a gangrene, &c.

ENCOUNTERS, in *Military Language*, a combat between two perſons; and the term is alſo more generally applied to attacks or battles between ſmall or large armies.

ENCRANIUM, in *Anatomy*, the ſame with CEREBELLUM.

ENCRASICOLUS, the anchovy, a ſmall ſea-fiſh, one of the harengiform kind, but wanting the row of ſerrated ſcales on the belly. They are caught in vaſt plenty in the Mediterranean, the Engliſh, and many other ſeas, and are well known in pickle in moſt nations of Europe. See ANCHOVY.

ENCRATITÆ, formed from ἐγκρατης, *continent*, a ſect of ancient heretics, thus called from their making profeſſion of continence, and abſolutely rejecting all uſe of marriage.

The founder of this ſect was Tatian, a diſciple of Juſtin, and one of the moſt learned perſons of all antiquity. After the death of that martyr, he made a ſeparation from the church, and ſoon had his followers; who, beſide the dogma juſt mentioned, borrowed a great many things from Saturninius and Marcion; beſide ſeveral errors, which they adhered to in common with the Gnoſtics and Valentinians.

They abſtained from eating any thing that had life, and denied that Adam was ſaved. They looked on ſuch as drank wine to be great ſinners; and for this reaſon only made uſe of water in celebrating the Euchariſt, as holding, that wine came from the devil. To countenance this tenet, they produced paſſages out of ſcripture, where mention is made of what befel Noah and Lot, when they were drunk.

They only admitted ſuch of the books of the Old Teſtament as they thought good; but in lieu thereof, they owned ſeveral ſpurious and apocryphal writings for canonical and divine. Such were the Acts of St. Andrew, John, and Thomas.

ENCRAULOS, in *Ichthyology*, the name given by Ariſtotle and many other of the ancient Greeks, to the fiſh which we call the anchovy. Authors deſcribe this under the diſtinct name of encraſicolus; but Artedi proves it to be a ſpecies of the ſame genus with the herring, and calls it the clupea with the upper-jaw longer than the under. This name carries a diſtinction with it that cannot be miſtaken.

ENCRINOS, in *Natural Hiſtory*, a name given by authors to a ſpecies of aſteropodium, or that plated and imbricated body which makes the baſe or root of the aſteria. This is compoſed of a number of ſmall plates, convex on one ſide, and concave on the other; and when found in fair pieces, is ſaid very exactly to reſemble a part of a ray of the magellanic ſtar. See ASTEROPODIUM.

ENCRIS, in the *Medical Writings of the Ancients*, ſignifies a ſort of cake made of fine flour, mixed with oil, and ſweetened with honey.

ENCROACHMENT, or ACCROACHMENT. See INCROACHMENT, and ACCROCHING.

ENCUMONIS, ſee ENCHYMONITES.

ENCURECK, in *Natural Hiſtory*, a venomous inſect, found in Perſia, and ſuppoſed by ſome to be a kind of tarantula. It neither ſtings nor bites, but lets fall its venom like a drop of water, which cauſes inſufferable pain in the part for a time; and afterwards ſo profound a ſleep, that we are told, nothing can raiſe the patient from it but cruſhing one of thoſe creatures on the part affected. It is nevertheleſs ſaid, that the ſheep eat theſe inſects without damage. Olearius, ap. Boyle, Works abr. vol. i. p. 37. Ibid. p. 38.

ENCYCLOPÆDIA, the circle or chain of arts and ſciences.

The word is compounded of the prepoſition ἐν, *in*, κυκλος, *circle*, and παιδεια, *ſcience, doctrine, diſcipline, learning*; the root being παις, *child, infant*.

The Greeks uſed the term for the knowlege of the ſeven liberal arts, and the poſſeſſion of all the ſciences. *Orbis ille doctrinæ, quem Græci* ἐγκυκλοπαιδειαν *vocant*, ſays Quintilian. It is ſometimes alſo written, κυκλοπαιδεια, *cyclopædia*.. Vitruvius, in the Preface to his ſixth book, calls it, *encyclios diſciplina*. See CYCLOPÆDIA.

END *for* END, in the *Sea-language*, when a rope runs all out of the block, ſo that it is unreeved, they ſay it is run out *end for end*.

ENDECAGON, or HENDECAGON, in *Geometry*. See HENDECAGON.

ENDECASYLLABUS, or HENDECASYLLABUS. See HENDECASYLLABUM.

ENDECERES, of ἐνδεκα, *eleven*, in the *Naval Architecture of the Ancients*, a word uſed to expreſs a galley which had eleven ſeries or tires of rowers. Thoſe with two or three tires were very much in uſe among the ancients, and from thoſe to ſuch as had five or ſix tires. Thoſe of nine tires were ſometimes uſed, but it was very ſeldom; and thoſe of eleven, fifteen, and ſo on, were rather for ſtate than ſervice. We read of them carried ſo high as to contain twenty, thirty, and forty rows of oars. One of this

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this largeſt ſort was built for Philopator, which required four thouſand men.

ENDEIXIS, of ενδεικνυμι, *I indicate*, in *Medicine*, an indication of diſeaſes, whereby is ſhewn what is to be done; as for example, a *plethora*, or too great fulneſs of blood, indicates the opening of a vein. Blancard, in voc. See DISEASE.

ENDEIXIS, Ενδειξις, in *Antiquity*, an action brought againſt ſuch as affected any place or thing, of which they were incapable by law. Pott. Archæol. Græc. lib. i. cap. 23. tom. i. p. 125.

ENDEMIC *diſeaſe*, of εν and δημος, *people*, that which affects many people together in the ſame country, as proceeding from ſome cauſe peculiar to the country where it reigns. See DISEASE.

ENDENTED, DENTED, or INDENTED, in *Heraldry*. See INDENTED.

ENDENTED, is alſo applied to a feſs or pale, and other triangular pieces, when divided alternately between two different colours. Coupé, or *endented* with or and azure.

ENDESIS, from εν and δεω, *I bind*, a word uſed by Hippocrates to expreſs that part of the foot where the bones of the tibia end, and which is connected by ligaments to the ankle.

ENDEW, in *Falconry*, is ſaid of a hawk that digeſts her meat ſo well, that ſhe not only diſcharges her gorge of it, but ever cleanſes her pannel.

ENDICA, a word uſed by the alchemiſts for the fæces which ſubſide to the bottom of the veſſel in infuſions; to ſome of which they attribute great virtues.

ENDITEMENT, or INDICTMENT, in *Common Law*. See INDICTMENT.

ENDIVE, or SUCCORY, *cichorium*, in *Botany*, a genus of the *ſyngeneſia polygamia æqualis* claſs. Its characters are theſe: the flower hath a common ſcaly empalement, which at firſt is cylindrical, but is afterward expanded; the ſcales are narrow, ſpear-ſhaped, and equal. The flower is compoſed of many hermaphrodite florets with one petal, which is tongue-ſhaped, and cut into five ſegments. Theſe have five ſhort hairy ſtamina: the germen is ſituated under the petal, which afterwards becomes a ſingle ſeed, incloſed with a down, and ſhut up in the empalement. There are four ſpecies. See *Tab.* V. *of Botany, Claſs* 1.

The curled *endive* is now much cultivated in the Engliſh gardens, being one of the principal ingredients in the ſallads of autumn and winter; for which purpoſe it is continued as long as the ſeaſon will permit. The firſt time for ſowing theſe ſeeds is in June; for thoſe which are ſown earlier in the year, generally run up to ſeed before they are arrived to a proper ſize for blanching.

Thoſe plants which were firſt tranſplanted will be fit to blanch by the end of Auguſt at fartheſt; and if they are properly managed, in three weeks or a month they will be ſufficiently blanched for uſe; which will be as ſoon as theſe ſallads are commonly required; for during the continuance of good cos lettuce, few perſons care for *endive*.

As the quantity of roots required for a middling family is not very great, ſo there ſhould not be too many plants tied up to blanch at the ſame time. The manner of tying them is this: firſt gather all the inner leaves of the plant in regular order into one hand; and then take up all thoſe that are ſound of the outſide ones, pulling off the decayed ones which lie near the ground, obſerving to place the outſide leaves near the middle ones, as near as poſſible in their natural order, ſo as not to croſs each other. Having thus got the whole plant up in your hand, tie it up with baſs or twigs, at about two inches below the top, very cloſe. About a week after, the plants ſhould be gone over again, to have another tie round the middle, to prevent the heart-leaves from burſting out on one ſide, which they are ſubject to do, as the plants grow, if not prevented.

After October, when the nights begin to be froſty, thoſe plants which are far above ground will be liable to be prejudiced thereby, eſpecially if not covered up at ſuch times: the beſt method, therefore, for the late crops is, to take up the plants in a very dry day, and with a large flat pointed dibble plant them into the ſides of trenches of earth, which ſhould be laid very upright, ſideways towards the ſun, with the tops of the plants out of the ground, ſo that the haſty rains may run off, and be kept dry and ſecured from froſts. The plants thus treated, will be blanched fit for uſe in about three weeks or a month's time; after which they will not keep good long.

The wild *ſuccory*, of which there are ſome varieties in the colour of the flowers, is ſeldom propagated in gardens, it growing wild in unfrequented lanes and dunghills, in divers parts of England, where the herb-women gather it, and ſupply the markets for medicinal uſe. Miller.

The common *ſuccory* ſtands recommended by moſt of the medical writers, as one of the beſt known aperients and detergents: it is preſcribed in all diſeaſes of the liver, and is a powerful diuretic. Schroder tells us, that it has alſo great virtues attributed to it againſt hæmorrhages; but it is not much regarded at preſent in that light.

ENDIVIA *marina*, the *ſea-endive*, in *Natural Hiſtory*, the name of a ſpecies of ſea-plant, deſcribed by count Marſigli. There are two ſpecies of it, the one having broad and jagged leaves, reſembling thoſe of the vine; the other much narrower. This laſt kind grows on ſtones, ſhells, pieces of wood, or any other ſubſtances, accidentally found at the bottom of the ſea. It ſeldom grows in very deep water, and thrives beſt in places where the ſea is calm and quiet. It is of a duſky greeniſh colour, variegated in ſome places with yellow. It exactly reſembles the ſhape of the *endive* common in our gardens, and its leaves are cut and fringed in the ſame manner; but they are of ſo tender a ſubſtance, that a ſlight touch deſtroys them; they are indeed tenderer and more delicate than thoſe of any other known plant, either of the ſea or land. When this plant is examined by the microſcope, its ſurface is found to be compoſed of a great number of eminences and cavities, or little holes, between and among them; and when the leaves are cut tranſverſely, there are ſeen a great number of glandules in them. Marſigli, Hiſt. de la Mer, p. 72. See CORALLINES.

ENDLESS *rolls*, and *ſcrew*, ſee the ſubſtantives.

ENDORSE, in *Heraldry*, an ordinary, containing the eighth part of a pale.

This, Leigh ſays, is never uſed but when a pale is between two ſuch; though others hold, that an *endorſe* may be borne between birds, fiſhes, beaſts, &c. Sir J. Ferne adds, that it ſhews the ſame coat has been ſometimes two coats, and afterwards conjoined within one eſcutcheon, for ſome myſtery of arms. He bears azure an *endorſe* argent. *Tab.* II. *Herald. fig.* 58.

ENDORSED, ENDOSSE', in *Heraldry*, is where things are borne back to back.

ENDORSEMENT, of *in* and *dorſum*, *back*, is particularly uſed in *Commerce*, for a writing on the back of a bill of exchange by the proprietor or bearer, either thereby to transfer it to ſome other, or to render it payable to the order of ſome other, or elſe to ſerve for an acquittance or receipt. See EXCHANGE.

The *endorſement* is only the name of the proprietor, or *endorſer*. Note, when the *endorſement* of a bill of exchange is to render it payable to another, it is called an *order*.

To an order it is neceſſary the *endorſement* be dated, and contain the name of him who paid the value thereof; in which caſe, the bill belongs to the perſon with whoſe name the order is filed, without any other tra n without theſe conditions, the bill is judged to belong to the perſon who *endorſed* it. The bearer of a bill of exchange proteſted has a remedy againſt the *endorſers* for the payment of the re-change of the places where the bill was negociated by their order. In caſe a bill or note is refuſed to be paid, &c. the bearer has a remedy againſt any one of the *endorſers*, where there are ſeveral. See BILL.

ENDORSING, or INDORSING, in *Law*, implies the writing on the back-ſide of a deed, inſtrument, &c. ſomething relating to the matters contained therein.

ENDOSIS, Ενδοσις, of εν and διδωμι, *I give*, in the *Medical Writings of the Ancients*, a word uſed to expreſs a remiſſion of any kind, as when a tumour, inflammation, or hardneſs of any part, becomes leſs violent; and when the patient becomes eaſier, after the exacerbations in fevers of the continual kind, and after fits of the intermittent.

ENDOWMENT, or INDOWMENT, the giving or aſſigning of a dower to a woman. See DOWER.

The word is alſo uſed figuratively, for the ſetting forth or ſevering a ſufficient portion for a vicar, towards his perpetual maintenance, when the benefice is appropriated; whence ſuch a vicarage is called a vicarage *endowed*.

ENDYMATIA, in *Antiquity*, a kind of dance uſed among the Greeks, performed in Arcadia, to the ſound of certain airs compoſed for the flute.

ENELIAXIS, Ενηλιαξις, or rather *Enyaliaxis*, Ενυαλιαξις, in *Antiquity*, a feſtival in honour of Enyalius, whom ſome will have to be the ſame with Mars, others only one of his miniſters. Pott. Archæol. Græc. lib. ii. cap. 20. tom. i. p. 394.

ENEMA, of ενιημι, *I put in*, in *Medicine*, denotes a *clyſter*. See CLYSTER.

ENEMY. See ALIEN.

ENEOREMA, of εναιρεω, *I liſt up*, is uſed by ancient medical writers for thoſe parts of the urine which float about in the middle reſembling a cloud, formed, according

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cording to Boerhaave, principally of muriatic ſalt. Comm. Inſtit. § 382.

ENEOS, of *ev* and *ανω*, *I cry*, a word uſed by the antient writers in *Medicine* for a perſon born deaf, or unable to perform the common offices of life, for want of any of the principal organs.

ENERGETICAL *bodies* or *particles*, are ſuch as are eminently active, and which produce manifeſt operations of various natures, according to the various circumſtances and motions of ſuch bodies or particles.

ENERGICI, an appellation given to certain diſciples of Calvin and Melanchon, of the ſixteenth century, becauſe they held the Euchariſt was the energy and virtue of Jeſus Chriſt, not his real body, nor a repreſentation thereof.

ENERGUMENUS, Ενεργουμενος, a term ſometimes uſed by divines and ſchoolmen, to ſignify a perſon poſſeſſed with a devil, or an evil ſpirit.

The word is formed from the Greek, *ενεργεισθαι*, *to be agitated, worked*, of *ev*, and *εργον*, *opus*.

Though Papius ſays, the *Energumeni* were ſuch as counterfeited the actions of the devil, performing things which ſeemed ſupernatural. The council of Orange debars, or deprives the *Energumeni* of the functions of the prieſthood. See DÆMONIAC.

ENERGY, an uncommon force or ſtrength in a diſcourſe, a ſentence, or a word. See EMPHASIS.

The word is Greek, *ενεργεια*, formed of the prepoſition *ev* and *εργον*, *work, labour*.

ENERVATING, the act of deſtroying the force, uſe, or office, of the nerves, either by cutting them, by weakening them with debauchery, or by ſome other violence.

Exceſs of wine, and other ſtrong, hot, ſpirituous liquors, *enervate* or weaken the nerves. When they would render a horſe uſeleſs, they *enervate* him, or cut his nerves.

ENERVATING, is particularly uſed in the *Manege*, for the cutting two tendons on the ſide of a horſe's head, under the eyes, which meet on the tip of the noſe; they thus *enervate* horſes, to make their heads ſmall and lean.

The word is alſo uſed figuratively. It is no ſmall artifice in diſputing, to be able to *enervate* and extenuate the allegations of one's antagoniſt. This author has a weak, *enervate* ſtyle. See NERVE.

ENERVATION, a term in the *Ancient Anatomy*, applied to the tendons of the recti, or ſtrait muſcles of the abdomen.

The fibres of the recti of the abdomen do not go from one extreme of the muſcles to the other, but are interſected by ſeveral nervous places, called by the ancients *enervations*, though they be real tendons.

Their number is not alike in all; ſome having three, others four, &c.

ENFANS *perdus*, a French phraſe, uſed in *War*, to ſignify the ſoldiers who march at the head of a body of forces appointed to ſuſtain them, in order to begin an attack, make an aſſault, or force a poſt.

The word literally imports *loſt children*, on account of the imminent danger they are expoſed to.

In Engliſh, they are called the *forlorn*, or *forlorn hope*.

At preſent, the grenadiers uſually begin ſuch attacks.

ENFILADE, a French term, ſometimes uſed in Engliſh, ſignifying a ſeries or continuation of ſeveral things, diſpoſed, as it were, in the ſame thread or line; as an *enfilade* of rooms, of doors, of buildings, &c.

The word is formed of the French verb, *enfiler*, *to ſtring a thing*, which is compounded of *en*, *in*, and *fil*, of *filum*, *thread*; q. d. a thread or ſtring of any thing.

ENFILADE, in *War*, is applied to thoſe TRENCHES, and other lines, which are ranged in a right line, and ſo may be ſcoured or ſwept by the cannon lengthways, or in the direction of the line, and rendered almoſt defenceleſs.

Care muſt be taken that the lines be not *enfiled*, or *enfiladed*; on the contrary, the covert line muſt be *enfiladed*, that the enemy may be driven out of it. The laſt boyau, or gut of the trenches, is ſubject to be *enfiladed*, that is, to be ſcoured according to its length.

A *battery d'enfilade*, is that where the cannon ſweep a right line.

A *poſt*, or command *d'enfilade*, is a height from which one may ſweep a whole line at once.

ENFRANCHISEMENT, the incorporating any man into a ſociety or body politic. See FREEDOM and FRANCHISE.

Thus, he that by charter is made denizen of England, is ſaid to be *enfranchiſed*. The like is underſtood of a perſon made a citizen of London, or other city or corporate town; becauſe he is thereby made partaker of the liberties appertaining to the corporation whereof he is *enfranchiſed*.

ENGAGEMENT, in a *Naval ſenſe*, denotes a particular or general battle at ſea, or an action of hoſtility between ſingle ſhips, or detachments, or ſquadrons of men of war: the whole œconomy of which may be arranged under the heads of preparation, action, and repair. The preparation is begun by iſſuing the order to clear the ſhip for action, which is repeated by the boatſwain and his mates at all the hatchways. The hammocks are firſt removed; every ſailor ſtowing his own bedding properly and firmly cording it with a laſhing, or line provided for that purpoſe: as each ſide of the quarter deck and poop is furniſhed with a double net-work, ſupported by iron cranes fixed immediately above the gunnel or top of the ſhip's ſide; the hammocks thus corded, are firmly ſtowed by the quarter-maſter between the two parts of the netting, ſo as to form an excellent barrier or ſort of parapet, to prevent the execution of ſmall ſhot on the quarter-deck: the tops, waiſte, and fore-caſtle, are fenced in the ſame manner. At the ſame time the boatſwain and his mates are employed in ſecuring the ſail-yards, to prevent them from tumbling down when the ſhip is cannonaded, whereby it might be diſabled. The yards are ſecured by ſtrong chains or ropes, beſides thoſe by which they are uſually ſuſpended. The boatſwain alſo provides the neceſſary materials for repairing the rigging; and the carpenter and his crew prepare ſhot-plugs and mauls to cloſe up any breach that may be made near the ſurface of the water, and provide the iron-works neceſſary to refit the chain-pumps. The gunner with his mates and quarter-gunners, examine the cannon of the different batteries, and provide proper charges, &c. The maſter and his mates attend to the number and trimming of the ſails, &c. The lieutenants viſit the different decks, taking care that all incumbrances are removed, and giving inſtructions to the other officers, that every thing may be ready for the expected *engagement* at a moment's warning. When the hoſtile ſhips have approached each other to a competent diſtance, the drums beat to arms: the boatſwain and his mates pipe, *all hands to quarters!* at every hatch-way. The perſons appointed to manage the great guns immediately repair to their reſpective ſtations; crows, hand-ſpikes, rammers, ſponges, powder-horns, matches, and train-tackles are placed in order by the ſide of every cannon. The hatches are laid to prevent any one from eſcaping into the lower apartments. The marines are drawn up in rank and file, on the quarter-deck, poop, and fore-caſtle. The laſhings of the great guns are let looſe, and the tompions withdrawn: the whole artillery, above and below, is run out at the ports, and levelled to the point-blank range ready for firing. When the neceſſary preparations are finiſhed, the commencement of the action is determined by the mutual diſtance and ſituation of the adverſe ſhips, or by the ſignal from the commander in chief of the fleet or ſquadron. The cannon being levelled in parallel rows, projecting from the ſhip's ſide, the moſt natural order of battle is evidently to range the ſhips a-breaſt of each other, eſpecially if the *engagement* is general. The moſt convenient diſtance is probably within the point-blank range of a muſket, ſo that all the artillery may do effectual execution. The combat uſually begins by a vigorous cannonade, accompanied with the united efforts of all the ſwivel-guns and ſmall arms. Inſtead of firing platoons, or vollies of cannon at once, the general rule on theſe occaſions throughout the ſhip is to load, fire, and ſponge the guns with all poſſible expedition, yet without confuſion or precipitation. The captain of each gun is enjoined to fire only when the piece is properly directed to its object. The lieutenants who command the different batteries traverſe the deck, to ſee that the battle is proſecuted with vigour, and to animate the men in their duty. The midſhipmen ſecond theſe injunctions, and give aſſiſtance where it is required at the guns committed to their charge. The gunner takes care that the artillery is ſupplied with powder, and that the cartridges are conveyed along the decks in covered boxes. The ſhip that is defeated acknowleges the victory by ſtriking the colours, and is immediately taken poſſeſſion of by the conqueror, who ſecures her officers and crew as priſoners in his own ſhip, and inveſts two principal officers with the command of the prize till a captain is appointed by the commander in chief. When the *engagement* is concluded, they begin the repair. The cannon are ſecured by their breechings and tackles; the ſails that have been rendered unſerviceable, are unbent; and the wounded maſts and yards ſtruck upon the deck, and fiſhed or replaced by others. The ſtanding rigging is knotted, and the running rigging ſpliced wherever this is neceſſary. Proper ſails are bent in the room of thoſe that are become uſeleſs. The carpenter and his crew repair breaches in the ſhip's hull by ſhot-plugs, pieces of plank, and ſheet-lead. The gunner and his aſſiſtants repleniſh the allotted number of charged cartridges, and refit the damaged furniture of the cannon.

When two fleets or ſquadrons are preparing for *engagement*,

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ment, it will be the endeavour of the admiral or commander in chief to come to action as ſoon as poſſible. To facilitate the execution of the admiral's orders, the whole fleet is ranged into three ſquadrons; each of which is claſſed into three diviſions, under the command of different officers. Before the action begins, the adverſe fleets are commonly drawn up in two lines parallel to each other, and cloſe-hauled. When the admiral diſplays the ſignal for the line of battle, the ſeveral diviſions ſeparate from the colours in which they were diſpoſed according to the uſual order of ſailing, and every ſhip crowds into its ſtation in the wake of the next a-head, at the diſtance generally of about fifty fathom; which diſtance is regularly obſerved from the van to the rear: though the admiral may ſometimes find it neceſſary to contract or extend his line, according to the length of that of his adverſary; always taking care that his own line be ſecure from being doubled, which might throw his van and rear into confuſion. When the adverſe fleets approach each other, the courſes are commonly hauled up in the brails, and the top-gallant ſails and ſtay-ſails furled: the frigates, tenders, and fire-ſhips, being hauled upon the wind, lie at ſome diſtance behind the line of battle; and tranſports and ſtore-ſhips lie beyond theſe, at a ſtill greater diſtance from the ſcene of action; and if the number of ſhips allows it, a body of reſerve from the different ſquadrons is ſelected to cover the fire-ſhips, &c. and ſtationed oppoſite to the weakeſt parts of the line, ſo that they may readily fall into the line in caſe of neceſſity. Each ſhip forming the line ſhould keep cloſe to its ſtation during the *engagement*; the aſſault of boarding being ſeldom permitted unleſs in ſingle action: becauſe the regularity of a cloſe line conſtitutes the principal force of the fleet; and the ſkill of the admiral is greatly concerned in keeping his line, notwithſtanding unequal attacks and damage, as complete as poſſible. If he proves victorious, he ſhould proſecute his victory as much as poſſible, by ſeizing, burning, or deſtroying the enemies ſhips. If he is defeated and reduced to the neceſſity of retreating, he may judge it expedient, for greater ſecurity, to range his fleet into the form of a half-moon, placing himſelf in the centre. The enemy's ſhips that attempt to fall upon his rear will thus be expoſed to the fire of the admiral and his ſeconds, and the eſcape of his own ſhips will be facilitated whilſt the purſuit of his adverſary is retarded. Upon the whole, the real force or ſuperiority of a fleet conſiſts leſs in the number of veſſels and the vivacity of the action, than in good order, dexterity in working the ſhips, preſence of mind and ſkilful conduct in the admiral and captains. Falconer's Marine Dict. Art. ENGAGEMENT. See BATTLE, LINE *of battle*, and SIGNAL.

ENGAGEMENT, in *Engliſh Hiſtory*, was the obligation impoſed by Oliver Cromwell required to be ſigned by every member of the Firſt Parliament in 1654, aſſembled by his authority, after he was declared Protector, viz. I *A. B.* do hereby freely promiſe and engage myſelf to be true and faithful to the Lord Protector, and to the commonwealth of England, Scotland, and Ireland, and ſhall not (according to the tenure of the indenture whereby I am returned to ſerve in this preſent parliament) propoſe or give any conſent to alter the government, as it is ſettled in one ſingle perſon and a parliament. Many, who refuſed to ſign this *engagement*, were excluded from the houſe.

ENGAMOS, in *Natural Hiſtory*, the name given by the people of ſome parts of Guinea to a root very common there, and much reſembling our larger ſort of turneps, but not ſo ſweet or juicy. They commonly boil theſe with their pattatas, in the ſame kettle with their meat. The latter of theſe roots, which is conſiderably different from our potatoe, gives a fine flavour to the whole, and makes the broth and meat taſte as if roſe-water were added to it. The *engamos* alſo partakes of the flavour, and in this caſe becomes very agreeable. Phil. Tranſ. N° 108.

ENGASTRIMANTES, Εγγαστριμαντεις, in *Antiquity*, called alſo ENGASTRIMYTHI, Εγγαστριμυθοι, a deſignation given to ſuch diviners as were poſſeſſed with demons, which either lodged or ſpoke within their bodies. Pott. Archæol. Græc. lib. ii. cap. 12. tom. i. p. 301.

ENGASTRIMYTHUS, Εγγαστριμυθος, or ENGASTRIMANDER, a perſon who ſpeaks from, or with the belly, without opening his mouth; or, if open, without ſtirring the lips.

Thus called by the Greeks, from εν, γαστηρ *belly*, and μυθος, *ſpeech*; and by the Latins, *ventriloquus*, *quaſi ex ventre loquens*.

The ancient philoſophers, &c. are divided on the ſubject of the *engaſtrimythi*: Hippocrates mentions it as a diſeaſe. Others will have it a kind of divination, and aſcribe the origin and firſt diſcipline thereof to one Euryclus, whom nobody knows any thing of. Others attribute it to the operation or poſſeſſion of an evil ſpirit; and others, to art and mechaniſm.

The moſt eminent *engaſtrimythi* were the Pythians or prieſteſſes of Apollo, who delivered oracles from within, without any action of the mouth or lips.

St. Chryſoſtom and Oecumenius make expreſs mention of a ſort of divine men, called by the Greeks *engaſtrimandri*, whoſe prophetic bellies pronounced oracles.

M. Schottus, library-keeper to the king of Pruſſia, in a Diſſertation on the Apotheoſis of Homer, maintained that the *engaſtrimythi* of the ancients were only poets; who, when the prieſteſs could not ſpeak in verſe, ſupplied the defect, by explaining or delivering in verſe what Apollo dictated in the cavity of the baſon, placed on the ſacred tripod.

Leo Allatius has an expreſs treatiſe on the *engaſtrimythi*. See VENTRI-LOQUISTS.

ENGENDERING, or INGENDERING, the act of begetting or producing the kind, by way of generation.

The term is likewiſe applied to other productions of nature: thus, meteors are ſaid to be *engendered* in the middle region of the air. Crude fruits *engender* worms. The ancients believed, that inſects were *engendered* of putefaction.

ENGINE, in *Mechanics*, a compound machine, conſiſting of ſeveral ſimple ones, as wheels, ſcrews, levers, or the like, combined together, in order to lift, caſt, or ſuſtain a weight, or produce ſome other conſiderable effect, ſo as to ſave either time or force.

The word is formed of the French, *engine*; of the Latin, *ingenium*, *wit*; becauſe of the ingenuity required in the contrivance of *engines*, to augment the effect of moving powers.

The kinds of *engines* are infinite; ſome for war, as the BALISTA, CATAPULTA, SCORPIO, ARIES, &c. others for the arts of peace, as MILLS, CRANES, PRESSES, CLOCKS, WATCHES; *engines* to drive piles, to raiſe water, WHEEL and WATER-*works*; to extinguiſh fire, ſee FIRE-*engine*, &c. See HYDROCANISTERIUM. See STEAM-*engine*, &c. See alſo INSTRUMENT.

ENGINEER, or INGINEER, in its general ſenſe, is applied to a contriver or maker of any kind of uſeful engines or machines.

In its more proper ſenſe, it denotes an officer in an army or fortified place, whoſe buſineſs is to contrive and inſpect attacks, defences, works, &c.

An *engineer* ſhould be an able and expert mathematician, particularly verſed in military architecture and gunnery; being often ſent to view and examine the places intended to be attacked; to chooſe out, and ſhew the general the weakeſt place; to draw the trenches, aſſign the places of arms, galleries, lodgments on the counterſcarp and half-moons; conduct the works, ſaps, mines, &c. and appoint the workmen their nightly taſk: he is alſo to make the lines of contravallation; with the redoubts, &c.

Under the eſtabliſhment of the office of his majeſty's ordnance, the corps of *engineers* conſiſts of one colonel in chief, two directors or lieutenant-colonels, four ſub-directors or majors, twelve *engineers* in ordinary or captains, twelve *engineers* extraordinary or captains, fourteen ſub-*engineers* or lieutenants, twenty-four practitioner-*engineers* or ſecond-lieutenants, excluſive of a few *engineers* on the Iriſh eſtabliſhment. See ORDNANCE.

ENGISOMA, Εγγισωμα from εγγυς, *near*, a ſpecies of fracture of the ſcull, wherein one of the extremities of the fractured bone is thruſt inwards upon the dura mater, and the other extremity raiſed outwards. See TREPANNING.

ENGLECERIE, ENGLECHERIE, or ENGLESCHYRE, a term of great import among our anceſtors, though now obſolete; properly ſignifying the quality of an Engliſhman.

If a man were privately ſlain, or murdered, he was anciently accounted FRANCIGENA (which comprehended every alien, eſpecially the Danes) till *englecerie* was proved, i. e. till it was made to appear that he was an Engliſhman, Bracton, lib. iii.

The origin of the cuſtom anciently ſubſiſting among the Goths in Sweden and Denmark, was thus: king Canutus, having conquered England, at the requeſt of his nobles, ſent back his army into Denmark, only reſerving a guard of Danes for his perſon; and made a law, that if any Engliſhman killed a Dane, he ſhould be tried for the murder; or, if he eſcaped, the village where the man was ſlain ſhould be charged to pay ſixty-ſix marks into the exchequer. After this law, which was continued by William the Conqueror, for the like ſecurity to his own Normans, whenever a murder was committed, it was neceſſary to prove the party ſlain an Engliſhman, that the penalty of ſixty-ſix marks might not be charged on the village.

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village. This practice was abolished by ſtatute 14 Edw. III. cap. 4.

ENGLISH, in a general ſenſe, ſomething that relates to the country or people of England.

We ſay, the *Engliſh* crown, *Engliſh* copperas, *Engliſh* names, *Engliſh* money, *Engliſh* meaſures, *Engliſh* weights, &c.

The ſweating-ſickneſs is called by foreigners, *ſudor Anglicanus*, the *Engliſh ſweat*. Dr. Cheyne calls the vapours the *Engliſh malady*. See SUDOR-ANGLICUS.

ENGLISH *Drops*, *Guttæ Anglicanæ*. See DROP.

ENGLISH, or the ENGLISH *Tongue*, the language ſpoken by the people of England; and with ſome variation, by thoſe of Scotland, as well as part of Ireland, and the reſt of the Britiſh dominions.

The *Engliſh* is of Gothic, or Teutonic extraction: this was the root or ſtock upon which ſeveral other dialects have been ſince grafted, particularly the Latin and French. See TEUTONIC, &c.

The language anciently ſpoken in our Iſland was the Britiſh, or Welſh, which was common to the Britons and Gauls; and which ſtill ſubſiſts, in more or leſs purity, in the principality of Wales, the iſlands and Highlands of Scotland, part of Ireland, and ſome provinces of France, particularly Bretagne, and very lately ſubſiſted in the county of Cornwall. See CORNISH *language*.

As the Roman empire, extending itſelf towards the weſtern parts of Europe, under Julius Cæſar, Claudius, and Domitian, came to take in Gaul and Britain, the Roman tongue became propagated therewith; all the edicts, &c. relating to the public affairs, being deſignedly wrote in that language.

The Latin, however, it is certain, never got ſo much ground, or prevailed ſo far in England, as in Lombardy, Spain, and the Gauls; partly on account of its great diſtance from Rome, and the ſmall reſort of Romans hither; and partly, becauſe the entire reduction of the kingdom was not effected till ſo late as the reign of Claudius, when the empire was on the declining hand, and the new province was forced to be ſoon deſerted by its conquerors, called to defend their territorries nearer home.

Britain, thus left naked, became an eaſy prey to the Angli, or Anglo-Saxons, a ſtrolling nation, from Jutland and Norway, who took an eaſy poſſeſſion thereof about the year 450, much about the time that the Franks, another German nation, entered Gaul. The Gauls and Franks, it ſeems, at length came to terms; found means to unite into one nation; and thus, the ancient Gauliſh, with its mixture of Latin, continued the prevailing tongue, only farther intermixed with the Francic or lingua Franca of their new inmates: but the Britons were more conſtant, and determined abſolutely to refuſe any ſuch coalition: they had embraced Chriſtianity, Auguſtine being ſent from Rome to convert them about the year 570, and their competitors were heathens; rather than admit of ſuch an union, therefore, they choſe to be ſhut up, with their language, in the mountainous parts of Cambria or Wales.

The *Engliſh* Saxons, thus left abſolute lords, changed every thing; their own language was now fully eſtabliſhed; and the very name of the country was henceforth to be Anglo-Saxon. The new language remained, in good meaſure, pure and unmixed, till the Norman invaſion: the attempts of the Danes, and the neighbourhood of the Britons, indeed, wrought ſome leſſer innovations therein; but, in the main, it preſerved itſelf; for, as to the Danes, their language was not much different from the other. Edward the Confeſſor, however, who had lived long in France, might poſſibly bring in a little mixture of the dialect of that country.

But William I. and his Normans, having got poſſeſſion of England, an alteration was ſoon attempted: the conqueſt was not complete, unleſs the Conqueror's language, the French or Franco-Gallic were introduced; and accordingly, all his acts, diplomas, edicts, pleadings, and other judicial matters, were written, &c. in that tongue.

But his attempts proved unſucceſsful; the number of Normans he brought over being very ſmall in compariſon of the *Engliſh*, with whom they were incorporated, they loſt or forgot their own language, ſooner than they could make any change in the *Engliſh*. This, however, did not hinder, but, by the endeavours of the Conqueror, abundance of French words, though many of them of Latin original, crept into the *Engliſh*; and many *Engliſh* words, by degrees, grew out of uſe.

Hence, as to the origin and etymology of many of our words, Dr. Wallis lays it down, that ſuch words of German original as we have, in common with the French, are to be reckoned as our own, rather than as words borrowed from them; and that the old Gauliſh words, common to the French and the Welſh, which are found in our language, have been likewiſe taken from the Welſh, rather than from the French. Hence, alſo, the ſame author accounts why the names of the divers ſorts of cattle are Saxon; as ox, cow, calf, ſheep, hog, boar, deer, &c. and yet that their fleſh, when prepared for food, is French; as beef, veal, mutton, pork, brawn, veniſon, &c. the Norman ſoldiers, not concerning themſelves with paſtures, parks, and the like places, where ſuch creatures are fed and kept, ſo much as with markets, kitchens, feaſts, and entertainments, where the food was either prepared, ſold, or eaten.

Under Henry II. Dr. Swift obſerves, the French made a ſtill greater progreſs; becauſe of the large territories he poſſeſſed on that continent, both from his father and his wife, which occaſioned frequent journies thither, with numerous retinues, &c. And for ſome centuries after, there was a conſtant intercourſe between France and England, by the dominions we poſſeſſed there, and the conqueſts we made; ſo that the language, two or three hundred years ago, ſeems to have had much more French than at preſent.

Beſides this alteration from the conquerors, the language in proceſs of time underwent ſeveral others; and at length came to have numerous words and phraſes of foreign dialects ingrafted into it, in lieu of the ancient Saxon; particularly, by means of negociations and commerce with other nations; by the marriages of royal families; by the affectation of many writers, in moſt ages, who are fond of coining new words, and altering the uſual forms of ſpeech, for the greater delicacy; and, by the neceſſity of framing or borrowing new words, according as new things and inventions turn up: and by ſuch means was the old Anglo-Saxon converted into the preſent *Engliſh* tongue.

Having traced the riſe and progreſs of our language hiſtorically, we think it may be no incurious amuſement to repreſent by actual examples the ſeveral ſucceſſive changes and ſtages it has paſſed through, to arrive at its preſent perfection: in order to which, we ſhall make uſe of the collections of the ingenious Mr. Greenwood.

From the Saxon invaſion, we have no memorial extant of the language for 250 years: the oldeſt Saxon writing in being is a gloſs on the Evangeliſts, written in the year 700, by Eadfride, biſhop of Holy Iſland; in which the three firſt articles of the Lord's Prayer run thus:

" Uren Fader thic arth in heofnas, ſic gehalgud
" thin noma, ſo cymeth thin ric. Sic thin willa
" ſue is heofnas, and in eortho," &c.

Two hundred years after, in the year 900, the ſame was rendered thus:

" Thu ure Fader the eart on heoſenum, ſi thin
" nama gehalgod; cume thin rice. Si thin willa on
" eorthan ſwa, ſwa on heofenum."

In the following age it was turned thus in the Saxon Homilies, ſaid to be tranſlated by king Alfred:

" Fæder ure thu the earth on heofenum, ſi thin
" nama gehalgod, to be cume thin rice, gewurthe
" thin willa on eoarthan ſwa, ſwa on heofnum," &c.

About the year 1160, under Henry II. near which period the Saxon began to aſſume a form in which the beginning of the preſent *Engliſh* may be diſcovered; it was thus rendered by pope Adrian, an Engliſhman, in rhyme:

" Ure Fader in heaven rich,
" Thy name be hayled ever lich,
" Thou bring us thy michell bliſſe:
" Als hit in heaven y-doe
" Evar in yearth beene it alſo," &c.

About 100 years after, in the time of Henry III. it was tranſlated thus:

" Fadir that art in heaven bliſſe,
" Thin helge nam it wurth the bliſs,
" Cumen & mot thy kingdom,
" Thin holy will be it all don,
" In heaven and in erdh alſo," &c.

Two hundred years after, under Henry VI. it was rendered thus:

" Our Fadir that art in hevenes, halewid be thi
" name, thi kingdom come to thee, be thi will
" don in eerthe, as in hevene."

Dr. Hickes furniſhes an extraordinary ſpecimen of the *Engliſh*, as ſpoken in the year 1385, in his Theſaur. Liter. Septent. which we ſhall the rather entertain the reader with, as it is on this very ſubject, the *Engliſh tongue*; and contains not only the hiſtory, but the reaſons of the changes and differences therein:

" As it is knowe how meny maner peple beeth in this
" lond; there beeth alſo ſo many dyvers longages and
" tonges. Notheleſs Walſche men and Scots that beeth
" nought medled with other nations, holdeth wel nyh
" hir firſt longage and ſpeche: but yif the Scottes that
" were ſometime confederat and woned with the Pictes
" drawe

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" drawe ſomewhat after hir ſpeche; but the Flemynges " that woneth in the weſte ſide of Wales, haveth left " her ſtrange ſpech, and ſpeketh Sexonliche now. Alſo " Engliſhe men, they had from the bygynnynge thre " maner ſpeche: northerne, ſowtherne, and middel " ſpeche in the middel of the londe, as they come of " three maner of peple of Germania: notheleſs by " commyxtion and mellynge firſt with Danes, and " afterwards with Normans, in meny the contrary lon- " gage is apayred [corrupted]. This appayrynge of the " burthe of the tunge is bycauſe of tweie thynges, oon " is for children in ſcole agenſt the uſage and maner of " all other nations, beeth compelled for to leve hire " own longage, and for to conſtrue hir leſſons and here " thynges in French, and ſo they haveth ſethe Normans " come firſt into Engelond. Alſo gentlemen children " beeth taught to ſpeke Frenſche from the tyme that " they beeth rokked in here cradel, and kunneth ſpeke " and play with a childes broche; and uplondiſſche men " will linke hymſelf to gentilmen, and fondeth with " great beſyneſſe for to ſpeake Frenſche to be told of. " Hit ſeemeth a greet wonder how *Engliſche* men and " her own longage and tonge, is ſo dyverſe of ſown " in this oon ilond: and the longage of Normandie is " comlynge of another lond, and hath oon manner ſoun " amonge alle men that ſpeketh hit arigt in Engelond. " Alſo of the foreſaid Saxon tonge that is deled [divided] " a three, and is abide ſcarceliche with few uplondiſſche " men, is greet wonder. For men of the eſt, with " men of the weſt, is, as it were, under the ſame par- " tie of hevene acordeth more in ſownygne of ſpeche, " than men of the north, with men of the ſouth. " Therefore it is that Mercii, that beeth men of myddel " Engelond, as it were parteners of the endes, under- " ſtondeth bettre the ſide longages northerne and ſouth- " erne, than northerne or ſoutherne underſtondeth " either other. All the longage of the Northumbers, " and ſpecialliche at York, is ſo ſcharp, ſlitting and " frotynge, and unſchape, that we ſoutherne men may " that longage unnethe underſtonde. I trow that that " is by cauſe that they beeth nyh to ſtrange men and " nations, that ſpeketh ſtrongliche, and alſo bycauſe " that the kinges of Engelond wonneth alwey fer from " that cuntry," &c.

The firſt of our authors, who can properly be ſaid to have written *Engliſh*, was Sir John Gower, who, in his Confeſſion of a Lover, calls Chaucer his diſciple.

How the *Engliſh* ſtood about the year 1400, may be ſeen in Chaucer, who refined and improved it very conſiderably; though he is charged with the affectation of mixing too many French and Latin words with his *Engliſh*, and by that means, with too much altering and corrupting the primitive language.

In the year 1537, the Lord's Prayer was printed according to the following verſion:

" O oure Father which arte in heven, halowed be " thy name: let thy kingdome come, thy will be " fulfilled as well in erth as it is in heven," &c.

Where the reader will obſerve the diction almoſt brought to the preſent ſtandard; the variations being principally in the orthography. See an hiſtorical view of the progreſs of the *Engliſh* language, with ſpecimens at different periods, from the age of Alfred to that of Elizabeth, in the Introduction to Dr. Johnſon's *Engliſh* Dictionary, vol. i. fol.

Spencer, who lived in the ſame age, contributed not a little to the improvement and refining of the tongue: he threw aſide abundance of the outlandiſh ornaments, and wrote a purer *Engliſh*, yet with more elegance and variety than had been known before. He was ſucceeded by Shakſpeare, Ben. Johnſon, lord Bacon, Milton, Cowley, Waller, Tillotſon, Dryden, Addiſon and Pope, &c. whoſe works are in every body's hands; and by whom the language has been tranſmitted to us under all its preſent advantages.

The perfections aſcribed to the *Engliſh*, and that in a degree ſuperiour to any of the modern tongues, are, 1. That it is very ſtrong and ſignificant; to which our finely compounded words, formed on the model of the Greeks, do not a little contribute.

2. Copious; of which Mr. Greenwood gives us inſtances in the word ſtriking; which we have above thirty different ſynonymous expreſſions for; as *to ſmite*, *bang*, *beat*, *baſt*, *buffet*, *cuff*, *hit*, *thump*, *thwack*, *ſlap*, *rap*, *tap*, *kick*, *ſpurn*, *box*, *yerke*, *pummel*, *punch*, &c. and the word *anger*, for which he enumerates above forty. So we ſay *to ſeeth* or *boil* fleſh, *ſtew* prunes, *poche* eggs, *coddle* apples, *bake* bread; for which expreſſions, *to ſeeth*, *ſtew*, *poche*, *coddle*, and *bake*, the Latins, with all the boaſted copia of the tongue, have only one word, *coquere*; and the French, as much as they abound with terms of cookery, not many more; the word *cuire* ſerving indifferently for *ſeething*, *boiling* *baking*, *ſtewing*, and *codling*.

3. Muſical and harmonious; in which reſpect Mr. Dennis makes no ſcruple to aſſert it ſuperior even to the French. This, which ſome may think ſtrange, he proves hence, that we have blank verſe which is harmonious by mere force of numbers and quantity; whereas the French have long ago deſiſted from all pretenſions to poetical numbers, without the aſſiſtance of rhyme.

It may be added on this laſt head, from Mr. Welſtead, that the *Engliſh* has many meaſures, the iambic and trochee, for inſtance, in common with the Greek and Latin; an advantage ariſing from the variation of the accent; and that rhyme is peculiarly natural to it, varying itſelf to the ear with exceſſive ſweetneſs; not to mention the cæſuras, pauſes, tranſpoſitions, and numberleſs other graces, which the *Engliſh* verſification is capable of, probably beyond every other living language.

Some object to the *Engliſh*, that it conſiſts too much of monoſyllables; which others make a piece of merit, as it argues the greater antiquity, if what Salmaſius ſays be true: *Certum quippe eſt, linguas omnes, quæ monoſyllabis conſtant, cæteris eſſe antiquiores*; he adds, that the *ancient Greek abounded herein, as appears from the ancient poets, and ſuch as affected antiquity.* De Re Helleniſt.

But we have a farther advantage from our monoſyllables, viz. *conciſeneſs*; as we are hereby enabled to expreſs more matter in the ſame compaſs of letters than any other modern tongue. The only thing we ſuffer by it, is, ſomething in point of ſoftneſs and numbers; and yet we have verſes compoſed wholly of monoſyllables, that do not want harmony; as that of Creech,

" Nor could the world have borne ſo fierce a flame."

Others object to our language, that it does not equal the ſoftneſs, the delicacy, of the more ſouthern languages, of France, Spain, and Italy. It ſeems to retain ſomewhat of the Gothic roughneſs of the people who framed and introduced it; the ſoil and climate it was planted in, not tending much to mellow and refine it.

To this purpoſe does Dr. Swift ſpeak, who accounts for the effect hence, that the Latin tongue was never in its purity in our iſland; and beſides, it was removed, in its imperfect ſtate, before it could have time to incorporate with the language of the country, and ſubdue and ſoften it, as it did in the other provinces of France and Spain, &c. But it is to be obſerved, that, upon the whole, this, ſuppoſing it true, does not lie as an objection againſt the language, but the people: our manners are alſo leſs poliſhed than ſome of our neighbours; we are not yet arrived at that pitch of moleſſe, of delicateſſe, of ſoupleſſe, which we cenſure in them; and it is but juſt our language correſpond with the reſt of our character.

Mr. Welſtead is of opinion, that the *Engliſh* language is not capable of a much greater perfection than it has already attained. We have trafficked, he obſerves, with every country for the enriching it; the ancients and moderns have both contributed to the giving it ſplendor and magnificence; the faireſt cyons that could be had from the gardens of France and Italy, have been grafted on our old ſtocks, to refine the ſavageneſs of the breed; we have laid aſide moſt of our harſh, antique words, and retained few but thoſe of good and ſound energy: the moſt beautiful poliſh is at length given our tongue that it will bear, without deſtroying and altering the very baſis and ground work of it; its Teutonic ruſt is worn away, and little or nothing is wanting either of copiouſneſs or harmony. He goes on to argue the maturity and perfection of the *Engliſh*, from another very extrinſic principle, viz. by comparing the time and circumſtances of the improvements made ſince the firſt refiners of it; with thoſe of the Greek, Latin, French, and other tongues that confeſſedly have riſen to their height.

Every civilized nation, that author thinks, has its claſſical age; and he ſuggeſts, that the *Engliſh* are not far from it. So that what remains to be done for the *Engliſh* tongue, ſhould not be to advance, but to fix it where it is, and prevent its declining. There is, in effect, a point of perfection, which when a language has once arrived at, it cannot exceed, though it may degenerate from it; and thus it happened to the two fineſt languages that the world has known.

It may ſeem odd to talk of fixing ſo unſtable a thing as language: the Greek liturgies of St. Baſil, and St. Chryſoſtom, ſtill uſed in that church, the one for ſolemn, the other for common days, have been a long time unintelligible to the people; ſo much is the vulgar Greek degenerated from its original purity! Polybius teſtifies, that the articles of truce between the Romans and Carthaginians could ſcarce be underſtood by the moſt learned Roman antiquaries, three hundred and fifty years after the time in which they were made. In effect, from the days of Romulus, to thoſe of Julius Cæſar, the Latin was perpetually changing; and what was written three hundred years before Tully, was as unintelligible in his time as

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the *Engliſh* and French of the ſame period are now; and theſe two have changed as much ſince William the Conqueror, in about ſeven hundred years, as the Latin appears to have done in a like term.

Whether our language will decline as faſt as the Roman did, may admit of ſome doubt; there being many circumſtances in the affairs of the nation, which contributed to that ſpeedy corruption, that may not, in all probability, find place among us. The French, for about a century paſt, has been poliſhing as much as it will bear; and it appears to be now declining, by the natural inconſtancy of that people, and the affectation of ſome late authors, to introduce cant words, which is the moſt ruinous corruption in any language. But without ſome ſuch conſideration, there does not ſeem any abſolute neceſſity, why a language ſhould be perpetually changing.

We find examples to the contrary: from Homer to Plutarch, are above a thouſand years; and ſo long, at leaſt, Dr. Swift thinks, we may allow the purity of the Greek; the Grecians ſpread their colonies round all the coaſts and iſlands of Aſia Minor, and the Egean ſea, where the language was preſerved entire for many ages after they themſelves became provinces to Rome, and were overrun by the barbarous nations. The Chineſe have books in their language above two thouſand years old; neither have the frequent conqueſts of the Tartars been able to alter it. And the German, Spaniſh, and Italian, have admitted few or no changes for ſome ages paſt.

On ſuch conſiderations, that author moved the then prime miniſter, the earl of Oxford, to eſtabliſh a ſociety, or academy, for the ſettling, and aſcertaining, the purity of our tongue; to ſet a mark on the improprieties which cuſtom has made familiar, to throw out vicious phraſes and words, to correct others, and perhaps retrieve ſome others now grown obſolete, and to adjuſt the orthography, pointing, &c.

Without ſome ſuch means, he complains, that the fame any writer can expect will be ſo ſhort and ſcanty, as by no means to be a ſufficient motive to call forth, and engage a man to exert his genius. Our language is chiefly confined to theſe two iſlands; and it is hard our authors fame ſhould be limited in time as well as place. Were it not for the Bible and Common-Prayer, we ſhould hardly have been able to underſtand any thing written a hundred years ago.

It is a melancholy reflexion, that Petrarch ſtill ſpeaks good Italian; whereas Chaucer, who lived an hundred years later, is not to be underſtood by an Engliſh reader without a Saxon and French gloſſary. And what ſecurity has Dryden himſelf, while things continue on their preſent footing, that he ſhall not in a like ſpace of time become as obſolete as Chaucer is?

Grammars and dictionaries, with whatever care and judgment they are compoſed, will prove but a feeble ſtay to a fleeting language, unleſs they have ſome extraordinary ſanction and authority. And, what is to be lamented, ſuch writings have contributed to the corruption almoſt as much as the perfection of our tongue.

Dr. Gill, Ben. Johnſon, and Hexham, it is certain, by forcing the *Engliſh* tongue to the Latin method, have clogged and perplexed it with abundance of uſeleſs precepts concerning caſes, genders, and declenſions of nouns, tenſes, moods, and conjugations of verbs, and other things, which our language has nothing to do with. Nor have even Dr. Wallis, Greenwood, &c. though ſenſible of the fault in thoſe others, been able wholly to keep clear of it themſelves.

ENGLISH, *Borough*. See BOROUGH.

ENGONASIS, Ἐγγονασις, in *Aſtronomy*, Hercules; one of the northern conſtellations. See HERCULES.

ENGOUTED, in *Falconry*, is ſaid of a hawk's feathers, when they have black ſpots in them.

ENGRAFTING, GRAFTING, or GRAFFING, in *Agriculture* and *Gardening*, the art, or act, of inſerting, or fixing, a cyon, ſhoot, or bud, of one tree, in the ſtock of another; in order to correct, and improve its fruit.

Engrafting is the art of applying a *graft*, or ſhoot, of one plant, to the ſtock of another; in ſuch manner, as that the ſap paſſing freely through both, the tree *grafted* on may produce the ſame kind of fruit with that whence the *graft* is taken.

Engrafting only differs from *inoculation*, in this, that the latter is performed when the ſap is at the higheſt, in ſummer; and the former before it riſes, at leaſt, in any quantity.

Engrafting is one of the principal operations in gardening, and that whereon the goodneſs of great part of our fruit greatly depends.

It is very extraordinary, that the ſeeds, or kernels, or ſtones of a fruit, as an apple, pear, peach, plum, cherry, &c. being ſown, degenerate in the ground; ſo that the tree ariſing from it is of another kind, a ſort of wilding, harſher, ſourer, and coarſer, than that of the parent tree. To correct this, trees thus reared muſt always be *grafted* from other better kinds.

Apples are commonly raiſed by *engrafting* the intended kinds on crab-ſtocks, procured by ſowing the kernels; ſo are pears procured by *grafting* on the wild pear-ſtock; though for dwarf, or wall-trees, they generally chooſe to *engraft* on the quince-ſtock.

They will alſo do, if *grafted* on the white-thorn. Peaches are produced by *grafting*, on an almond or plumb-ſtock. Indeed, in this fruit, it ſometimes happens, that the ſtone ſown produces better fruit than that from which it was taken; but this is not common; beſide that the tree in ſuch caſe is long before it comes to bear. Plums are raiſed by *engrafting* on a damaſcene, or wild plum-ſtock; and cherries, on the black cherry, or merry-ſtock, raiſed from ſtones.

Our beſt gardeners, likewiſe, *engraft* their leſs kindly trees from other better of the ſame ſort, to mend them; as alſo, the ſmaller and ſingle flowers, as gilliflowers, &c. from the larger and finer. *To produce ſtocks for* engrafting *on*, ſee STOCK. For the choice of *graffs* or *cyons*, ſee GRAFT.

The curious furniſh us with other extraordinary and anomalous inſtances of *engrafting*; as of apples on plane, elder, thorn, cabbage-ſtalk, &c. and the like of pears, &c. pears on apple-trees, on elms, &c. cherries on the laurel, coral-berries on the plum; beech on the cheſtnut, oak on the elm, gooſeberry on the currant, the vine on the cherry-tree, &c.

Inſeritur lauro ceraſus, partuque coacto
Tingit adoptivus virginis ora pudor. Auſon.

Ev'n Daphne's coyneſs thou doſt mock,
And wedſt the cherry to her ſtock. Cowl. to Evel.

——— *Mutatamque inſita mala*
Ferre pirum, & prunis lapidoſa rubeſcere corna.
Virg. Georg. lib. ii. ver. 33.

———*Steriles platani, malos geſſere valentes;*
Caſtaneæ, fagos; ornuſque incanuit albo
Flore piri; glandemque ſues fregêre ſub ulmis.
Id. ibid. ver. 70, &c.

The origin and invention of *engrafting* is differently related by naturaliſts. Theophraſtus tells us, that a bird, having ſwallowed a fruit whole, chanced to caſt it forth into a cleft, or cavity, of a rotten tree; where mixing with ſome of the putrified parts of the wood, and being waſhed with the rains, it budded, and produced within this tree another tree of a different kind. This led the huſbandman to certain reflections, from which, ſoon afterwards, aroſe the art of *engrafting*.

Pliny ſets the thing in a different light: a countryman having a mind to make a paliſade in his grounds, that it might endure the longer, bethought himſelf to fill up, and ſtrengthen the bottom of the palliſade, by running, or wattling it with the trunks of ivy. The effect of this was, that the ſtakes of the paliſade, taking root, became *engrafted* into the trunks, and produced large trees; which ſuggeſted to the huſbandman the art of *engrafting*.

The reaſon, or philoſophy, of *engrafting* is ſomewhat obſcure; and had not hazard given the firſt hint, all our knowlege of nature would never have led us to it. The effect is ordinarily attributed to the diverſity of the pores, or ducts, of the *graft*, from thoſe of the ſtock, which change the figure of the particles of the juices in paſſing through them to the reſt of the tree.

Mr. Bradley, on occaſion of ſome obſervations of Agricola, ſuggeſts ſomething new on this head: the ſtock *grafted* on, he thinks, is only to be conſidered as a fund of vegetable matter, which is to be filtred through the cyon, and digeſted, and brought to maturity, as the time of growth in the veſſels of the cyon directs. A cyon, therefore, of one kind, *grafted* on a tree of another, may be more properly ſaid to take root in the tree it is *grafted* in, than to unite itſelf with it: for it is viſible, that the cyon preſerves its natural purity and intent, though it be fed and nouriſhed with a mere crab; which is without doubt occaſioned by the difference of the veſſels in the cyon from thoſe of the ſtock; ſo that *grafting* may be juſtly compared to planting.

In proſecution of this view of that ingenious author, we add, that the natural juices of the earth, by their ſecretion and comminution, in paſſing through the roots, &c. before they arrive at the cyon, muſt doubtleſs arrive there half elaborated and concocted; and ſo diſpoſed for a more eaſy, plentiful, and perfect aſſimilation and nutrition; whence the cyon muſt neceſſarily grow and thrive better and faſter than if it were put immediately in the ground, there to live on coarſe diet, and harder of digeſtion; and the fruit produced, by this further prepa-

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preparation in the cyon, muſt be finer and further exalted, than if fed immediately from the more imperfectly prepared and altered juices of the ſtock.

The cyon, to ſay no more, is ſomewhat in the condition of the fœtus in utero, fed from the mother's blood; or, at leaſt, it is in that of the infant after excluſion, fed with the mother's milk.

Tools neceſſary for grafting. In order to *grafting*, a perſon muſt be provided with the following tools. 1. A neat and ſmall hand-ſaw to cut off the heads of large ſtocks. 2. A ſtrong knife with a thick back, to make clefts in the ſtocks. 3. A ſharp pen-knife to cut the *grafts*. 4. A *grafting* chiſſel and a ſmall mallet. 5. Baſs-ſtrings, or elſe woollen yarn, to faſten on the *grafts* with, and, finally, a quantity of clay, which ſhould be prepared a month before it is uſed, and kept turned and worked about every day like mortar. The beſt mixture for this matter is, a quantity of ſtrong, fat, and viſcous loam muſt be got, and into this muſt be well beat and mixed ſome ſtone-horſe dung, and ſome chopped ſtraw cut very ſhort and ſmall; finally, a quantity of common ſalt muſt be thrown in; this muſt be mixed up and beat together into a paſte with water, but it muſt not be expoſed to the froſts. This is equally proper to be employed for all the different ſorts of *grafting*. Miller.

Some perſons have lately uſed a compoſition of turpentine, bees-wax, and roſin, melted together, which, applied round the graft about a quarter of an inch thick, will keep out the air more effectually than clay, be hardened by cold, and reſiſt the froſt, and fall off, when melted by the ſummer heat, without any trouble.

Principal kinds of grafting are, *grafting* in the cleft, *grafting* in the rind, white *grafting*, *grafting* by approach, ſcutcheon *grafting*, root *grafting*, reiterated *grafting*, *grafting* on branches, &c.

GRAFTING *in the cleft*, or *ſtock*, called alſo *ſlit*-GRAFTING, is the moſt ancient and ordinary way. It is chiefly uſed for middle-ſized ſtocks, from one to two inches diameter. Its ſeaſon is in the months of February and March. The method, as now practiſed, is thus: the head of the ſtock being ſawn, or cut off, ſmooth and clean, with a ſlope, a perpendicular cleft is made therein, nearly two inches deep, with a ſtrong knife, or chiſſel, as near the pith as may be to miſs it. In this cleft, the *grafting* chiſſel, or wedge, is put to keep it open. The *graft*, or cyon, is prepared by cutting it aſlope, in form of a wedge, to ſuit the cleft; only leaving a ſmall ſhoulder on each ſide; and, when cut, is to be placed exactly in the cleft, ſo as that the inner bark of the cyon may aptly and cloſely join to the inner part of the bark, or rind, of the ſtock; in the dextrous performance of which the chief ſecret conſiſts. If the cleft pinch too tight, a ſmall wedge may be left in it to bear the ſtreſs. And, laſtly, the cleft is covered over with clay, leaving two eyes of the cyon above the clay for ſhooting; or rather, as M. Gentil adviſes, with moſs, or the freſh bark of a tree bound on with oſier.

The reader, who would have this in more elegant terms, may be furniſhed from Virgil, Georg. ii. ver. 78, &c.

Aut rurſum enodes trunci reſecantur & altè
Finditur in ſolidum cuneis via: deinde feraces
Plantæ immittuntur: nec longum tempus, & ingens
Exiit ad cœlum ramis felicibus arbos,
Miraturque novas frondes, & non ſua poma.

GRAFTING *in the rind*, or *ſhoulder*-GRAFTING, called alſo *ſlicing*, and *packing*, is practiſed in the latter end of March, or beginning of April. The method is as follows:

The top of the ſtock is cut off in a ſmooth, ſtrait place; then the cyon, or *graft*, is prepared by cutting on one ſide from the joint, or ſeam, down ſlopewiſe, making the ſlope about an inch long, and obſerving its bent, that ſo, when the cyon is fixed to the ſtock, it may ſtand nearly upright. At the top of the ſlope, they make a ſhoulder, whereby it is to reſt on the ſlope of the ſtock. The whole ſlope is to be plain and ſmooth, that it may lie even to the ſide of the ſtock. As to the length of the cyon, for a ſtandard-tree, it may lie about four inches from the ſhoulder; but for a dwarf, or wall-tree, ſix inches. The cyon being prepared, the outſide is applied to the weſt, or ſouth-weſt ſide of the ſtock, and its length and breadth meaſured thereon; which done, the bark of the ſtock is cut away to thoſe dimenſions, that the cut part of the cyon may fit it. Wherein, regard is to be had to the bigneſs of the ſtock, and the thickneſs of the bark, to proportion the length and breadth of the chip thereto; otherwiſe the paſſages of the juice in the ſtock and cyon will not meet. Laſtly, laying the cut-part of the cyon on that of the ſtock, they bind them together with woollen yarn, and cover the whole with clay an inch above, and as far below the ſtock's head; working it round the cyon, till it become ſharp at top, that the rain may run down it.

This method has ſeveral advantages over the former: as that the wound heals up ſooner; and that, in the mean time, it is in leſs danger from the weather; that it does leſs injury to the ſtocks and *grafts*, as avoiding thoſe ſevere ſplittings and pinchings; that the bark is more eaſily placed in the paſſage of the ſap here, than in the cleft; that the *graft* thrives and ſhoots with greater vigour, and bears ſooner, in this way than in that; and that it is practicable on ſmaller ſtocks than the other, which muſt have a good body and conſiſtence, before they can bear cleaving. See *Crown*-GRAFTING.

GRAFTING *in the bark* is performed thus: prepare the ſtock, and cyon, as in *grafting in the rind*; but, inſtead of cutting the bark of the ſtock, ſlit the ſame on the ſouth-weſt ſide, from the top, almoſt as long as the ſloped part of the cyon, and at the top of the ſlit looſen the bark with the top of your knife. Thruſt an inſtrument, made of ivory, ſilver, or the like, and formed at the end like the ſlope-end of the cyon, but much leſs, down between the bark and wood, to make room for the cyon; which being put in, the bark is to be ſo managed, as that it may fall cloſe to the ſtock, and edges of the cyon.

GRAFTING by approach or ablactation. See ABLACTATION and INARCHING.

All thoſe trees which are of the ſame tribe, that is, which agree in their flower and fruit, will take upon one another; thus all the nuts may be *engrafted* on one another; as may alſo all the plums, and all that are allied to them; as the almond, peach, nectarine, and the like; but as theſe generally loſe a great deal of gum in the *grafting*, the operation of inoculation is much more proper for them.

All the trees which bear cones will ſucceed very well on one another, even though ſome ſhed their leaves in winter, and others do not. Thus the cedar of Lebanon and the larch tree do very well on one another; but theſe, becauſe they abound ſo greatly in reſin, muſt be *grafted* by approach, becauſe the reſin of the *graft* being loſt from it before it is ſet into the ſtock, makes it otherwiſe often miſcarry.

Bad weather will often deſtroy the hopes of the beſt operator; otherwiſe with theſe regulations the whole generally ſucceeds very well; and is not only of uſe for the propagating many exotic plants, but even will make very tender ones bear our climate, by placing them on the hardier ſtocks of the ſame kind.

Whip-GRAFTING, or *Tongue*-GRAFTING, is a ſort of *grafting* in the rind, proper for ſmall ſtocks, from an inch diameter to a quarter of an inch. Mr. Miller ſpeaks of it as the moſt effectual way of any, and that moſt in uſe.

In this, the ſtock and cyon are always to be of the ſame bigneſs. The cyon to be ſloped off a full inch, or more; and the like is to be done to the ſtock; and ſo the one to be tied to the other. Otherwiſe, the top of the ſtock being cut off, a ſhoulder is to be made in the *graft*; and the reſt to be performed as already ſhewn under *grafting in the rind*.

This method is alſo improved by what they call *tipping*, or *tonguing*; which is, the making a ſlit with a knife in the bare part of the ſtock, downwards; and the like in the ſloped face of the cyon, upwards; then joining them, by thruſting one ſlice into the other, till the bare place of the cyon cover that of the ſtock; then there ſhould be a ligature of baſs to faſten the cyon, ſo that it may not eaſily be diſplaced, which ſhould be covered with clay.

Side-GRAFTING. In this, the cyon is prepared as in *whip-grafting*; but the head of the ſtock is not cut off. Only, from a ſmooth part on the weſt ſide, ſo much of the bark is pared off as the cyon will cover; then ſlitting both cyon and ſtock, as in the laſt article, they bind the two together, and cloſe them up with clay. At the year's end, the top of the ſtock is cut off at the grafted place, ſlopewiſe; and the place is covered with clay.

Scutcheon-GRAFTING, is another method of *grafting* in the rind, practiſed in June, July, and Auguſt, when the bark will not part from the ſtock. It is performed by ſlitting the bark of the ſtock in form of the capital letter T, looſening it with the point of a knife, and clapping in a cyon, prepared as above. See INOCULATION and SCUTCHEON.

Crown-GRAFTING, is when four or more *grafts* are placed round the ſtock, between the bark and the rind, ſomewhat in the manner of a crown. This is only practiſed in the larger trees, which are capable of receiving a number of *grafts*, and are too big to be cloven. The method is in all reſpects the ſame as that already delivered for *grafting in the rind*.

Root-GRAFTING, is a modern invention, treated of at large by Agricola: its intention is ſomewhat different from the former, being for the propagation, or multiplication, of plants.

To perform this, take a *graft*, or ſprig, of a young tree, which

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which you intend to propagate; and a ſmall piece of the root of another tree of the ſame kind, or of a kind very like it; or elſe pieces of roots cut off other trees, in tranſplanting, and *whip-graft* them together; obſerving, that the two butt-ends of the *graft* and root be joined, and that the rind of the root join that of the *graft*. Theſe may, afterwards, be planted out at pleaſure, and the piece of root will draw the ſap, and feed the *graft*, as the ſtock does in the other way.

This way of propagation is very eaſy and expeditious; roots being more plentiful than ſtocks: by this method the pieces of roots of one crab-ſtock, or apple-ſtock, will ſerve for twenty or thirty apple *graffs*, and the like of other trees. The ſame is alſo an excellent way for raiſing of tender trees, that will hardly bear being *grafted* in the ſtock. Add, that trees thus *grafted*, bear ſooner, and are more eaſily dwarfed, than thoſe done in any other way.

Reiterated GRAFTING, or *grafting by a double*, or *triple inciſion*, is another method mentioned by Agricola: to perform which, firſt *graft* a good cyon on a ſtock, and cut it away to one half, or a third part; then fix another *graft* to it, of a better kind, and a third to that; for ſtill the oftener a tree is *engrafted*, the finer fruit it produces.

By this method, that author aſſures us, he produced muſcat pears, that were admirable; making, at firſt, uſe of a ſtock *grafted* with a pound-pear, on which he *grafted* a ſummer bon chretien; and when the branch of this latter had ſhot, he *grafted* on it a cyon of bergamot; which he alſo cut, and *grafted* on it a cyon of a muſcat pear.

ENGRAFTING *of branches*, Agricola mentions as a very certain and profitable operation, beſt practiſed on large, full grown, and even old trees.

To do this, half or more of the branches muſt be lopped off, and *grafts* of three or four years old applied to them; taking care to have ſtakes, or other things, to ſupport them againſt the wind, &c.

He adds, that by this method, you will have, perhaps, the ſame year, at leaſt the ſecond or third, ſuch a quantity of fruit, as the youngeſt and ſoundeſt tree would hardly produce.

The facility with which *grafts* take place, and grow on proper ſubjects, is well known; there are, however, many accidents and uncertainties attending them in their different periods. Some periſh immediately, ſome after appearing healthy for many months, ſome even after years of health. Of theſe laſt ſome die without the ſtocks ſuffering any thing; others periſh together with it. It is very certain, that the greater part of *grafted* trees do not live ſo long as they would have done in their natural ſtate, yet this is no unexceptionable rule, for there are ſome which evidently live the longer for this practice; nay, there are inſtances of *grafts*, which being placed on ſtocks naturally of ſhort duration, live longer than when placed on thoſe which are more robuſt and laſting. Theſe are irregularities which have been little conſidered hitherto, though they happen in a practice, the advantages of which are very great. One great requiſite for the ſucceeding of any *graft* is, that it be in its own nature capable of ſo cloſe and intimate an union with the ſubſtance of the ſtock, that it becomes, as it were, a natural branch of it. If all trees reſembled one another in their ſtructure and juices, if their ſolid parts were all of the ſame figure, and their ſap all of the ſame nature and conſiſtence, their veſſels all of the ſame diameters, and their elaſticity, and the number of the tracheæ equal in all, and in all filled with the ſame quantities of air; if trees were alike in theſe particulars, probably *grafts* of all trees would ſucceed upon one another, but this is by no means the caſe.

The *grafts* of the almond on the plum, and of the plum on the almond, always grow very vigorouſly for the firſt year, and give all the appearance imaginable of ſucceeding entirely, yet they always periſh in the ſecond, or elſe in the third year. The almond *graft* upon the plum-ſtock always puſhes out very vigorouſly at firſt, but the part of the ſtock immediately under the *graft* grows ſmaller, and periſhes; the *graft* abſorbing too much of its juices, and the *graft* neceſſarily periſhes with it. The decay of the whole generally happens early in the ſpring, and that plainly from the different ſeaſon of the natural ſhooting of the two trees, the almond puſhing very vigorouſly, and conſequently draining the ſtock of its juices, at a time when, according to its nature, the juices are but in ſmall quantity in it, and the ſap does not begin to aſcend. The *grafts* of the plum on the almond are, from the ſame cauſe, furniſhed with an abundance of ſap, which they have at that time no occaſion for, and conſequently they as certainly periſh of repletion, as the other of inanition. Mem. Acad. Par. 1730.

The peach *grafted* on the plum ſucceeds excellently, and lives longer than it would have done in its natural ſtate. The reaſon of which is this: the peach is a tender tree, it ſhoots with great vivacity, and produces more branches than the root is able to maintain, which is the reaſon why peach-trees are uſually full of dead wood, and often their large branches periſh, and ſometimes their whole trunk; on this occaſion, the plum being a ſlow ſhooting tree, communicates its virtue to the *graft*; and the peach conſequently ſends out ſhoots, which are more robuſt and ſtrong, and are no more in number than the root is able to ſupply with nouriſhment; hence the tree is more ſtrong and laſting. Miller.

See an account of methods of *engrafting* for improving and haſtening the fruit, under FRUIT-*trees*.

ENGRAFTING *of the ſmall-pox*. See INOCULATION.

ENGRAILED, or INGRAILED, in *Heraldry* (from the French *grêle, hail*) is when a thing is repreſented with its edges ragged, or notched, ſemicircularly, as if broken by ſomething falling on it. See *Tab.* II. *Herald. fig.* 57. See INDENTED, and INVECTED.

Spelman expreſſes it in Latin by *imbricatus*; others by *ingrediatus*; and others by *ſtriatus*.

ENGRAVERS. See ENGRAVING.

By 8 Geo. II. cap. 13. *engravers* that ſhall invent, deſign, and engrave prints, have the ſole right of printing them for fourteen years, which are to be engraved with the names of the proprietors; and others copying and ſelling ſuch prints, though by varying, &c. without their conſent, ſhall forfeit 5*l*. for every print, and alſo the plates and ſheet, &c. This privilege was continued for twenty-eight years by 7 Geo. III. cap. 38. And by 17 Geo. III. cap. 57. double coſts are given.

ENGRAVING, or GRAVING, the art, or act, of cutting metals, and precious ſtones, and repreſenting figures, letters, and other matters, thereon.

The word is a compound of the prepoſition ἐν, *in*, and γράφω, *I write*. Though Menage, after Salmaſius, derives it from the Latin *cavare, to hollow*; others from the Latin, *graphiare*; and others from the German, *graben*, q. d. *effodere, to dig out*. In Latin it is called *ſculptura*, and *cælatura*.

Engraving is properly a branch of ſculpture; though with us it generally ſtands contradiſtinguiſhed from ſculpture; as the latter, popularly called *carving*, expreſſes the forming of figures, &c. emboſſed, or in relievo; and the latter, thoſe indented, or in creux.

Among the French, the term *engraving*, *graveure*, is of larger extent. It includes all kinds of ſculpture, both that performed with the chiſſel and knife, on marbles and woods in relievo; and that in metals, ſtones, &c. with the graver indented.

Engraving is divided into ſeveral branches, according to the matters it is practiſed on, and the manner of performing it. The original way of *engraving* on wood is now diſtinguiſhed by the name of CUTTING *in wood*; that on metals with aqua fortis, is called ETCHING; that by the knife, burniſher, punch, and ſcraper, MEZZOTINTO; that on ſtones, for tombs, &c. *carving*, or *ſtone-cutting*; and laſtly, that performed with the graver on metals, as copper, braſs, ſteel, ſilver, &c. as alſo on precious ſtones, cryſtals, &c. retains alone the primitive denomination of *engraving*.

Engraving is an art, for the greateſt part, of modern invention; having its riſe no earlier than the middle of the fifteenth century. The ancients, it is true, practiſed *engraving* on precious ſtones and cryſtals, with very good ſucceſs; and there are ſtill many of their works remaining, equal to any production of the later ages. But the art of *engraving* on plates, and blocks of wood, to afford prints, or impreſſions, was not known till after the invention of painting in oil.

The diſcovery is aſcribed to Muſo Finiguerra, a goldſmith of Florence, about the year 1460; who having uſed to take impreſſions of every thing he cut, in clay, and to caſt melted ſulphur in this mould, at length perceiving that what came out of the mould was marked with the ſame prints as his plate, by the black which the ſulphur had taken from his graving, he tried to do as much on ſilver plates, with wet paper, by rolling it ſmoothly with a roller, which alſo ſucceeded. This was the origin of producing impreſſions upon paper in lines, as prints are now done; but the art of *engraving* them ſeems to have been of earlier date. See PRINTING.

By him it is ſaid to have been communicated to Baldini, a goldſmith of the ſame city, who engraved ſeveral plates from drawings of Boticelli, and was afterwards aſſiſted by Andrea Mantegna, of Padua, who improved the art. However, the Germans pretend that this art was practiſed among them by Luprecht Ruſt, the maſter of Schoen, as early as the year 1450. Other German writers aſcribe the invention of it to Francis à Bocholt, who was immediately ſucceeded by Iſrael al Meckenick, and Martin Stock, Albert Durer's maſter. The Dutch pre-

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tend that the art of taking off impreſſions on wood was diſcovered by Lawrence of Harlem, who died between the years 1435 and 1440; and that of *engraving* on copper by Peter Schoeffer, a printer of Metz; and that it was carried into Germany and Italy by his workmen, when Metz was taken in 1462.

However, the ſecret ſoon got abroad, and coming to the hands of Martin Schoen, of Colmar, in Germany, who is ſaid to have practiſed this art from the year 1460 to 1470; Albert Durer, who was born at Nuremberg in 1470, and died in 1528; Lucas, of Leyden, born in 1494, and who died in 1533; and Marco Antonio of Bologna, in the beginning of the ſixteenth century; they greatly improved it, and began to engrave on wood and copper, in which they ſucceeded to admiration. See Evelyn's Hiſtory of Chalcography.

ENGRAVING *in copper*, is employed in repreſenting diverſe ſubjects, as portraits, hiſtories, landſcapes, foliages, figures, buildings, &c. either after paintings, or after deſigns made for this purpoſe.

It is performed with the graver, dry point, or with aqua fortis. For the firſt, there needs but little apparatus, and few inſtruments. The plate you work on being well poliſhed (for the method of preparing which, ſee COPPER-*plates*), is covered over with a thin ſkin of virgin-wax, and on this the draught, or deſign, done in black lead, red chalk, or other ungummed matter, is laid; and rubbed down for the wax to take off. The deſign thus transferred upon the wax, is traced through on the copper, with a point, or needle; then heating the plate, and taking off the wax, the ſtrokes remain; to be followed, heightened, &c. according to the tenor of the deſign, with the GRAVER, which is to be very ſharp, and well tempered.

The dry point, or needle, which has been of late much uſed in *engraving*, is a tool like an etching point, which being drawn hard on the copper, cuts a ſtroke, and raiſes a burr; the burr is ſcraped off, and there remains a ſtroke more ſoft and delicate than can can be produced in any other way.

In the conduct of the graver and dry point conſiſts all the art; for which there are no rules to be given; all depending on the habitude, diſpoſition, and genius, of the artiſt. However, ſome general obſervations and directions may not be improper. As the principles of *engraving* are the ſame with thoſe of painting, a perſon cannot expect to attain any conſiderable degree of perfection in this art who is not a good maſter of deſign; and therefore he ought to be well acquainted both with perſpective and architecture: for the former, by the proper degradations of ſtrong and faint colours, will enable him to throw backwards the figures and other objects of the picture or deſign which he propoſes to imitate; and the latter will teach him to preſerve the due proportion of its ſeveral orders, which the painter often entruſts to the diſcretion of the engraver. In order to preſerve equality and union in his works, the engraver ſhould always ſketch out the principal objects of his piece before he undertakes to finiſh them. Care ſhould be taken that the graver be carried level upon the plate, and be preſſed, as occaſion requires, with greater or leſs force, carrying the hand as evenly as poſſible. In drawing ſtrait lines, a leſs degree of preſſure ſerves for thoſe that are finer, and a greater is required to form the broader and deeper lines. In forming circular or curved lines, the hand and graver muſt be held ſteady, and the plate is to be moved upon the cuſhion under the graver. In large works a cuſhion is uſeleſs. The engraved work may be rendered more viſible, by rubbing it over with a roll of felt, dipt in oil. The ſtrokes of the graver ſhould never be croſſed too much in a lozenge manner, particularly in the repreſentation of fleſh, becauſe ſharp angles produce the unpleaſing effect of lattice-work, and take from the eye the repoſe which is agreeable to it in all kinds of pictureſque deſigns: we ſhould except the caſe of clouds, tempeſts, waves of the ſea, the ſkins of hairy animals, or the leaves of trees, where this method of croſſing may be admitted. But in avoiding the lozenge, it is not proper to get entirely into the ſquare, which would give too much of the hardneſs of ſtone. In conducting the ſtrokes, the action of the figures, and of all their parts, ſhould be conſidered; and it ſhould be obſerved how they advance towards, or recede from the eye; and the graver ſhould be guided according to the riſings or cavities of the muſcles or folds, making the ſtrokes wider and fainter in the light, and cloſer and firmer in the ſhades. Thus the figures will not appear jagged; and the hand ſhould be lightened in ſuch a manner, that the outlines may be formed and terminated without being cut too hard: however, though the ſtrokes break off where the muſcle begins, yet they ought always to have a certain connection with each other, ſo that the firſt ſtroke may often ſerve by its return to make the ſecond, which will ſhew the freedom of the engraver.

In *engraving* the fleſh, the effect may be produced in the lighter parts, and middle tints, by long pecks of the gravers, rather than by light lines, or by round dots, or by dots a little lengthened by the graver, or, beſt of all, by a judicious mixture of theſe together.

In *engraving* the hair and the beard, the engraver ſhould begin his work by laying the principal grounds, and ſketching the chief ſhades in a careleſs manner, or with a few ſtrokes; and he may finiſh it at leiſure with finer and thinner ſtrokes to the extremities. When architecture, or ſculpture, is to be repreſented, except it be old and ruinous buildings, the work ought not to be made very black; becauſe, as edifices are commonly conſtructed either of ſtone or white marble, the colour, being reflected on all ſides, does not produce dark or brown ſhades, as in other ſubſtances. White points muſt not be put in the pupils of the eyes of figures, as in *engravings* after paintings; nor muſt the hair or beard be repreſented as in nature, which makes the locks appear flowing in the air; becauſe in ſculpture there can be no ſuch appearances.

In *engraving* cloths of different kinds, linen ſhould be done with finer and cloſer lines than other ſorts, and be executed with ſingle ſtrokes. Woollen cloth ſhould be engraved wide, in proportion to the coarſeneſs or fineneſs of the ſtuff, and with only two ſtrokes; and when the ſtrokes are croſſed, the ſecond ſhould be ſmaller than the firſt, and the third than the ſecond. Shining ſtuffs, which are generally of ſilk or ſattin, and which produce flat and broken folds, ſhould be engraved more hard and more ſtrait than others, with one or two ſtrokes, as their colours are bright or brown; and between the firſt ſtrokes other ſmaller muſt be joined, which is called interlining. Velvet and pluſh are expreſſed in the ſame manner, and ſhould always be interlined. Metals, as armour, &c. are alſo repreſented by interlining, or by clear ſingle ſtrokes. In architecture, the ſtrokes which form the rounding objects ſhould tend to the point of ſight; and when whole columns occur, it is proper to produce the effect as much as poſſible, by perpendicular ſtrokes. If a groſs ſtroke is put, it ſhould be at right angles, and wider and thinner than the firſt ſtroke. In *engraving* mountains, the ſtrokes ought to be frequently diſcontinued and broken, for ſharp and craggy objects; and they ſhould be ſtrait, in the lozenge manner, and accompanied with long points or dots; and rocks ſhould be repreſented by croſs ſtrokes more ſquare and even. Objects that are diſtant towards the horizon ſhould be kept very tender, and ſlightly charged with black. Waters that are calm and ſtill are beſt repreſented by ſtrokes that are ſtrait, and parallel to the horizon, interlined with thoſe that are finer; omitting ſuch places as, in conſequence of gleams of light, exhibit the ſhining appearance of water; and the form of objects, reflected from the water, at a ſmall diſtance upon it, or on the banks of the water, are expreſſed by the ſame ſtrokes, retouched more ſtrongly, or faintly, as occaſion may require, and even by ſome that are perpendicular. For agitated waters, as the waves of the ſea, the firſt ſtrokes ſhould follow the figure of the waves, and may be interlined, and the croſs ſtrokes ought to be very lozenge. In caſcades, the ſtrokes ſhould follow the fall, and be interlined. In *engraving* clouds, the graver ſhould ſport, when they appear thick and agitated, in turning every way according to their form, and their agitation. If the clouds are dark, ſo that two ſtrokes are neceſſary, they ſhould be croſſed more lozenge than the figures, and the ſecond ſtrokes ſhould be rather wider than the firſt. The flat clouds, that are loſt inſenſibly in the clear ſky, ſhould be made by ſtrokes parallel to the horizon, and a little waving; if ſecond ſtrokes are required, they ſhould be more or leſs lozenge; and when they are brought to the extremity, the hand ſhould be ſo lightened, that they may form no outline. The flat and clear ſky is repreſented by parallel and ſtrait ſtrokes, without the leaſt turning. In landſcapes, the trees, rocks, earth, and herbage, ſhould be etched as much as poſſible; nothing ſhould be left for the graver but perfecting, ſoftening, and ſtrengthening. The dry point produces an effect more delicate than the graver can, and may be uſed to great advantage in linen, ſkies, diſtances, ice, and often in water, eſpecially in ſmall *engravings*. In moſt things it is proper to etch the ſhadows, only leaving the lighter tints for the dry point, graver, &c. Encyclopedie, art. GRAVURE; and Handmaid to the Arts, vol. ii. p. 63, &c.

The other inſtruments, beſides the graver and dry point, are, a CUSHION, or ſand-bag, to lay the plate on, to give it the neceſſary turns and motions: a burniſher, round at one end, and uſually flattiſh at the other, to rub out

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ſlips and failures, and to ſoften the ſtrokes, &c. A ſcraper, to pare off the ſurface, on occaſion; and a rubber of black cloth, or hat, to fill up the ſtrokes, that it may appear how the work proceeds.

To take off printed cuts, ſo that the outlines and principal ſtrokes may be exactly copied for graving, may be thus performed: if the *print* be not above a year or two old, the paper need only be moiſtened with water in the manner uſually practiſed for *printing* cuts; but if it be more ancient, it ſhould be laid to ſoak all night in water, and afterwards hung in the air till it becomes dry enough for the preſs. The paper thus prepared, is to be laid with its *printed* ſide next the plate, thinly caſed over with white wax, which is thus to be committed to the rolling preſs, whereby an impreſſion of the cut will be obtained. Boyle's Works abr. vol. i. p. 136.

ENGRAVING *in copper with aqua fortis*. See ETCHING.

ENGRAVING *in chalks* is the art of imitating or counterfeiting upon copper, drawings made with chalks on paper. This method of *engraving* was invented by M. Francis, to whom the king of France granted a penſion for the diſcovery. It is intended to form a kind of deception, ſo that the connoiſſeur may not be able, on the firſt inſpection, to diſtinguiſh between the original drawing, and the engraving made in imitation of it; and it is extremely uſeful, as it ſerves to multiply copies of drawings left by thoſe maſters who excelled in the uſe of chalks, and thus to form and improve young artiſts, who could not have acceſs to the originals in the practice of drawing. This kind of *engraving* is not performed with the points of the graver, as is the uſual manner in copper-plate *engraving*, but by a mixture of varied and irregular dots, as being more proper to reſemble the grain produced by the chalks on paper, more or leſs ſoft. Every ſtroke of the chalks on paper may be conſidered as an infinite number of adjoining points, which are the ſmall eminences of the grain of the paper, touched by the chalk in paſſing over it. When the copper-plate has been poliſhed and varniſhed, or properly prepared, as in the common method of *engraving*, the drawing to be imitated may be counterproved on the varniſh of the plate. If this cannot be conveniently done, black lead pencil, or red chalk, muſt be applied to varniſhed or oiled paper, and by means of this chalk, or pencil, all the traces of the original will be tranſmitted to the varniſh. See CALQUING and ENGRAVING, *above*.

The outlines of the object muſt be formed in the etching by points, whoſe magnitude and diſtance muſt be determined by the quality of the ſtrokes in the original drawing. The artiſt may be provided with pointed inſtruments, or needles, of various ſizes, with ſingle or double points. In forming the light and ſhade, he ſhould diſtinguiſh between thoſe hatches which ſerve to expreſs the perſpective of the object, and thoſe which form the ground of it. The principal hatches ſhould be more ſtrongly marked; the middle tints, if etched, ſhould be marked lightly, or they may be left till the varniſh is taken off, and be perfected with a greater degree of ſoftneſs, by needles, or the point of the graver, as the original may require. There is nothing peculiar in the method of applying the aqua fortis in this kind of *engraving*; but it may be obſerved, that it ſhould not be left ſo long as to corrode the lighter parts too much: if the light parts are ſufficiently corroded, they may be ſtopped out with turpentine, varniſh, and lamp-black, mixed together, and the aqua fortis may be applied again to the ſtronger parts; for it will be no detriment to them, if the points which compoſe the ſhade burſt into one another, provided the extreme be avoided. When the work of the aqua fortis is finiſhed, and the varniſh taken off the copper, it will be neceſſary in the ſofteſt parts, ſuch as the fleſh, &c. to interſtipple with proper points; as an effect will be thus produced more delicate than it is poſſible to attain with the aqua fortis only; and the ſtrongeſt ſhades will require additional ſtrength, to be given them with ſmall ſtrokes of the graver. This ſort of *engraving* ſhould be ſcraped before it is finiſhed.

Drawings made with chalks of different colours may be imitated in this manner, if a plate be provided for every colour. Encyclopedie.

ENGRAVING *in aqua tinta* is the art of imitating upon copper drawings made with biſtre, or Indian ink.

ENGRAVING *in mezzotinto*. See MEZZOTINTO.

ENGRAVING *on precious ſtones*, is the repreſenting of figures, or devices, either in relievo, or indented, on diverſe kinds of hard, poliſhed ſtones.

The art of *engraving* on precious ſtones is one of thoſe wherein the ancients excelled; there being diverſe antique agats, cornelians, and onyxes, which ſurpaſs any thing of that kind the moderns have produced. Pyrgoteles among the Greeks, and Dioſcorides under the firſt emperors of Rome, are the moſt eminent engravers we read of: the former was ſo eſteemed by Alexander, that he forbad any body elſe to engrave his head; and Auguſtus's head, engraven by the latter, was found ſo beautiful, that the ſucceeding emperors choſe it for their ſeal.

All the polite arts having been buried under the ruins of the Roman empire, the art of *engraving* on ſtones ſhared the ſame fate. It was retrieved in Italy, at the beginning of the fifteenth century; when one John of Florence, and after him Dominic of Milan, performed works of this kind far from being contemptible.

From that time, ſuch ſculptures became common enough in Europe, and particularly in Germany, whence great numbers were ſent into other countries; but they came ſhort of the beauty of thoſe of the ancients, eſpecially thoſe on precious ſtones; for as to thoſe on cryſtal, the Germans, and after their example, the French, &c. have ſucceeded well enough in them.

In this branch of *engraving* they make uſe either of the diamond or emery. The diamond, which is the hardeſt and moſt perfect of all precious ſtones, is only cut by itſelf, or with its own matter.

The firſt thing is to cement two rough diamonds to the ends of two ſticks, big enough to hold them ſteady by, in the hands; and to rub or grind them againſt each other, till they be brought to the figure deſired. The duſt, or powder, rubbed off, ſerves afterwards to poliſh them; which is performed with a kind of mill, that turns a wheel of lead, pewter, or copper.

The diamond is fixed in a braſs diſh, and thus applied to the wheel, which is covered with a diamond duſt, mixed up with oil of olives; and when the diamond is to be cut facet-wiſe, they apply firſt one face, then another, to the wheel.

Rubies, ſapphires, and topazes, are cut and formed the ſame way, on a copper wheel; and poliſhed with tripoli, diluted in water.

As to emeralds, hyacinths, amethyſts, garnets, agats, and other of the ſofter ſtones, they are cut on a leaden wheel, moiſtened with emery and water, and poliſhed with tripoli, on a pewter wheel. Lapis lazuli, opal, &c. are poliſhed on a wooden wheel.

To faſhion and engrave vaſes of agat, cryſtal, lapis lazuli, or the like, they have a kind of lathe, like that of the pewterers; excepting, that whereas the latter is to hold the veſſels, which are to be wrought with proper tools; the former generally holds the tools, which are turned by a wheel, and the veſſel is held to them to be cut and engraved, either in relievo, or otherwiſe; remembering from time to time to moiſten the tools with diamond-duſt and oil, or, at leaſt, with emery and water.

To engrave figures or devices on any of theſe ſtones, when poliſhed, ſuch as medals, or ſeals, &c. they uſe a little iron wheel, the two ends of whoſe axis are received within two pieces of iron placed upright, as in the turners lathe, and to be brought cloſer, or ſet farther apart, at pleaſure. At one end of one of the axes are fitted the proper tools, being kept tight by a ſcrew. Laſtly, the wheel is turned by the foot, and the ſtone applied by the hand to the tool; and thus ſhifted and conducted as occaſion requires.

The tools are generally of iron, ſometimes of braſs. As to their form, it is various, but it generally bears ſome reſemblance to chiſſels, gouges, &c. Some have ſmall round heads like buttons; others like ferrels, to take the pieces out; others flat, &c. Theſe tools are not applied directly againſt the ſtones, but, as it were, ſidewiſe; thus wearing, and, as it were, grinding off the ſubſtance. And ſtill, whether it be figures, or letters, or characters, the manner of application is the ſame. The tools, as above obſerved, are to be frequently moiſtened with diamond duſt, and oil of olives. When the ſtone is engraven, they poliſh it on a wheel of bruſhes, made of hog's briſtles, with tripoli. For the larger, and leſs delicate works, they have copper, or pewter tools, on purpoſe to poliſh the ground, or plain parts, with tripoli, &c. which they apply after the ſame manner as thoſe wherewith the graving is performed.

ENGRAVING *on ſteel*, is chiefly employed in cutting punches, matrices, and dies, proper for ſtriking coins, medals, and counters.

The method of *engraving*, with the inſtruments, &c. are the ſame for coins, as for medals and counters: all the difference conſiſts in their greater, or leſs relievo; the relievo of coins being much leſs conſiderable than that of medals; and that of counters ſtill leſs than that of coins.

The engraver in ſteel uſually begins with punches, or punchions, which are in relievo, and ſerve for making the creux, or cavities of the matrices, and dies; though ſometimes he begins immediately with the creux; but it is only when the intended work is to be cut very ſhallow. The firſt thing is to deſign his figures; then he moulds

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moulds them in white wax, of the ſize and depth required; and from this wax he graves his punch.

This punch is a piece of ſteel, or, at leaſt, of iron and ſteel mixed; on which, before they temper, or harden it, the intended figure, whether a head, or a reverſe, is cut, or carved, in relievo. The inſtruments uſed in this *graving* in relievo, which are much the ſame as thoſe wherewith the finiſhing of the work in creux is effected, are of ſteel: the principal are, gravers of divers kinds, chiſſels, flatters, &c. when the punch is finiſhed, they give it a very high temper, that it may the better bear the blows of the hammer, wherewith it is ſtruck, to give the impreſſion to the matrice.

What they call *matrice*, or *matrix*, is a piece of good ſteel, of a cubic form, called alſo the *dye*, whereon the relievo of the punch is ſtruck in creux: it is called *matrix*, becauſe in the cavities, or indentures, thereof, the coins, or medals, ſeem formed, or generated, as animals are in the matrix of their mother. To ſoften this ſteel, that it may more eaſily take the impreſſions of the punch, they make it red-hot; and, after ſtriking the punch thereon in this ſtate, they proceed to touch up, or finiſh, the ſtrokes and lines, where, becauſe of their fineneſs, or the too great relievo, they are in any reſpect defective, with ſome of the tools above mentioned.

The figure thus finiſhed, they proceed to engrave the reſt of the medal; as the mouldings of the border, the engrailed ring, letters, &c. all which, particularly the letters, and graining, or engrailment, are performed with little ſteel punches, well tempered, and very ſharp. Add, that as they ſometimes make uſe of puncheons to engrave the creux of the matrix, ſo, on ſome occaſions, they make uſe of the creux of the matrix to engrave the relievo of the punch.

To ſee and judge of the *engraving* in creux, divers means have been deviſed to take the impreſſions therefrom, as the work proceeds; ſometimes they make uſe of a compoſition of common wax, turpentine, and lamp-black; which, always retaining its ſoftneſs, eaſily takes the impreſſion of the part of the *graving* it is applied to; but this only ſerving to ſhew the work piece-meal, they have had recourſe to other ways, to ſhew the whole figure. The firſt, by pouring melted lead on a piece of paper, and clapping the matrice thereon; the ſecond, with melted ſulphur, managed the ſame way; and the third, proper only where the *graving* is ſhallow, by laying a piece of ſoft paper on the *graving*, and over the paper a leaf of lead; when, giving two or three blows with a hammer on the lead, the paper takes the impreſſion of the work.

When the matrix is quite finiſhed, they temper it, rub it well with a pumice-ſtone, and clean out the ſtone again with a hair-bruſh; and, laſtly, poliſh it with oil and emery: in this condition it is fit for the mill, to be uſed to ſtrike coins, medals, &c.

After the like manner are the matrices for caſting of printing letters engraven. See *Letter* FOUNDERY.

ENGRAVING *of ſeals, ſtamps, puncheons, marking irons, gilding irons*, and other matters, for goldſmiths, pewterers, bookbinders, &c. either in relievo, or indenture, is performed after the manner laſt deſcribed.

ENGRAVING *in wood*. See CUTTING *in wood*.

ENGRAULIS, in *Zoology*, a name given, by ſome authors, to the ANCHOVY, called alſo, by ſome, lycoſtomus, and, by others, halecula. See ENCRASICOLUS.

ENGROSSING, the writing a deed over fair, and in proper legible characters. Among lawyers it more particularly means the copying of any writing fair upon parchment, or ſtamped paper. See COPY, CALLIGRAPHUS, &c.

ENGROSSING, in *Commerce*, ſignifies the buying up any commodity in the groſs, or foreſtalling the market. See FORESTALLING.

ENGUICHE, in *Heraldry*, is applied to the great mouth of a hunting horn, when it has a rim of a different colour from the horn itſelf.

ENGYSCOPE, from ἐγγὺς, *near*, and σκοπέω, *I obſerve*, a machine better known under the name of *microſcope*. See MICROSCOPE.

ENGYTHECA, from ἐγγὺς, *near*, and θήκη, *repoſitory*, in *Antiquity*, a cup-board, or place where cups and other veſſels uſed to be laid.

ENHARMONIC, in *Muſic*, according to the diviſion of the ancients, the laſt of the three *genera*, or kinds, of muſic.

The *enharmonic* genus is ſaid to have been thus called, becauſe of its ſuperior excellence; though wherein that conſiſts, ſays Mr. Malcolm, we do not ſee. It was by all acknowleged ſo difficult, that few could practiſe it.

The ſeveral genera are divided into diaſtems, upon which the differences depend. Thoſe of the *enharmonic* are, the *dieſis*, and the *ditonum*; thoſe of the *chromatic*, the *hemitonium*, and *trihemitonium*; and, in the *diatonic*, the *hemitonium*, or *limma*, and the *tonus*.

But under theſe general names, which diſtinguiſh the *genera*, there are ſeveral different intervals, or ratios, which conſtitute the *chroai*, or *colores generum*, which were the different ſpecies of *enharmonic*, CHROMATIC, and DIATONIC.

According to ſome, the intervals, conſtituting the *enharmonic* genus, are the ſemitone minor, the *enharmonic* dieſis, and the third major. Phil. Tranſ. N° 481. p. 272.

This is to be underſtood of what the *enharmonic* ought, accurately ſpeaking, to be. Salinus has thus defined it, and others after him. This diviſion is alſo approved of by Dr. Pepuſch. The ancients do not agree in the numbers, by which they expreſs theſe diviſions of the *enharmonic* genus; but the differences that occur are not ſufficient to conſtitute any ſubordinate ſpecies of the *enharmonic*; and therefore they agree in not ſubdividing it. Phil. Tranſ. ibid. Vid. Wallis, Appendix ad Ptolem. p. 165, 166.

ENHARMONICAL *dieſis*. See DIESIS.

ENHERITANCE. See INHERITANCE.

ENHYDRI, in *Natural Hiſtory*, a genus of cruſtated ferrugineous bodies, formed into large, and, in great part, empty caſes, encloſing a ſmall quantity of an aqueous fluid. Of this genus we have only two ſpecies.

Some of the ancients have ſuppoſed this ſtone ſo called, becauſe its ſurface was always wet, as if by the effect of water oozing from within. The word itſelf expreſſes this notion, as being compounded of ἐν and ὕδωρ. But Pliny tells us directly the contrary, that the water was contained within, and made no ſhew on the outſide, and that the ſurface of the ſtone was white and ſmooth. From this it appears, that the *enhydrus* of the Romans, or at leaſt the kind known to Pliny, was not the ferrugineous one, common in our time, but the flinty kind. Of theſe we alſo have ſome in England. They are, as he ſays, white and ſmooth on the ſurface, and are flints perfectly round, covered with a white cruſt, of the bigneſs of a large apple, and containing a quantity of water, lodged in their central cavity, and rattling in it on ſhaking.

ENHYDRIS, the ancient Greek name for the OTTER.

ENIF, a fixed ſtar of the third magnitude, in Pegaſus's mouth.

ENIGMA. See ÆNIGMA.

ENIXUM *Sal*, among many of the *Chemiſts*, a neutral ſalt, neither acid nor alkaline, but participating of both.

Such are *common* SALT, NITRE, ALUM, VITRIOL, &c. Others apply it to peculiar ſalts, of this general kind.

The *ſal enixum* of Paracelſus is the caput mortuum of ſpirit of nitre, diſtilled in a retort with oil of vitriol; it is of a white colour, and pleaſant acid taſte. If this be diſſolved in hot water, and cryſtallized, it will be a more pleaſant medicine, poſſeſſing ſimilar virtues with vitriolated tartar. It is diuretic, and may be given from a ſcruple to a dram, in broth, or water-gruel.

ENLARGE, in the *Manege*, is uſed for making a horſe go large, that is, making him embrace more ground than he before covered. This is done when a horſe works upon a round, or upon volts, and approaches too near the center, ſo that it is deſired he ſhould gain more ground, or take a greater compaſs. To *enlarge* your horſe, you ſhould prick him with both heels, or aid him with the calves of your legs, and bear your hand outwards. If your horſe narrows, he is enlarged by pricking him with the inner heel, and ſuſtaining him with the outer leg, in order to preſs him forwards, and make his ſhoulders go. Upon ſuch occaſions the riding-maſters cry only *large, large*. See IN.

ENLARGING *ſtatute*. See STATUTE.

ENMANCHE', in *Heraldry*, is when a chief has two lines drawn from the middle of the upper edge, to the ſides, the depth of half the chief; the two lines including an obtuſe angle, whoſe vertex is the center of the top of the chief. See *Tab.* II. *Herald. fig.* 49.

The heralds conceive this, as bearing ſome reſemblance to *ſleeves*; whence the etymology of the word, from the French *manche*, *ſleeve*. It differs from *chappe*, where the lines come from the top to the bottom of the chief.

ENNEACTIS, in *Natural Hiſtory*, a name given, by Linkius, to a ſort of ſtar-fiſh, of the more branched or aſtrophyte kind, which has only nine rays, where they firſt part from the body, but theſe divide into a vaſt number of others afterwards.

ENNEADECATERIS, in *Chronology*, a cycle, or period, of nineteen ſolar years.

The word is formed of ἐννέα, *nine*; δέκα, *ten*; and ἔτος, *year*.

Such is the lunar cycle invented by Meton, at the end whereof the moon returns nearly to the ſame point from which it departed. Whence the Jews, Athenians, and other

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other nations, who were disposed to accommodate the lunar months to the solar years, made use of the *enneadecaeteris*; allowing to seven of the years thirteen months apiece, and to the rest twelve. See CYCLE, and EMBOLISMIC.

ENNEADECATERIS, *the Jewish*, is properly a cycle of 19 lunar years, beginning from *molad tohu*, and returning again and again; whereof every 3d, 6th, 8th, 11th, 14th, 17th, and 19th, are embolismic, or of 383 days 21 hours apiece; the rest common, or of 354 days 8 hours apiece. See YEAR.—Consequently, the Jewish *enneadecateris* is 6939 days 18 hours.

ENNEAGON, in *Geometry*, a figure of nine angles, and nine sides.

The word is formed of εννεα, *nine*; and γωνια, *angle*.

ENNEAGON, in *Fortification*, denotes a place with nine bastions. See FORTIFIED *Place*.

ENNEAHEDRIA, in *Natural History*, the name of a genus of spars.

The word is derived from the Greek εννεα, *nine*, and ἑδρα, a *side*.

The bodies of this genus are spars, composed of nine planes, in a trigonal column, terminated at each end by a trigonal pyramid. Of this genus there are four known species. Hill's Hist. of Foss. p. 208.

ENNEANDRIA, in *Botany*, the ninth class of plants, with hermaphrodite flowers, and nine stamina, or male parts, in each.

The word is derived from the Greek εννεα, *nine*, and ανηρ, *male*.

This class comprehends three orders; viz. the *monogynia*, having one style, of which there are four genera; the *trigynia*, having three styles, including one genus; and *hexagynia*, having six styles, and containing one genus.

The plants of this class are the bay-tree, rhubarb, &c.

ENNEATICAL *days* are every ninth day of a sickness; which, some imagine, naturally occasion a great alteration, either for the better, or worse.

ENNEATICAL *years* are every ninth year of a man's life. See CLIMACTERIC.

ENNEEMIMERIS is one kind of the *cæsura* of a Latin verse, where, after the fourth foot, there is an odd syllable ending a word, which helps to make the next foot with the following word; as in this instance,

Ille latus niveum molli fultus hyacintho.

where all the four kinds of the *cæsura* occur.

ENNEOPHTHALMOS, from εννεα, *nine*, and οφθαλμος, *eye*, in *Zoology*, a name given, by some, to the lamprey.

ENNERIS, in the *Ancient Ship-Building*, a name given to those GALLEYS, or vessels, which had nine tires of rowers. These were of a very considerable size; though Meibom has found so convenient a method of placing the rowers, that he has taken off very much from that immense height others supposed they had above the water. We read of the tessaracontes, and other amazing vessels of this fabric; that of Philopator having forty rows of oars, and that of Ptolemy Philadelphus thirty; and some others which are spoken of, twenty. It has been disputed by many, whether such large vessels as those were ever actually built, or used; but Meibom gives great reason to believe, that they really were, though he, at the same time, alleges against Salmasius, and the more sanguine admirers of the works of the ancients, that very few vessels were built larger than these *enneres*, or nine tiered ones, and proves it from Livy and Plutarch, and from Polybius. We are apt to admire, in many cases, what we ought also to imitate, but never attempt it. This is the case in these galleys; and Meibom, who has given the rules of this ancient naval architecture, is of opinion, that by imitating it at present, modern galleys and galleasses might be built much more conveniently both for strength and celerity, and also at less expence, than they are at present. Meibom. de Trirem.

The modern form is indeed allowed to be better than theirs, but if, in the structure, the proportion of the long ships of the ancients were observed, they might be greatly improved; in the modern way of five men sitting at one oar in the galleasses, much strength is wasted to no purpose, because they sit too near to the fulcrum, or stay, whereas a smaller number of rowers, at a greater distance from the stay, would give more strength, and throw the vessel along much more swiftly, and would require less charge. Galleys of this sort, thus managed at a small expence, would be found of great use in the larger rivers, and in the shallow seas, and therefore convenient for the Baltic, the Britannic, and the Mediterranean seas, and would be the most useful of all vessels for transporting great numbers of forces.

ENOLMIS, Ενολμις, in *Antiquity*, a designation given to Apollo's priestess at Delphi, because she sat on the tripod which was called *olmos*, ολμος. Hence also Apollo is called *Enolmos*, Ενολμος. Pott. Archæol. Græc. lib. ii. cap. 9. tom. i. p. 275.

ENORAINE, in the *Manege*, a wither-wrung horse, or one that is spoiled in the withers. The word is obsolete.

ENORCHIS, in *Natural History*, the name given, by many authors, to that species of *ætites*, or eagle-stone, in which the callimus, or internal nucleus, is not loose, so as to rattle in it when shaken, but remains fixed to one side. The Germans call this *hodenstein*. The outer crust is usually of a whitish colour, and the internal nucleus is yellowish or browniish, and it is usually of the size of a pigeon's egg, and of the shape of the human testicle; whence the name.

ENORMOUS, something excessive, or monstrous, especially in bulk. The COLOSSUS of Rhodes was of an *enormous* stature.

The word is formed of the privative *e*, and *norma*, *rule*; q. d. *void of, or contrary to, rule or measure*; *contra normam*. In the corrupt ages of Latinity, they used *innormis*, and *inormis*.

In the French *jurisprudence*, *læsio enormis*, *enormous damage*, is that which exceeds half the value of the thing sold.

ENQUEST, or INQUEST, in *Law*, denotes an inquisition of a jury by hearing of witnesses.

This is the most usual manner of trial, in all causes, both civil and criminal, within this realm. In civil causes, after proof is made, on either side, of so much as each party thinks good for himself; if the doubt be in the effect, it is referred to the discretion of twelve indifferent men, impanelled by the sheriff for that purpose; and as they bring in their verdict, so judgment passeth: for the judge saith, *the jury findeth the fact thus*. For the *enquest* in criminal causes, see JURY.

ENRICHED *column*. See COLUMN.

ENRICHING *plants*, a term used, by the English farmers, to express such plants as are found to do good to land, rather than to exhaust it, and in consequence of which the same piece of land will produce a good crop of corn, though it would, without the assistance of their having been planted on it, have yielded a very poor one. The mystery of this difference between plants, some of which are found to burn up, that is, impoverish lands, while others enrich it, and leave it fitter for succeeding crops than they found it, is explained by Mr. Tull. This author having observed, that breaking the earth, by digging, or horse-hoeing, between the plants, gave them great increase, found that it was this practice that enriched the earth; and that, while corn and such plants as stand close, and cannot be hoed between, impoverish the ground, and suffer no means of *enriching* it again to be used, there were some other things, the crops of which being planted thinner, gave room to the earth to be ploughed, dug, or hoed between, and that these were the plants which were called the *enriching* kind by the farmers; and the whole secret lay in this, that the hoeing, ploughing, or otherways breaking the earth between them, in order to kill the weeds, enriched the ground greatly more, in proportion, than these plants exhausted it; and the consequence was, that though they had thriven very well, yet the earth was left richer than before, notwithstanding all that they had imbibed from it. Tull's Horsehoeing Husbandry, p. 37.

On this observation, this excellent author seems to have founded the system of what he calls horsehoeing husbandry, concerning which he has written a large and useful treatise. He found that this stirring up of the earth enriched it so greatly, that, where it was used in a proper manner, the kind of plant need not be changed, but that the same earth would yield a successive series of crops of the same plant, and that even without dunging, or ever lying fallow, and every crop, for a long time, would be better than the former ones. The method of sowing, to this purpose, is not by scattering the corn with the hand, but sowing it in rows, and leaving large intervals between, the naked earth of which might be turned up by the hoe. See ALLEY and HOEING.

ENROLLMENT. See INROLLMENT.

Clerk of the ENROLLMENT *of fines*. See CLERK *of the Inrollments*.

ENS, ENTITY, *Being*, in *Metaphysics*, is applied, in a general sense, to every thing which the mind any way apprehends, and whereof it affirms, denies, proves, or disproves, any thing. This other philosophers call *cogitable*, and *intelligible*; and the logicians, *thema*.

ENS, in a less general sense, signifies something that is, or exists, some way farther than by being conceived, or being capable of being conceived, in the mind. This is particularly called *ens positivum*, or *reale*; positive, or real, being. In opposition to which stands *non ens*.

ENS, in its proper, or restrained sense, is that to which there are real attributes belonging; or that which has a reality, not only out of the intellect, but in itself. This is

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is what is properly meant by *res*, *thing*; and what we otherwiſe call *ens*, *reale*, and alſo *ſubſtance*.

ENS *rationis*, is that which depends wholly on the mind, or which exiſts only in the imagination: of which they diſtinguiſh three kinds: *ens rationis affectivum*, which is done or produced by the mind, as knowledge; *ens rationis ſubjectivum*, which is received into the mind, as ſcience; and *ens rationis objectivum*, which is repreſented by the mind, as a chimæra, a golden mountain, or the like. Which laſt, if it have no other manner of being, i. e. if it be repreſented ſo as it does not, or cannot be, is what we moſt properly call, *ens rationis*. The generality of ſchool philoſophers, and the Peripatetics among the reſt, aſſert, that there are of theſe *entia rationis objectiva*. Others deny there are, or can be, any ſuch things.

ENS, or ENS *primum*, in *Chemiſtry*, denotes the moſt efficacious part of any natural mixt body, whether animal, vegetable, or foſſil, wherein all the qualities or virtues of the ingredients of the mixt are comprehended in a ſmall compaſs.

Parcelſus pretends to have been able to ſeparate the *ens primum* from bodies, and with it to effect prodigious things towards the renovation and reſtoration of youth; but his proceſſes are ſo obſcurely delivered, that no body has been induced to try them.

Mr. Boyle gives us a proceſs from M. le Febure, whereby the *ens primum*, or eſſence of baum, is eaſily obtained; he adds, that the effects of an *ens* of baum thus drawn, are no ways inferior to thoſe of Paracelſus; and inſtances in a ſpecial friend of his, upon whoſe taking it only for a fortnight, the nails of his hands and feet fell off, and were ſucceeded by a ſet of new ones; which convinced him ſo far of its efficacy, that he left off taking it himſelf; but, giving ſome of it to an old woman of ſeventy years of age, who ſerved in the houſe, it produced the menſes again; and that ſo copiouſly, as wonderfully to ſtartle the woman.

Upon giving a little of it to an old hen, her feathers began to moult on the ſixth day, and ſhe grew ſtark-naked; but before a fortnight was over, ſhe had others in their room, which were fairer, and better coloured than the former.

The relation is odd enough; yet, conſidering the authority from which we have it, and how eaſily the thing is tried, it is ſurpriſing no body has yet attempted to proſecute it. The proceſs is this:

Having gathered, e. gr. ſome baum, or other proper plant, at the proper ſeaſon and time, beat it into a pulp in a marble mortar; and, putting it into a bolt-head hermetically ſealed, digeſt it forty days on a dunghil, or other analogous heat: this done, take out the matter, which will now be more liquid than before; and ſeparating from it the dregs or groſſer parts, digeſt it anew in a gentle bath, that the remaining groſſer parts may alſo ſubſide; filtrate it, and add to it the fixed ſalt drawn from the former dregs, dried and calcined; to the liquor thus prepared, add equal parts of the liquor of good ſea-ſalt, well purified and melted, and then let it run *per deliquium*; laſtly, ſeal up the mixture in a bolt-head, and expoſe it to the ſun ſix weeks longer; at the end of which term, the *ens primum* of the plant will be found ſwimming on the liquor, in a liquid, tranſparent form, ſometimes of a green, and ſometimes a reddiſh colour, according to the plant uſed.

ENS *primum ſalium*, a name given by Paracelſus to a preparation of ſea-ſalt, which he calls alſo a perpetual oil, and SAL *circulatum*, which ſee.

ENS *Veneris*, or *flower of Venus*, a chemical preparation from vitriol, firſt publiſhed by Mr. Boyle, held as a ſpecific in the rickets, and much commended in nervous caſes, obſtinate cachexies, loſs of appetite, and obſtructions of all kinds.

It is prepared by ſubliming equal parts of the powder of Cyprus vitriol (calcined till it is of a dark colour) and of ſal ammoniac, into the form of yellow flowers. It has its name from the particles of Venus, copper, imparted to it by the vitriol.

ENS *martis*, is the flower of iron ſublimed with the ſame ſalt.

ENSAL, in the *Materia Medica*, a name uſed by ſome authors for the common ſmall cardamom of the ſhops.

ENSCONCED, in the *Military Art*. See INSCONCED.

ENSEELED, in *Falconry*, a term uſed for a hawk which has a thread drawn through her upper eyelids, and made faſt under her beak, to obſcure her ſight.

ENSEMBLE, a French term, ſometimes uſed in our language, literally ſignifying *together*, or *one with another*; being formed from the Latin, *in*, and *ſimul*.

In *Architecture*, we ſay, the *enſemble*, or *tout enſemble* of a building; meaning the work or compoſition, conſidered together, and not in parts; and ſometimes alſo the relative proportion of the parts to the whole. All thoſe pieces of building make a fine *enſemble*.

To judge well of a ſtatue, or other work of ſculpture, one muſt firſt examine whether the *enſemble* be good.

The *tout enſemble* of a painting, is that harmony which reſults from the diſtribution of the ſeveral objects or figures whereof the whole is compoſed. This picture is good, taking the parts ſeparately; but the *tout enſemble* is bad.

ENSIFORM *Leaf*, in *Botany*. See LEAF.

ENSIFORMIS, of *enſis*, *ſword*, and *forma*, *ſhape*; *Cartilago*. See XIPHOIDES.

ENSIGN, in the *Military Art*, a banner or COLOURS, under which the ſoldiers are ranged, according to the different companies or parties to which they belong. When a battalion is encamped, they are placed in its front; but in garriſon they are lodged with the commanding officer. There is a ſmaller ſort, called camp-colours, placed on the right and left of the parade of a regiment when in the field. See FLAG and STANDARD.

The Turkiſh *enſigns* are horſes tails; the number of which diſtinguiſhes the rank of their commanders; the ſultan has ſeven, the grand vizier only three, &c. Thoſe of the Europeans are pieces of taffetty, with divers figures, colours, arms, and devices, thereon. Xenophon tells us, that the *enſign* borne by the Perſians was a golden eagle on a white flag; the Corinthians bore the winged horſe, or Pegaſus; the Athenians, an owl; the Meſſenians, the Greek letter M; the Lacedæmonians, the Λ.

The Romans had a great diverſity of *enſigns*; the wolf, minotaur, horſe, boar, and at length the EAGLE. See SIGNA.

A military *enſign*, on a medal of a Roman colony, denotes it a colony peopled with old ſoldiers.

ENSIGNS, in a *Ship*, are thoſe colours which are hoiſted on a long pole erected over the poop, and called the *enſign-ſtaff*. There are few ſhips, whether men of war or merchants, but have their *enſigns*. Their chief uſe is, that when any ſtrange ſhips meet at ſea, or make into any harbour, by heaving out the colours in the poop, that is, putting theſe *enſigns* abroad, they diſcover of what part and country they are, and ſerve to characteriſe the different ſquadrons of the navy. Thus, the Britiſh heave out their colours with a double croſs, viz. that of St. George and St. Andrew, formed into an union, upon a field which is either red, white, or blue; and ſo all other countries with ſome particular diſtinction, whereby they may be known. The *enſigns* ſerve alſo for many other uſes. See FLAG.

ENSIGN, is alſo uſed for an officer in the infantry, who bears the *enſign* or colours; by the Latins called *ſignifer* and *vexillifer*.

He has the charge of the *enſign* in battle; and, if he be killed, the captain is to take it in his ſtead. The *enſign* is the loweſt commiſſioned officer in a company of foot, under the command of the lieutenant; and, in his abſence, ſupplies his poſt. In cavalry, the enſign is termed a cornet. See CORNET.

ENSTASIS, Ἔνστασις, of ἐν and ἵστημι, *ſtatuo*, in *Logic*, a manner of replying to an opponent, either by confuting his argument, or denying the juſtneſs of his concluſion. Voſſ. Rhet. lib. iii. p. 380.

ENSTASIS, in *Medicine*, a term uſed to expreſs the ingreſs of moleculæ into the vacuity of the pores which obſtruct them, and thereby cauſe diſeaſes. It is a word familiar with Eraſiſtratus and Aſclepiades, who was a follower of Democritus, and taught that moſt diſeaſes were cauſed by ſuch an ingreſs of matter into the pores. Thus Aſclepiades defined a phrenſy to be ſuch an *enſtaſis* in the membranes of the brain. Plutarch, in his Precepts of Health, alſo mentions this *enſtaſis*; and Galen and Caſſius, who is ſuppoſed to have been of the ſect of the Rationaliſts, expreſſes the ſame ſenſe by the ſame word.

ENTABLATURE, in *Architecture*, is that part of an order of column which is over the capital, comprehending the ARCHITRAVE, FRIZE, and CORNICHE.

The word ſeems formed of *tabulatum*, or *intabulamentum*.

The *entablature* is alſo called the *trabeation*, and by Vitruvius and Vignola, *ornament*. It is different in the different orders: indeed, it conſiſts of the three grand parts or diviſions above mentioned, in all; but thoſe parts conſiſt of a greater or leſs number of particular members or ſubdiviſions, as the orders are more or leſs rich.

Vignola makes the *entablature* a quarter of the height of the whole column, in all the orders.

In the Tuſcan and Doric, the architrave, frize, and cornich, are all of the ſame height; in the Ionic, Corinthian, and Compoſite, the whole *entablature* being fifteen parts, five of them are allowed for the architrave, four for the frize, and ſix for the corniche. See IONIC, CORINTHIAN, &c. and COLUMN.

ENTABLATURE, or ENTABLAMENT, is ſometimes alſo uſed for the laſt row of ſtones on the top of the wall of a building, whereon the timber and covering reſt.

As this is frequently made to project beyond the naked

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of the wall to carry off the rain, ſome authors call it in Latin, *ſtillicidium*, or *drip*. Such an *entablature* does not ſtand out far enough; it lets the water fall on the foot of the wall.

ENTABLER, in the *Manege*, is ſaid of a horſe whoſe croupe goes before his ſhoulders, in working upon volts; for, in the regular manege, one half of the ſhoulders ought to go before the croupe. Thus we ſay, your horſe *entables*; for, in working to the right, he has an inclination to throw himſelf upon the right heel; which fault you may prevent, by taking hold of the right rein, keeping your right leg near, and removing your left leg as far as the horſe's ſhoulder. A horſe cannot commit this fault without committing that called, *aculer*; but *aculer* may be without *entabler*. See ACULER.

ENTAIL, in *Law*, ſignifies FEE TAIL, or *fee entailed*, that is, abridged, curtailed, or limited to certain conditions. For the docking of an *entail*, ſee DOCKING and RECOVERY.

ENTALI, in the *Materia Medica*, a name given by ſome authors to foſſile alum.

ENTALIUM, the *pipe-ſhell*, in the *Materia Medica*, a ſhell of the ſame genus with the *dentalia*, being a ſpecies of the *tubuli marini*. It is frequent in the Eaſt Indies, and ſometimes is found on our own ſhores. The virtues aſcribed to it are the ſame with thoſe of the *dentalium*; but neither of them have any title to more than thoſe of alkaline abſorbents, like the other teſtaceous powders.

ENTASIS, *diſtenſion*, from εν and τεινω, *I ſtretch*, a word uſed in various ſenſes by different authors in *Medicine*, but by moſt applied to the parts of generation; and thence *entatica* were medicines, in whatever form, meant as provocatives.

ENTE', in *Heraldry*, literally implies *engraſted*, and is uſed by foreign heralds to expreſs a method of marſhalling, little known among us: yet we have an inſtance of it in the fourth grand quarter of his majeſty's royal enſign, whoſe blazon is Brunſwick and Lunenburgh, impaled with ancient Saxony, *enté in pointe*.

ENTELECHIA, Εντελεχεια, of εντελεχης, *perfect*, a Greek term, by which Ariſtotle defines the ſoul; and which, not occurring in any other author, has given the critics and philoſophers infinite perplexity to diſcover its true meaning. See SOUL.

Hermolaus Barbarus is even ſaid to have conſulted the devil about it; after which, in his Paraphraſe on Themeſtius, whether from the devil or himſelf, we know not, he renders it by *perfectihabia*, which is not a whit the clearer.

Cicero, whoſe interpretation ſhould be preferable to that of any modern, defines *entelechia* (Tuſc. Queſt. lib. i. cap. 1.) to be, *a certain, continued, and perpetual motion*; whence it ſhould ſeem, that Ariſtotle took the ſoul for the mode of the body; a *continuous motion* being, doubtleſs a mode of body.

The common Peripatetics hold *entelechia* to ſignify *act*, and under it ſuppoſe the form of the compound or animal to be underſtood.

Laſtly, other, and thoſe the lateſt Peripatetics, agree, that the *act*, or *entelechia*, whereby Ariſtotle meant to explain the nature of the ſoul, is either ſome mode of the body, as motion, or it is nothing.

ENTENDEMENT, in *Law*. See INTENDMENT.

To ENTER *a Hawk*, among *Sportſmen*, is uſed of a hawk when ſhe begins to kill.

To ENTER *a hound*. See ENTRANCE *of hounds*.

ENTERADENES, of ενλερον, *inteſtine*, and αδην, *gland*, in *Anatomy*, a name by which many authors have called the inteſtinal glands.

ENTERENCHYTÆ, of ενλερα, *the viſcera*, and εγχυω, *I infuſe*, in *Medicine*, a name given by authors to the ſeveral inſtruments contrived for throwing clyſters into the bowels, ſuch as the bladder and pipe, the ſyringe, and the like, for liquid clyſters; and the box with the double pipe for conveying the ſmoak of tobacco. See CLYSTER and FUMIGATOR.

ENTERFERING, in the *Manege*. See CUTTING.

ENTERMEW. See FALCON.

ENTEROCHELE, in *Medicine*, a rupture, or deſcent of the inteſtines.

The word is formed of ενλερον, *inteſtine*, and κηλη, *tumor*.

The *enterocele* is a kind of hernia, or rupture, wherein the inteſtines, and particularly the ilium, fall either into the groin or the ſcrotum. See HERNIA.

There are two kinds of *enterocele*; the *perfect*, which happens when the inteſtine falls into the ſcrotum; and the *imperfect*, when it only falls into the groin.

The next cauſe of the *enterocele* is, the relaxation, or extenſion of the lower part of the peritonæum, wherein the inteſtines are contained. The remote cauſes are, great liſts, too violent exerciſes, great coughs, frequent vomiting, much crying, &c. whence it is that children are much ſubject to it. The remedy is chiefly by external applications, as truſſes and bolſters.

ENTERO-EPIPLOCELE, a kind of rupture, wherein the inteſtines, and *epiploon* or caul, fall together into the *ſcrotum*. See HERNIA. The cauſes are the ſame as thoſe of the ENTEROCELE.

ENTERO-EPIPLOMPHALUS, a kind of exomphalus, wherein the inteſtines, and epiploon or caul, bunch out at the navel.

The word is compoſed of ενλερον, *inteſtine*, επιπλοον, *caul*, and ομφαλος, *umbilicus*, *navel*.

ENTERO-HYDROMPHALUS, in *Medicine*, a kind of exomphalus, wherein, beſide a diſplacing and bunching out of the inteſtine, there is a quantity of watery humours collected along with it.

The word is formed of the Greek, ενλερον, *inteſtine*, ὑδωρ, *water*, and ομφαλος, *navel*.

ENTEROLOGY, (from ενλερον, *inteſtinum*, *a gut*, and λογος, *ſermo*, *diſcourſe*) is properly a treatiſe of the bowels. Though the word is generally underſtood to include the contents of three cavities, head, breaſt, and all the viſcera, or belly.

ENTEROMPHALUS, Εντερομφαλος, in *Medicine*, a kind of exomphalus, wherein the inteſtines, being fallen out of their place, occaſion a tumor in the navel. See EXOMPHALUS and HERNIA.

The word is formed of the Greek, ενλερον, *inteſtine*, and ομφαλος, *umbilicus*.

ENTERORAPHE, of ενλερον and ραφη, *ſuture*, in *Surgery*, a name given to the ſutures of the inteſtines.

To ENTERPEN, in *Falconry*, is a term applied to a hawk, when her feathers are wrapped up, ſnarled or entangled.

ENTERPLEADER, in *Law*, the diſcuſſing or trying a point, incidentally falling out before the principal cauſe can be determined.

Thus, two perſons being found heirs to land by two ſeveral offices in one county, the king is brought in doubt to which of them livery ought to be made. Before livery, therefore, they muſt *enterplede*; that is, formally try between themſelves which is the right heir.

ENTERPRISE, denotes an undertaking attended with ſome difficulty and danger: in the *Military Art*, this kind of ſervice is aſſigned to the light-infantry, light-horſe, and huſſars.

ENTERRMENT, or INTERRMENT. See INTERRMENT.

ENTERSOLE. See MEZANINE.

ENTERTAINMENTS, *epulæ*, among the ancients, were of various kinds, as 1. *Funeral entertainments*, *epulæ funebres*. 2. *Entertainments* given by the huſband on bringing home his wife, called *epulæ genialeſ*. 3. Thoſe beſtowed on the ſoldiers, called *epulæ militares*; which was done before or after an engagement, or on occaſion of proclaiming the general *imperator*. 4. *Birth-day entertainments*, *epulæ natalitiæ*.

There were many other kinds, denominated either from the place where, the perſons by whom, or the occaſion for which they were given.

ENTERVIEW, in *Falconry*, a term uſed for the ſecond year of a hawk's age.

ENTHALIUM, in *Natural Hiſtory*, a name given by ſome to a ſpecies of the *tubuli marini*, more uſually known by the name of *penicillum marinum*, and *pinceau de mer*. See PENICILLI *Marini*.

ENTHEMATA, from ενλιθημι, *I put in*, in *Medicine*, a word uſed to expreſs ſuch medicines as were immediately put into large freſh wounds to ſtop the hæmorrhage, and prevent inflammation, or other bad conſequences.

ENTHETOS, from ενλιθημι, in the writings of the old *Phyſicians*, a name given to certain applications intended to be thruſt up the noſtrils to ſtop hæmorrhages.

ENTHUSIASM, Ενθουσιασμος, a poetic, or prophetic rage or fury, which tranſports the mind, inflames and raiſes the imagination, and makes it conceive and expreſs things extraordinary and ſurpriſing.

The word is derived from the Greek, ενθεος, or ενθυς, a man animated in an extraordinary manner with the ſpirit of God; in whom God is, or whom God animates. Whence the verb ενθουσιαζω, or ενθουσιαω, and the noun ενθουσιασμος, *enthuſiaſm*: and ενθουσιαστης, *enthuſiaſt*, a perſon ſubject to ſuch tranſports.

M. de Piles defines *enthuſiaſm* to be a tranſport of the mind, whereby it is led to think and imagine things in a ſublime, ſurpriſing, yet probable manner.

The ſublime he thinks a neceſſary ingredient in the definition, as being the proper effect and production of *enthuſiaſm*.

This is the *enthuſiaſm* felt in poetry, oratory, muſic, painting, ſculpture, &c. but this *enthuſiaſm* which belongs to the works of art, is very different from that attributed to the ſibyls and prieſteſſes of the oracles, and heathen

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heathen gods, which was little elſe but fanaticiſm, and conſiſted principally in grimace, and contorſions of the body. See ORACLE and PYTHIAN.

There is a degree of aſſent, ſays Mr. Locke, which, with ſome men, has the ſame authority as either faith or reaſon; and that is *enthuſiaſm*, which, laying by reaſon, would ſet up revelation without it; whereby, in effect, it takes away both reaſon and revelation, and ſubſtitutes in the room of it the ungrounded fancies of a man's own brain, and aſſumes them for a foundation, both of opinion and conduct.

Immediate revelation being a much eaſier way for men to eſtabliſh their opinions, and regulate their conduct by than the tedious labour of ſtrict reaſoning; it is no wonder, that ſome have been very apt to pretend to it; eſpecially in ſuch of their actions and opinions as they cannot account for by the ordinary methods of knowlege and principles of reaſon. Hence we ſee, that in all ages men, in whom melancholy has mixed with devotion, or whoſe conceit of themſelves has raiſed them into an opinion of a greater familiarity with God than is allowed others, have often flattered themſelves with the perſuaſion of an immediate intercourſe with the Deity, and frequent communications with the Divine Spirit.

Their minds being thus prepared, whatever groundleſs opinion comes to ſettle itſelf ſtrongly upon their fancies, is an illumination from the Spirit of God; and whatſoever odd action they find in themſelves an inclination to do, that impulſe is concluded to be a call or direction from heaven, and muſt be obeyed.

This we take to be properly *enthuſiaſm*; which, though riſing from the conceit of a warm or over-weening brain, works where it once gets footing, more powerfully on the perſuaſions and actions of men than either reaſon or revelation, or both together; men being moſt forwardly obedient to the impulſes they receive from themſelves.

When men are once got into this way of immediate revelation, of illumination without ſearch, and certainty without proof, reaſon is loſt upon them; they are above it; they ſee the light infuſed into their underſtanding, and they cannot be miſtaken: like the light of bright ſun-ſhine, it ſhews itſelf, and needs no other proof but its own evidence; they feel the hand of God moving them within, and the impulſes of the ſpirit, and cannot be miſtaken in what they feel. But, of this ſeeing and feeling, is it a preception of an inclination to do ſomething, or of the Spirit of God moving that inclination? theſe are two very different perceptions, and ſhould be carefully diſtinguiſhed.

If they know the thing to be a truth, they muſt do it, either by its own ſelf-evidence, or by the rational proofs that make it out to be ſo; if they know it to be a truth, either of theſe two ways, they in vain ſuppoſe it to be a revelation; for thus, all truths, of what kind ſoever, which men uninſpired are enlightened with, come into their minds. If they ſay, they know it to be true, becauſe it is a revelation from God, the reaſon is good; but then it will be demanded, how they know it to be a revelation from God? if they ſay, by the light it brings with it, they ſhould conſider, whether this be ſaying any more than that it is a revelation, becauſe they believe it to be true; for all the light they ſpeak of is but a ſtrong perſuaſion of their own minds that it is a truth, which is a very unſafe ground to proceed on, either in our tenets or actions. True light in the mind, is nothing elſe but the evidence of the truth of any propoſition; and if it be not ſelf-evident, all the light it can have is from the clearneſs of thoſe proofs upon which it is received. See EVIDENCE.

God, when he makes the prophet, doth not unmake the man; he leaves his faculties in their natural ſtate, to enable him to judge of his inſpirations, whether they be of divine original or not. If he would have us aſſent to the truth of any propoſition, he either evidences that truth by the uſual methods of natural reaſon, or elſe makes it known to be a truth which he would have us aſſent to by his authority; and convinces us, that it is from him, by ſome marks which reaſon cannot be miſtaken in. Eſſay on Hum. Underſt. book iv. chap. 19.

The holy men of old, who had revelations from God, had ſomething elſe beſides internal light, of aſſurance in their own minds, to teſtify to them, that it was from God; they had outward ſigns to convince them of the Author of thoſe revelations; and when they were to convince others, they had a power given them to juſtify the truth of their commiſſion from heaven; and, by viſible ſigns, to aſſert the Divine authority of the meſſage they were ſent with. Moſes ſaw the buſh burning without being conſumed, and heard a voice out of it. God, by another miracle, of his rod turned into a ſerpent, aſſured him likewiſe of a power to teſtify his miſſion, by the ſame miracle repeated before thoſe to whom he was ſent.

Devotion, undirected and unreſtrained by reaſon, degenerates into *enthuſiaſm*, or a religious phrenſy, founded in an apprehenſion of a preſent Divine energy on the mind, to which all its powers are ſuppoſed to be ſubject, and by which a perſon is carried on, without attention to anything elſe as his guide, and producing not only great perturbation of mind, but moſt amazing agitations of body. Many inſtances of this kind occur, both in ancient and modern times, to the diſgrace and injury of rational religion.

ENTHUSIAST, Ενθουσιαστης, a perſon poſſeſſed with *enthuſiaſm*. See ENTHUSIASM, FANATIC, &c.

The word is uſually underſtood in an ill ſenſe. It was applied by the ancients to a ſect of heretics, called alſo *Moſſalians* and *Euchites*; who, as Theodoret expreſſes it, were denominated *enthuſiaſts*, becauſe, being poſſeſſed by the devil, they believed themſelves divinely inſpired. See MASSALIANS and EUCHITES.

Among us, *enthuſiaſt* is ſometimes of like import with *fanatic*, and is applied to the Quakers and ancient Anabaptiſts, and modern prophets, from their pretences to extraordinary lights, revelations, viſions, impulſes, &c. from heaven.

ENTHYMEME, in *Logic* and *Rhetoric*, an argument conſiſting only of two propoſitions, an antecedent, and a conſequent deduced from it.

The word is Greek, ενθυμημα, formed of the verb ενθυμειϑαι, *to think, conceive*, a compound of ἐν and ϑυμος, *mind*.

Ariſtotle calls it the *rhetorical* or *probable argument*; the ſchools, the *imperfect ſyllogiſm*, in contradiſtinction to the perfect, which conſiſts of three propoſitions, and is called the *dialectical argument*.

It muſt be obſerved, however, that the *enthymeme* is really a perfect ſyllogiſm in the mind, and only imperfect in the expreſſion, becauſe one of the premiſes is ſuppreſſed, as being ſufficiently clear and obvious, and eaſily ſupplied by the underſtanding of thoſe with whom we diſcourſe.

Thus, in every right-lined triangle, the three angles are equal to two right ones; and conſequently, they are ſo in an iſoſceles triangle, is an *enthymeme*; the propoſition, that an iſoſceles triangle is a right-lined triangle being omitted, as being ſufficiently known and granted.

The *enthymeme* is the moſt ſimple and elegant of all argumentations; being what a man, in arguing cloſely, commonly makes, without attending at all to the form. Thus, that verſe remaining of Ovid's tragedy, intitled, Medea, contains an *enthymeme*: *Servare potui, perdere an poſſum rogas: I was able to ſave you; conſequently, to have deſtroyed you.* All the beauty would have been loſt, had all the propoſitions been expreſſed; the mind is diſpleaſed with a rehearſal of what is no ways neceſſary.

Sometimes, alſo, the two propoſitions of an *enthymeme* are both included in a ſingle propoſition, which Ariſtotle calls an *enthymematical ſentence*, and gives this inſtance thereof: *Mortal, do not bear an immortal hatred.* The whole *enthymeme* would be, *Thou art mortal; let not, therefore, thy hatred be immortal.*

ENTIER, in the *Manege*, is uſed for a ſort of reſty horſe, that refuſes to turn, and is ſo far from following or obſerving the hand, that he reſiſts it. If your horſe is *entier*, and refuſes to turn to what hand you will, provided he flies, or parts from the heels, you have a remedy, by putting the Newcaſtle on him; that is, a caveſſon, made after the Duke of Newcaſtle's way.

The word is French, and is alſo uſed among them to denote a ſtone-horſe.

ENTIERTIE, from the French, *entier*, is uſed in our *Law-books*, in contradiſtinction to *moiety*, and denotes the whole. Thus a bond, damages, &c. are ſaid to be entire, when they cannot be divided or apportioned.

ENTIRE *Tenancy*, in *Law*, is contradiſtinguiſhed to *ſeveral tenancy*, and ſignifies a ſole poſſeſſion in one man; whereas the other denotes a joint, or common one, in ſeveral. See TENANT and JOINT-TENANT.

ENTIRE *arms*. See ARMS.

ENTITATIVELY, ENTITATIVE, implies an abſtraction, or ſeparation, of all the circumſtances, from a thing under conſideration.

Thus, a thing is ſaid to be taken or conſidered *entitatively*, or *ſecundum entitatem*, when conſidered nakedly and preciſely, according to what it is in itſelf, without any thing extrinſic. E. gr. Peter *entitatively* taken, is Peter, as a thing, a ſubſtance, a man, &c. without any regard to his being a lord, a huſband, learned, &c.

ENTITY, in the *School-philoſophy*, a phyſical ens, or being, conſidered according to what it is in its natural capacity.

Some dealers in diſtinctions give us ſeveral kinds of *entity*.

Or,

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Or; *entity* denotes the actual eſſence or exiſtence of any thinking thing. See ENS.

ENTORSES, in the *Manege*. See PASTERN.

ENTOYER, or ENTOIRE, in *Heraldry*, is uſed to expreſs a bordure, charged entirely with things without life. See BORDURE.

ENTRAILS, the inteſtines or guts of an animal. See INTESTINES.

Menage derives the word from the barbarous Latin, *interalia*, formed of the Greek, εντερον, *inteſtine*.

ENTRAILS, is alſo uſed in a more extenſive ſenſe, for the viſcera, or all the parts contained in the cavities of the bodies of animals. See VISCERA.

The aruſpicina of the ancients was employed in conſidering the *entrails* of victims; as the heart, lungs, liver, &c. See ARUSPICES, &c.

ENTRANCE, in *Sea-language*, is a name often given to the foremoſt part of a ſhip under the ſurface of the ſea.

ENTRANCE *of hounds*, a phraſe uſed by our *Sportſmen*, to expreſs the inſtruction of theſe creatures in the art of hunting. They are ſaid to be entered when they are thoroughly taught this.

The time of entering of hounds, is, when they are ſeventeen or eighteen months old; they are then to be taught to take the water and ſwim; they are to be laid abroad in the heat of the day, to enure them to fatigue and exerciſe; and they muſt be frequently led through flocks of ſheep, and warrens, to uſe them to be under command, and to know that they are to run at nothing but what the huntſman orders. They muſt be carefully inſtructed each to know his own name, and to underſtand the voice of the huntſman, and the notes of the horn uſed in hunting; and finally, to uſe their own language in a proper manner.

The beſt time of entering them is about noon; and it ſhould be in a fair warm day; for, if they be entered in the morning, they will give out when the heat of the middle of the day comes on. Take the moſt advanced, that the game may not ſtand long before them, and let them be well rewarded when all is over. This ought to be repeated at leaſt once a week, for two months ſucceſſively; by this means they will be ſo fleſhed and ſeaſoned with what game you may enter them at, that they will never afterwards leave off the purſuit. The new hounds ſhould always be entered with the beſt and ſtaunchest hounds that can be had; and there is not to be one barking dog ſuffered in the field on this occaſion.

Whatever chace the hounds are intended for, the hare is the beſt game to enter them at, becauſe, in this chace, they will learn all the turns and doubles that they can poſſibly meet with in any other kind, and how to come to the hollo. They will learn alſo, from this chace, to have a perfect and nice ſcent, and hard feet, by being uſed to highways, beaten paths, and dry hills. The hounds, when firſt entered, muſt have all the advantages given them that can be. When the hare is put up, from her form, it muſt be obſerved which way ſhe went, and the ſcent muſt be left to cool a while, and then they muſt be laid in and helped as much as can be, by wind, view, hollo, or pricking the paſſage; nor will it be amiſs for the firſt time, to give them a hare tired the ſame morning in her courſe.

Some are of opinion, that the beſt way to enter young hounds, is, to take a live hare, and trail her upon the ground, ſometimes one way, and ſometimes another, and then to draw her off to a convenient diſtance, and hide her, that the dogs, taking the ſcent. may follow all the traces through which ſhe was drawn, and at length find her.

The huntſman ought very well to underſtand the nature and diſpoſition of his hounds, in finding out the game; for ſome hounds are of that temper, that when they have found the ſcent, they will run forward with it, not making any noiſe, nor ſhew of the tail; others, when they have found a head, will ſhew the game; and ſome, having found the footings of the beaſt, will prick up their ears a little, and either bark, or only wag their ears, or the hinder part of their bodies. This difference of natural diſpoſition the huntſman is particularly to obſerve in the young and newly entered pack, otherwiſe he will never underſtand them, nor ever be able to hunt them to any credit or advantage.

For entering the hound at hart or buck, he ſhould be in the prime of greaſe, for then he cannot ſtand up, or hold the chaſe ſo long. The foreſt pitched upon ſhould have all the relays at equal diſtances, as nearly as may be; but then the young hounds ſhould always have ſome old ſtaunch ones to enter them, and they ſhould be led to the fartheſt and laſt relay, and the hart or buck ſhould be hunted to them. Being come up, the old hounds ſhould be uncoupled; and when they have found the hart, and well entered the cry, then the young ones are to be uncoupled alſo; and if any of them are found to lag behind, they muſt be whipped and beaten forward.

In whatever place the hart is killed, the neck ſhould be immediately flayed, and the hounds rewarded; for it is beſt always to do this while the fleſh is hot. Another very good method of entering hounds at the buck, is to take one in the toils or nets, and wound one of his legs, ſo as to diſable him from running either very ſwiftly or very far; then let him looſe, and firſt let a blood-hound trace the creature, then let looſe all the young hounds; and when they have run down the animal, reward them with the neck.

Some enter their hounds within a toil; but this is a bad way; for the hart being in this caſe always in ſight, and not able to run an end, makes a great number of doubles and turnings: this is very different from the chaces they are to meet with afterwards; and when they find a hart run in the common way, ſtraight forward, and out of ſight, they will leave the chace, as unlike that by which they were taught.

ENTRAVES, *entravons*, in the *Manege*. See LOCKS.

ENTREPAS, in the *Manege*, is a broken pace, or going, properly a broken amble, that is neither walk nor trot, but has ſomewhat of an amble. This is the pace, or gait, of ſuch horſes as have no reins or backs, and go upon their ſhoulders, or of ſuch as are ſpoiled in their limbs.

ENTRICHOMA, from εν and θριξ, *hair*, in *Anatomy*, the name of the outer edge of the eye-lid, on which the hairs grow.

ENTRIES, amongſt *Hunters*, thoſe places in thickets through which deer are found lately to have paſſed; by means whereof their bigneſs or ſize is gueſſed at; and at which the hounds or beagles are put to them for the view.

ENTRIES, *books of*, in *Law*, are ancient and modern, and contain tranſcripts of proceedings that have been had in ſome particular actions: the principal of ſuch are neceſſary for gentlemen educated to the profeſſion of the law.

ENTRING *a ſhip*, in the *Sea-language*, the ſame with boarding her. See BOARDING.

ENTRING-*ladder*, in a *Ship*, is of two ſorts; one is uſed by the ſhips ſides, in a harbour, or in fair weather, for perſons to go in and out of the ſhip; the other is made of ropes, with ſmall ſtaves for ſteps, and is hung out of the galley to enter into the boat, or to come aboard the ſhip from thence, when the ſea runs ſo high that they dare not bring the boat to the ſhip's ſide, for fear of ſtaving her. See GANG-WAY.

ENTRING-*ropes*, in a *Ship*. See ROPE.

ENTROCHUS, in *Natural Hiſtory*, the name of a genus of foſſils of a very regular figure and ſtructure, ſuppoſed by many authors to be *lapides ſui generis*, and ſtones in their native ſtate. They are, however, in reality, the foſſile remains of ſome marine animal, probably either of the echinus, or of the ſtar-fiſh kind, filled like the foſſile ſpecies of the echini, with a plated ſpar. Our imperfect knowlege in the animal hiſtory has not yet been able to aſcertain to what creature they really belong; but their analogy, with the other animal remains, found in the foſſile world, plainly evince, that they are of that origin. They are cylindric columns, uſually about an inch in length, and are made up of a number of round joints, like ſo many ſmall wheels or ſegments of cylinders. Theſe joints, when found ſeparate, and naturally looſe, as they ſometimes are, are called *trochitæ*. They are all ſtriated, from the center to the circumference, and have a cavity in their middle, which is ſometimes found empty, but more frequently filled up with various matter, of the nature of the ſtratum, in which they have lain, or of other of the native foſſile ſubſtances.

The *entrochi* are compoſed of the ſame ſort of plated ſpar with the aſteriæ, and the ſpines and ſhells of the foſſile echini; and this is in theſe uſually of a bluiſh grey colour, and very bright and gloſſy, where freſh broken. They are ſubject to accidental injuries, like the other extraneous foſſils, which have been formed in animal moulds, and are frequently met with, compreſſed, or crooked. See TROCHITÆ.

That the *entrochi* are of marine origin, is evident from this, that they have not unfrequently ſea-ſhells found adhering to them; and when theſe are broken off, there remain on the *entrochi* no deficiencies, but the ſhells themſelves ſhew that they have been formed upon, and have grown to the *entrochi*, there being always natural hollows in them to anſwer to that part of the *entrochus* from which they havebeen ſeparated; whence it appears very plainly, that theſe *entrochi*, however altered ſince in their ſubſtance, were, however, exiſting in their preſent

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ſent ſhape, in thoſe very ſeas where theſe ſhells had their growth.

There are not unfrequently found among the *entrochi*, larger or ſmaller fragments of plated bodies.

We meet with the *entrochi* of all the ſizes, from that of a pin's head to a finger's length, and the thickneſs of one's middle finger. They are, in ſome places, found looſe upon ploughed lands; in others, they are lodged in great quantities in the ſtrata of clay, and very often in ſtones of different kinds, and different hardneſs. The Derbyſhire marble is extremely full of them, and owes its beauty, when poliſhed, principally to them. Hill's Hiſt. of Foſſ. p. 653. Phil. Tranſ. N° 100. See SPAR, BELEMNITES, OSTRACITES, &c.

ENTROCHO-*oſteriæ*, in *Natural Hiſtory*, the name given by authors to a peculiar kind of *entrochus*, differing from the common kind, in having a ſtellar cavity inſtead of a round one, in its center. See ENTROCHUS.

ENTROCHUS *pyramidalis*, a name given by ſome of the writers in *Natural Hiſtory*, to the ortho-ceratites, or tubulus marinus concameratus, a ſpecies of ſhell-fiſh, not known to us in its recent ſtate, but very common in the ſtones brought over from Sweden for pavements. Klein. de Tubul. Marin. p. 7. See TUBULI *concamerati*.

ENTROCHUS *ramoſus*, in *Natural Hiſtory*, the name of a foſſile body, the ſeveral parts of which reſemble the *entrochi*; but as they are joined together in this body, when perfect, they ſhew themſelves in their proper light, and a ſight of them in this ſtate is ſufficient to explode the opinion advanced by ſome perſons, of the *entrochi* being of a vegetable nature; or, as they have pleaſed to call them, *rock-plants*. This foſſil has evidently once been a *ſtella-marina*, or *ſea ſtar-fiſh*, conſiſting of twenty rays at the extremity of the body. The manner of inſertion of theſe has been this: the body is of a pentagonal figure, and from this there have ariſen five rays; theſe, at their extremity, have been divaricated, each into two, ſo as to make the number ten in the ſecond progreſſion; and each of theſe laſt being again divaricated into two at its extremity; the third and laſt progreſſion is of twenty rays. All this is eaſily diſtinguiſhable in the foſſil, when perfect, and ſeems to have been the whole figure of the animal while living. The prototype, or living animal, however, is not found; but this is not an accident peculiar to this foſſil, the cornua ammonis, and conchæ anomiæ, with many other bodies that have been once evidently ſhell-fiſh, being no where at this time found in their recent ſtate, though ſo very numerous in the foſſile world. This remarkable foſſile ſtar-fiſh is the body called by ſome authors, *lilium lapideum*. Keppeler's Epiſt. ad Klein de Entrochis.

ENTROCHORUM *radix*, in *Natural Hiſtory*. See RADIX.

ENTRUSION, or INTRUSION, in *Law*, denotes a violent or unlawful entrance into lands or tenements void of a poſſeſſor, by a perſon who has no right to them.

Thus, when a man ſteps into lands, the owner whereof lately died, before the right heir, either by himſelf, or any other, hath taken poſſeſſion, it is *entruſion*.

Entruſion and *abatement* are ſometimes taken for the ſame thing, though there is a difference. See ABATEMENT, in *Law*.

ENTRUSION, in the *Canon Law*. See INTRUSION.

ENTRY, or ENTRANCE, in its general ſenſe, denotes a door, gate, paſſage, &c. through which to *enter*, or arrive within a place.

ENTRY, in *Book-keeping*. See BOOK-KEEPING.

ENTRY, *bill of*. See BILL.

ENTRY, is ſometimes alſo uſed to denote a duty or impoſt laid on commodities imported into a ſtate, either by land or ſea.

The duties of *entry*, or importation, are paid according to a tariff ſettled for that purpoſe. Where the duty of *entry* of any commodity is not fixed by the tariff, it is paid by eſtimation, i. e. in proportion to what ſome other commodity of nearly the ſame quality and value uſes to pay. In making *entries* inwards, it is uſual for merchants to include all the goods they have on board the ſame ſhip in one bill, though ſometimes there may happen to be upwards of twenty ſeveral kinds; and in caſe the goods are ſhort entered, additional or port *entries* are now allowed; though formerly the goods ſo entered were forfeited. As to bills of *entry* outwards, or including goods to be exported, upon delivering them, and paying the cuſtoms, you will receive a COCKET, which teſtifies your payment thereof, and of all duties for ſuch goods. If ſeveral ſorts of goods are exported at once, of which ſome are free, and others pay cuſtoms, the exporter muſt have two cockets, and therefore muſt make two *entries*. *Entries* of goods, on which a DRAW-BACK is allowed, muſt likewiſe contain the name of the ſhip in which the goods were imported, the importer's name, and time of *entry* inwards. The *entry* being thus made, and an oath taken, that the cuſtoms for thoſe goods were paid as the law directs, you muſt carry it to the collector and comptroller, or their deputies; who, after examining their books, will grant a warrant, which muſt be given to the ſurveyor, ſearcher, or land-waiter, that they may certify the quantity of goods; after which the certificate muſt be brought back to the collector and comptroller, or their deputies, and oath made, that the ſaid goods are really ſhipped, and not landed again in any part of Great Britain. See DEBENTURE, IMPORTATION, and EXPORTATION.

ENTRY, alſo denotes a ſolemn reception, or a ceremony performed by kings, princes, embaſſadors, legates, &c. upon their firſt *entering* a city, or their return in triumph from ſome expedition.

ENTRY, in *Law*, ſignifies alſo the taking poſſeſſion of lands or tenements, in virtue of a title thereto. See POSSESSION.

ENTRY, *forcible*. See FORCIBLE.

ENTRY, is alſo uſed for a writ which grants poſſeſſion of lands or tenements to a perſon, on account of a legal right thereto.

Writs of entry, ſays Briton, ſavour much of the right of property: ſome, e. gr. are to recover cuſtoms and ſervices; and in theſe are contained the two words, *ſolet* and *debet*. Such are the writs, *quo jure*, *rationalibus diviſis*, *rationabili eſtoverio*, &c. In the *plea of entry*, there are three degrees: the firſt, where a man demandeth lands or tenements of his own ſeiſin, after the term is expired. The ſecond, where one demandeth lands or tenements lett by another, after the term is expired. The third, where one demandeth lands or tenements of that tenant who had *entry* by one to whom ſome anceſtor of the plaintiff did lett for a term now expired; and according to theſe degrees, the writs for remedy are varied. Beſide which, there is a fourth form, without degrees, and in caſe of a more remote ſeiſin, to which the other three degrees do not extend.

The writ in the ſecond degree is called a *writ of entry in le per*. In the third, *in le per & cui*. And in the fourth, without degrees, a *writ of entry in le poſt*; that is, after diſſeiſin, made by ſuch a one to ſuch a one. The words, *in le per*, *in le per & cui*, and *in le poſt*, denote the different forms of this writ, applied to the caſe upon which it is brought, and each form taking its name from the words contained in the writ. There are five things which put the *writ of entry* out of the degrees, viz. intruſion, as when the diſſeiſor dies ſeiſed, and a ſtranger enters; diſſeiſin upon diſſeſin, when the diſſeiſin is diſſeiſed by another; ſucceſſion, when the ſucceſſor in office or religious profeſſion enters; judgement, when a perſon recovers againſt the diſſeiſor; and eſcheat, when the diſſeiſor dies without heir, or commits felony, &c. on which account the lord enters. There are ſeveral other writs of *entry*: ſee CASU *conſimili*, CASU *proviſo*, *Communem* LEGEM, AD *terminum*, SINE *aſſenſu capitali*.

If a *writ of entry* be conceived out of the right caſe, ſo that one form is brought for another, it is abatable.

A *writ of entry* differs from an *aſſiſe*, in that it lies for the moſt part againſt him who entered lawfully, but holdeth againſt law: whereas an aſſiſe lieth againſt him who unlawfully diſſeiſed; yet, ſometimes, a *writ of entry* lieth upon an entruſion. See ASSISE.

ENTYPOSIS, from ἐντυπόω, *I make an impreſſion*, in *Anatomy*, the articulation of the ſhoulder with the arm.

ENVELOPE, in *Fortification*, denotes a mount of earth, ſometimes raiſed in the ditch of a place, and ſometimes beyond it, being either in form of a ſimple parapet, or of a ſmall rampart bordered with a parapet.

Theſe *envelopes* are made where weak places are only to be covered with ſingle lines, without advancing towards the field, which cannot be done but by works which require a great deal of room; ſuch as horn-works, half-moons, &c. *Envelopes* are ſometimes called *fillons*, *contregards*, *conſerves*, *lunettes*, &c.

ENVIRONNE' in the *French Heraldry*, is when a lion or other figure is *environed*, or encompaſſed round with other things. *Environné* with ſo many BEZANTS, &c. in orle.

ENULA, in *Botany*. See ELECAMPANE.

ENULION, from ἐν and οὖλον, *the gums*, a word uſed by ſome *Medical Writers* for the fleſh of the gums.

ENUMERATION, the act of numerating, or counting.

At the time of our Saviour's birth, Auguſtus Cæſar had commanded an *enumeration* to be made of all the world, or rather of all the people under his empire. Though ſeveral able authors are of opinion, that the CENSUS, tax, or *enumeration*, mentioned by St. Luke, did not extend to the whole empire, but only to the people of Judæa. See Perizonius de Cenſu Judaico, and Berger de Viis Militaribus.

At Rome, it was an uſual thing to have an *enumeration* made

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made of all the families: the firſt of theſe was under Servius Tullus, when the men amounted to eighty thouſand. Pompey and Craſſus made another, when they reached to four hundred thouſand. That of Cæſar did not exceed one hundred thouſand; ſo that the civil wars muſt have deſtroyed three hundred thouſand Roman citizens. Under Auguſtus, in the year 725, the Roman citizens throughout the empire were numbered at four million ſixty-three thouſand. In the year of Rome 746, the citizens being numbered again, were found four million two hundred and thirty-three thouſand. In the year 766, being the laſt year of Auguſtus's reign, that prince, together with Tiberius, made another *enumeration* of the citizens of Rome, when they were found four millions one hundred and thirty-ſeven thouſand perſons. Claudius made a new computation in the year of Chriſt 48, when, as Tacitus relates it, the Roman citizens throughout the whole empire amounted to ſix millions nine hundred and ſixty-four thouſand; though others repreſent the number as conſiderably greater. A very rare, yet indiſputable medal of Claudius, never yet made public, expreſſes the preciſe number in this liſt made by Claudius, which was called *oſtenſio*, to be ſeven millions of people fit to bear arms, beſide all the ſoldiers on foot in the armies, which amounted to fifty legions, fifty-ſeven cohorts, and ſixty ſoldiers. After this *enumeration*, we find no more till that of Veſpaſian, which was the laſt.

ENUMERATION, in *Rhetoric*, denotes a part of the peroration, wherein the orator, collecting the ſcattered heads of what has been delivered throughout the whole, makes a brief and artful rehearſal or recapitulation thereof. See APARITHMESIS and SYNATHROISMUS.

ENUMERATION *of the parts*, in *Rhetoric*, amounts to the ſame with what we more uſually call *diſtribution*. See DISTRIBUTION.

ENUNCIATION, a ſimple expreſſion or declaration of a thing, in terms either of affirmation or denial.

The ſchoolmen uſually diſtinguiſh three operations of the underſtanding; apprehenſion, *enunciation*, and reaſoning.

ENUNCIATION, among *Logicians*, denotes the ſame as *propoſition*. See PROPOSITION.

ENVOICE. See INVOICE.

ENVOY, a perſon deputed, or ſent purpoſely to negociate ſome particular affair with a foreign prince or republic.

Thoſe ſent from the courts of England, France, &c. to Genoa, the princes of Germany, and other petty princes and ſtates, do not go in quality of embaſſadors, but of *envoys*.

Add, that thoſe ſent from one great prince or ſtate to another, as from the king of England to the emperor, &c. when the affair they go upon is not very ſolemn and important, have frequently no other character but that of *envoys*. See EMBASSADOR.

Envoys are either *ordinary* or *extraordinary*.

Both kinds are under the protection of the law of nations, and enjoy all the privileges of embaſſadors, only differing from them in this, that the ſame ceremonies are not performed to them.

The quality of *envoy* extraordinary, Wicquefort obſerves, is very modern; more modern than that of reſident: the miniſters inveſted therewith, at firſt, took on them moſt of the airs of embaſſadors; but they have ſince been taught otherwiſe.

In the year 1639, the court of France made a declaration, that the ceremonies of conducting *envoys* extraordinary to their audience in the king and queen's coaches, with diverſe others, ſhould no longer be practiſed to *envoys*.

S. Juſtiniani, the firſt *envoy* extraordinary from Venice, after that regulation, offered to cover in ſpeaking to the king, but it was refuſed him; and the king of France himſelf declared, that he did not expect his *envoy* extraordinary at the court of Vienna ſhould be regarded any otherwiſe than as an ordinary reſident. Since this time, thoſe two kinds of miniſters have been treated alike. Wicquefort.

ENUR, a word uſed by ſome of the *Chemical Writers*, to expreſs the occult, or unſeen vapour of water, of which they ſuppoſe ſtones to be produced.

ENURE, in *Law*, ſignifies to take place, or be available, and is as much as to have effect. Thus, for inſtance, a releaſe made to tenant for life ſhall *enure*, and be of force and effect to him in the reverſion.

ENVY, in *Ethics*, is defined by Mr. Locke, to be an uneaſineſs of mind, occaſioned by the conſideration of a good we diſcover in poſſeſſion of another perſon, whom we deem leſs worthy of it than ourſelves. It is a compoſition of ſorrow and hatred, and ſtands in direct oppoſition to congratulation. *Envy*, in its nature and effects, is the baſeſt, moſt miſchievous, and moſt tormenting of all paſſions.

ENVY, in *Mythology*, is repreſented by the Greek and Roman poets as an infernal divinity, with ſquinting eyes, lean body, pale countenance, diſturbed air, head encompaſſed with ſerpents, &c.

ENURNY, is the herald's term for the bordure of a coat of arms being charged with any kind of beaſts.

ENXYLON, of ἐν and ξυλον, *wood*, a name uſed by the Greek authors for a ſpecies of worm or maggot, hatched from the egg of a beetle, and having its habitation in wood; which, in this ſtate, it erodes and burrows into, in various directions. The old Greeks called it alſo *dex* and *thrips*, and uſed the pieces of wood eroded by it in remarkable figures, as ſeals. See THRIPS.

ENYSTRON, of ἐν and ὑστερος, *poſterior*, a word uſed by Ariſtotle for the ſecond ventricle in ruminating quadrupeds, in which the food is elaborated and concocted.

EOLIC, or rather ÆLIC. See ÆOLIC.

EOLIPILE. See ÆOLIPILE.

EOLUS, and EOLUS's *harp*. See ÆOLUS.

EON, or ÆON. See ÆON.

EON, a word uſed by ſome anatomical writers to expreſs the whole ambit, or compaſs of the eye.

EONIANS, in *Church Hiſtory*, the followers of Eon, a wild fanatic of the province of Bretagne, in the twelfth century, whoſe brain was diſordered. He concluded from the reſemblance between *eum*, in the form for exerciſing malignant ſpirits, viz. *Per eum, qui venturus eſt judicare vivos & mortuos*, and his own name, Eon; that he was the ſon of God, and ordained to judge the quick and dead. Eon, however, was ſolemnly condemned by the Council at Rheims in 1148, at which pope Eugenius III. preſided, and ended his days in a miſerable priſon. He left behind him a number of followers and adherents, whom perſecution and death, ſo weakly and cruelly employed, could not perſuade to abandon his cauſe, or to renounce an abſurdity, which, ſays Moſheim, one would think could never have gained credit but in ſuch a place as Bedlam. Eccl. Hiſt. vol. ii. p. 458.

EORIA, in *Mythology*, a feaſt celebrated by the Athenians in honour of Erigonus, who, by way of puniſhment, for their not avenging the death of his father Icarus, engaged the gods to inflict the curſe on their daughters, that they ſhould love men who never returned their paſſion. The feaſt was inſtituted by the order of Apollo.

EOSTRE, in *Mythology*, a Saxon goddeſs, to whom they ſacrificed in the month of April, called the month of Eoſtra; and thence the name EASTER, which the Saxons retained after their converſion to Chriſtianity, applying it to the feſtival celebrated in commemoration of our Saviour's reſurrection. Bed. de Rat. Temp. cap. 13.

EPACTHES, Ἐπαχθης, in *Antiquity*, a feſtival celebrated in honour of Ceres, named Ἀχθεια, from ἀχθος, i. e. *grief*, in memory of her ſorrow, when ſhe had loſt her daughter Proſperine.

EPACTS, in *Chronology*, the exceſſes of the ſolar month above the lunar ſynodical month; and of the ſolar year above the lunar year of twelve ſynodical months; or of ſeveral ſolar months above as many ſynodical months; and ſeveral ſolar years above as many dozen of ſynodical months.

The *epacts*, then, are either *annual* or *menſtrual*.

EPACTS, *menſtrual*, are the exceſſes of the civil or calendar month above the lunar month.

Suppoſe, e. gr. it were new-moon on the firſt day of January; ſince the lunar month is 29 days, $12^h\ 44'\ 3''$; and the month of January contains 31 days; the menſtrual *epact* is 1 day $11^h\ 15'\ 57''$.

EPACTS, *annual*, are the exceſſes of the ſolar year above the lunar.

Hence, as the Julian year is 365 days 6^h, and the Julian lunar year 354 days $8^h\ 48'\ 38''$, the annual *epact* will be 10 days $21^h\ 11'\ 22''$; that is, nearly 11 days. Conſequently, the *epact* of 2 years is 22 days; of 3 years, 33 days; or rather 3, ſince 30 days make an EMBOLISMIC, or intercalary month.

Thus, the *epact* of 4 years is 14 days, and ſo of the reſt; and thus, every 19th year, the *epact* becomes 30 or 0; conſequently the 20th year the *epact* is 11 again; and ſo the cycle of *epacts* expires with the golden number or lunar cycle of 19 years, and begins with the ſame, as in the following table:

Gold. Numb.	Epacts.	Gold. Numb.	Epacts.	Gold. Numb.	Epacts.
1	XI	7	XVII	13	XXIII
2	XXII	8	XXVIII	14	IV
3	III.	9	IX	15	XV
4	XIV	10	XX	16	XXVI
5	XXV	11	I	17	VIII
6	VI	12	XII	18	XIX
				19	XXX

Again,

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Again, as the new moons are the ſame, that is, as they fall on the ſame day every 19 years, ſo the difference between the lunar and ſolar years is the ſame every 19 years. And becauſe the ſaid difference is always to be added to the lunar year, in order to adjuſt or make it equal to the ſolar year; hence the ſaid difference reſpectively belonging to each year of the moon's cycle is called the *epact of the ſaid year*, that is, the number to be added to the ſaid year, to make it equal to the ſolar year, the word being formed from the Greek, επαγω, *induco*, *intercalo*.

Upon this mutual reſpect between the cycle of the moon and the cycle of the *epacts*, is founded this rule for finding the Julian *epact*, belonging to any year of the moon's cycle. Multiply the year given of the moon's cycle into 11; and if the product be leſs than 30, it is the *epact* ſought; if the product be greater than 30, divide it by 30, and the remainder of the dividend is the *epact*. For inſtance, I would know the *epact* for the year 1712, which is the third year of the moon's cycle. Wherefore 3 is the *epact* for 1712, for $11\times3=33$, and 33 being divided by 30, there is left 3 of the dividend for the *epact*.

But the difference of the Julian and Gregorian years being equal to the exceſs of the ſolar above the lunar year, or 11 days, it happens that the Gregorian *epact* for one year is the ſame with the Julian *epact* for the preceding year.

By the help of the *epact* may be found what day of any month in any year the new moon falls on, thus: to the number of the month, from March incluſively, add the *epact* of the year given; if the ſum be leſs than 30, ſubtract it out of 30; if greater, ſubtract it out of 60; and the remainder will be the day whereon the new moon will fall.

If the new moon be ſought for in the month of January or March, then nothing is to be added to the *epact*; if for February or April, then only 1 is to be added.

For example: I would know what day of December the new moon was on A. D. 1711, the *epact* whereof is 22. By the aforeſaid rule, I find it will be December the 28th; for $22+10=32$, and $60-32=28$. See MOON.

The day whereon the new moon falls being thus found, it is eaſy to infer from thence what the age of the moon is on any day given. See MOON.

However, there is a peculiar rule commonly made uſe of to this purpoſe, which is this: add the *epact* of the year, the number of the month, from March incluſively, and the given day of the month all into one ſum; this, if it be leſs than 30, ſhews the age of the moon; if it be greater than 30, divide it by 30, and the remainder of the dividend ſhews the age of the moon, or how many days it is from the laſt new moon: this method will never err a whole day.

For inſtance; what was the age of the moon on December 31ſt, A. D. 1711? By this rule, I find, that the moon was then three days old; that is, it was then three days from the laſt new moon. For $22+10+31=63$, and 63 being divided by 30, there will remain of the dividend 3. And this exactly agrees to the other foregoing rule, whereby it was found, that the new moon was on December 28, 1711.

It muſt be obſerved, that at the time of the general council of Nice in 325, it was thought, that 19 Julian ſolar years were exactly equal to a CYCLE of 19 lunar years, or to 235 ſynodical months; and therefore, that at the end of 19 years, the new moons would happen exactly at the ſame time as they did 19 years before: but this is a miſtake;

	days	h.	′	″	‴
For 19 Julian ſolar years contain	6939	18	0	0	0
Whereas 235 ſynodical months contain only	6939	16	31	56	30
And are therefore leſs than 19 Julian ſolar years, by	0	1	28	3	30

Hence it appears, that the cycle of 19 years anticipates the new moons by one day in 310.7 years very nearly; and therefore the ſame cycle of *epacts* will not always hold; the moon's anticipation leſſening the ſeveral *epacts* by one every 310.7 years.

To have the *epacts*, therefore, point out the new moons perpetually; that *epact* given in the calendar is not ſufficient; but all the 30 *epacts* ſhould be beſtowed throughout the whole year, that the calendar may exhibit all the cycles of *epacts*. See a table of this kind in Wolfius's Elementa Chronologiæ, apud Opera, tom. iv. p. 133.

It is plain, that whenever the forementioned anticipation takes place, or it becomes neceſſary to ſet the *golden numbers* one day back in the calendar, the *epact* muſt be increaſed by an unit more than uſual, e. g. 12 muſt be added inſtead of 11, to the *epact* of the preceding, in order to form the *epact* of the current year; and thus the ſubſequent *epacts*, increaſing conſtantly by 11, will be greater by unit than the correſponding *epacts* of the preceding 19 years. If the *epacts* were once properly prefixed in the calendar, to denote the days on which the new moons fall in thoſe years, of which thoſe numbers are the *epacts*, they might remain in the calendar without ſhifting their places; ſince the augmentation of each *epact* by an unit extraordinary would anſwer the purpoſe, and preſerve the Julian account tolerably exact. But the Gregorian account is not ſo eaſily adjuſted; for it will require more conſideration to determine, when the *epacts* are to be more than ordinarily augmented, and at what times they are to continue in their uſual courſe; nay, to know when they are to be diminiſhed by an unit, which will moſt commonly be the caſe; becauſe, in every Gregorian ſolar year, conſiſting of any number of entire centuries not diviſible by four, the equinox is ſuppoſed to have anticipated one whole day; and therefore the biſſextile, or intercalary day is omitted; conſequently the preceding ſolar year, where one day was loſt, exceeded the lunar year by 10 days only inſtead of 11.

Lord Macclesfield has given the following directions for this purpoſe:

In the years 1800, 2100, 2700, 3000, &c. where the number of centuries is diviſible by 3 only, the Gregorian ſolar, as well as the lunar year, will have loſt a day; and conſequently the difference between them will be the ſame as uſual: therefore in thoſe years the *epacts* and golden numbers will remain unaltered; the former will go on in the ſame manner, and the latter ſtand prefixed to the ſame days in the calendar, for another century, as they did for the laſt. The caſe will be the ſame in the years 2000, 2800, 3200, &c. where the number of centuries are diviſible by 4 only. But in the years 2400 and 3600, whoſe number of centuries is diviſible both by 3 and 4, the Gregorian ſolar year remains as uſual, and the lunar year has loſt a day: the difference betwixt them being 12, the *epact* of the preceding year muſt be augmented by that number inſtead of 11, in order to form the *epact* of the then preſent year; and thus a new ſet of *epacts* will be introduced, each exceeding the precedent correſponding *epacts* by unit; and the golden numbers muſt be ſet one day back in the calendar.

Again, in the years 1900, 2200, 2300, 2500, &c. where the number of centuries is diviſible neither by 3 nor 4, the Gregorian ſolar year loſes one day, and the lunar none; and the difference between them, viz. 10, and not 11, muſt be added to the *epact* of the preceding for that of the current year; and thus a new ſet of *epacts* will be introduced, leſs by unit than their precedent correſponding *epacts*; and the golden numbers muſt be ſet a day forwarder in the calendar. By this method the new moon might be pointed out, either by the golden numbers or by the *epacts*, placed in the calendar for that purpoſe; according to the Julian account for ever, and according to the Gregorian account till the year 4199 incluſive. Phil. Tranſ. vol. xlvi. p. 417. or N° 495. art. 5.

Rule for finding the Gregorian EPACT.

Divide the centuries of any year by 4; multiply the remainder by 17, and to this product add the quotient multiplied by 43 and the number 86, and divide this whole ſum by 25: multiply the golden number by 11, from which product ſubtract the laſt quotient, and the remainder, rejecting the thirties from it, will be the *epact*.

Example for 1779.

1. $17\div4=4$—Remr. 1.
2. $1\times17=17$.
3. $43\times4+17+86=275$.
4. $275\div25=11$.
5. 13 (G. N°) $\times11=143$.
6. $143-11=132$. And,
7. $132\div30$.

leaves a remainder 12 for the *epact* required.

The reaſon of the operation may be evinced in the following manner:

If the new moons returned exactly at the ſame time after the expiration of 19 years, the product of the golden number, or year of the lunar cycle, multiplied by 11, would give the Gregorian *epact*; but we have already ſhewn, that they anticipate a day in 310.7 years, and therefore in a Julian century they muſt anticipate $\frac{100}{310.7}$, or nearly $\frac{8}{25}$ of a day; and in a Gregorian common century, which is one day ſhorter than a Julian century, they happen 1 day $-\frac{8}{25}$, or $\frac{17}{25}$ of a day later; and $3\times\frac{17}{25}=\frac{51}{25}$ of a day in 3 common centuries; but in four Gregorian centuries, one of which is biſſextile, they will

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will happen later by $\frac{51}{25}-\frac{8}{25}=\frac{43}{25}$ of a day; and in this proportion muſt the *epacts* be decreaſed. At preſent the Gregorian *epact* is 11 days ſhort of the Julian; but the quotient of the number of centuries divided by 4, which at this time is 4, multiplied (as the rule directs) by $\frac{43}{25}$, with the addition of the remainder 1 multiplied by $\frac{17}{25}$ amounts only to $\frac{189}{25}$, or 7 days $+\frac{14}{25}$; therefore, $\frac{86}{25}$ i. e. 3 days $+\frac{11}{25}$ muſt be added to complete the 11 days.

The *epact* may be found till the year 1900, by ſubtracting one from the golden number, multiplying the remainder by 11, and rejecting the thirties; becauſe the laſt quotient, mentioned in the foregoing rule, will be always 11 till the year 1900.

In the following table, the golden numbers, with their correſponding *epacts*, till the year 1900, may be ſeen at one view:

Gold. Numb.	Epact.	Gold. Numb.	Epact.	Gold. Numb.	Epact.	Gold. Numb.	Epact.
1	——	6	XXV.	11	XX	16	XV
2	XI	7	VI.	12	I	17	XXVI
3	XXII	8	XVII	13	XII	18	VII
4	III	9	XXVIII	14	XXIII	19	XVIII
5	XIV	10	IX	15	IV		

To find Eaſter by the *epact*, ſee EASTER.

To find the moon's age by the *epact*, ſee MOON.

EPAGOMENÆ. See YEAR, *Egyptian*.

EPANALEPSIS, Επαναλημψις, called alſo EPANADIPLOSIS, in *Rhetoric*, the repetition of the ſame word in the beginning of one ſentence, and at the end of another. Thus Virgil,

Ambo florentes ætatibus, Arcades ambo.

See ANADIPLOSIS.

EPANAPHORA, Επαναφορα, in *Rhetoric*, the ſame with *anaphora*. See ANAPHORA.

EPANASTASIS, from επανιστημι, *I cauſe to riſe*, a word uſed by Hippocrates, and others of the old phyſicians, for a critical tumour or tubercle in certain diſeaſes. Thus Hippocrates obſerves, that the tumours about the eyes, upon the recovery of the patient, prognoſticate diarrhœas.

EPANASTROPHE, Επαναστροφη, in *Rhetoric*, the ſame what is otherwiſe called *anadiploſis*. See ANADIPLOSIS.

EPANCYLOTOS, of αγκυλος, *crooked*, a ſort of wreathed bandage, deſcribed by Oribaſius.

EPANODUS, Επανοδος, in *Rhetoric*, a repetition of the ſame words in an inverted order; thus,

Nox brevis nimis, ah! nimis brevis nox. Voſſ. Rhet. lib. v. p. 298.

EPANORTHOSIS, in *Rhetoric*, a figure whereby the orator revokes and corrects ſomething before alleged, as too weak, and adds ſomething ſtronger and more conformable to the paſſion he is agitated by.

The word is formed of ορθος, *right, ſtrait*; whence ορθοω, *I ſtraiten*, ανορθοω, επανορθοω, *I redreſs, ſtraiten, correct*, and επανορθωσις, *correction*. Accordingly the Latins call it *correctio* and *emendatio*.

Such, e. gr. is that of Cicero for Cœlius: *O ſtultitia! ſtultitiamne dicam, an impudentiam ſingularem? Oh folly! folly did I call it, or rather intolerable impudence?* And in the firſt Catilinarian: *Quanquam quid loquor? Te ut ulla res frangat? Tu ut unquam te corrigas? Tu ut ullam fugam meditere? Tu ut ullum exilium cogites? Utinam tibi iſtam mentem dii immortales donarent.* Thus alſo Terence, in the Heautontimo-rumenos, introduces his old man Menedemus, ſaying,

Filium unicum adoleſcentulum
Habeo. Ah! quid dixi habere me? imo habui, Chreme.
Nunc habeam necne, incertum eſt.

EPAPHERESIS, from επι, denoting *repetition*, and αφαιρησις, *removal*, a term uſed by Galen, for frequently repeated evacuations of the veſſels by plebotomy.

EPARCHUS, Επαρχος, an officer under the Greek emperors of Conſtantinople, who had the command of the guards, or government of a province.

EPARER, in the *Manege*, is uſed to ſignify the flinging of a horſe, or his yerking or ſtriking out with his hind legs. In caprioles, a horſe muſt yerk out behind with all his force; but in ballottades he ſtrikes but half out; and in croupades he does not ſtrike out his hind legs at all. All horſes that yerk are reckoned rude. See YERKING.

EPARITA, in the *Materia Medica*, a name given by Paraceſus to a ſort of fine earth, of a liver-colour, ſeemingly the ſame with the Tokay bole.

EPARMATA, of αιρω, *I elevate*, in *Medicine*, are tumours of the glandules, called *parotes*, behind the ears.

EPARSIS, in the *Medical Writings of the Ancients*, a word ſometimes applied indifferently to any tumour, but more uſually appropriated to a parotis.

EPAULE, or ESPAULE, in *Fortification*, the ſhoulder of the baſtion, or the angle made by the face and flank, otherwiſe called the *angle of the epaule*. See BASTION and ANGLE.

The word is pure French, and literally ſignifies *ſhoulder*.

EPAULEMENT, in *Fortification*, a ſide-work haſtily thrown up, to cover the cannon or the men.

It is made either of earth thrown up, of bags filled with ſand or earth, or of gabions, faſcines, &c. with earth: of which latter ſort the *epaulements* of the places of arms for the cavalry behind the trenches uſually are.

EPAULEMENT, is alſo uſed for a demi-baſtion, conſiſting of a face and flank, placed at the point of a horn or crown-work. Alſo for a little flank added to the ſides of a horn-work, to defend them when too long. Alſo for the redoubts made on a right line to fortify it. And laſtly, for an orillon, or maſs of earth almoſt ſquare, faced and lined with a wall, and deſigned to cover the cannon of a caſemate. See BASTION and ORILLON.

EPAULETTES, are a kind of ſhoulder-knots choſen for the ſoldiers, which are to be of the colour of the facing, with a narrow yellow or white tape round it, and worſted fringe: thoſe for the officers are made of a gold or ſilver lace, with a rich fringe; they are badges of diſtinction worn on one or both ſhoulders. Thoſe of the dragoon-guards, horſe, and dragoons, are worn on the left ſhoulder: the light-dragoons, and officers of grenadiers, have one on each ſhoulder: thoſe of the battalion wear one on the right ſhoulder only, which is to be made of embroidery or lace, with a gold or ſilver fringe. Thoſe of the royal regiment of artillery are to be gold embroidery, with gold fringe on ſcarlet cloth, and worn on the right ſhoulder.

EPEMBOLE, Επεμβολη, in *Rhetoric*, the ſame with *parembole*. See PAREMBOLE.

EPENCRANIS, a name by which ſome of the old authors, particularly Eraſiſtratus, have called the cerebellum.

EPENDYTES, Επενδυτης, among the Greeks, a garment worn under the *pallium*, and above the *interula* or inner-coat, called in Greek, υποδυτης.

EPENTHESIS, in *Grammar*, the addition, or inſertion of a letter or ſyllable, in the middle of a word; as *relligio* for *religio*, *Mavors* for *Mars*, *alituum* for *alitum*. Virg. Æn. lib. vii. ver. 27.

The word is formed of επι, εν and τιθημι, q. d. επεντιθημι, *inſero, immitto*.

EPERLANUS, in *Ichthyology*, a name ſometimes given, on account of its pearl-colour, to the SMELT.

EPERON, in *Natural Hiſtory*, the ſpur-ſhell, ſo called from its reſembling in ſome degree the rowel of a ſpur. It is a ſpecies of ſnail, of the round-mouthed kind, or claſs of the *cochleæ lunares*; all its volutæ are ſurrounded with double rows of prickles. See LUNARIS *cochlea*.

EPERVIERS. in *Natural Hiſtory*, a name given by the French authors to a claſs of butterflies, which make the ſixth in Reaumur's method. They have a way of poizing themſelves on the wing in the manner of kites, and other birds of prey; and always live upon the wing, never ſettling themſelves upon the flowers they feed upon, but keep flying with a humming noiſe like a humble-bee, while they thruſt in their trunk and ſuck the juices of the flower.

EPHA, a dry MEASURE in uſe among the Hebrews.

The *epha* was the moſt common meaſure they uſed, and that whereby the reſt were regulated. It is commonly ſuppoſed that the *epha*, reduced to the Roman modius, contained four modii and a half. Now the Roman modius of grain, or flour, contained twenty libræ or pounds, conſequently the *epha* weighed ninety pounds. Dr. Arbuthnot reduces the *epha* to three pecks, three pints, Engliſh meaſure.

EPHÆTIUM, in *Botany*, a name by which ſome authors have called the ranunculus, or crow-foot.

EPHEBÆUM, Εφηβαιον, in *Antiquity*, the place where the ephebi or youth exerciſed; or, as ſome ſay, where thoſe who deſigned to exerciſe, met, and agreed what kind of exerciſe they ſhould contend in, and what ſhould be the victor's reward.

EPHEBI, Εφηβοι, among the Athenians, a deſignation given to their young men when they arrived at eighteen years of age, at which time they had their names entered in a public regiſter. Pott. Archæol. Græc. lib. i. cap. 9. tom. i. p. 48.

EPHEDRA, in *Botany*, See HORSE-*tail*.

EPHELÆUM, in *Anatomy*, is the place from the hypogaſtrum,

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gaſtrum, or lower part of the abdomen, to the ſecret parts.

EPHELCIS, from ελκος, *ulcer*, a word uſed by the ancient Greek *Phyſicians*, ſometimes for the cruſt of an ulcer, and ſometimes for a ſmall abraſion or bloody fragment, brought up by coughing, in an hæmoptyſis.

EPHELIS, from επι and ἥλιος, *ſun*, a name uſed by the ancient writers on *Medicine*, for a diſorder of the face, brought on by the ſun and drying winds, and of the nature of what we call ſun-burning. It was a certain roughneſs, hardneſs, and bad colour of the ſkin.

The *ephelis*, or ſun-burning, is removed by an application of reſin, to which a third part of foſſile ſalt, and a little honey are added; but all theſe diſorders, as alſo the unnatural colour of cicatrices, are remedied by the following preparation, aſcribed to Trypho the elder:

Take equal quantities of myrobolans, crocomagna, cimolian earth of a bluiſh colour, bitter almonds, the meals of barley and bitter vetch, dyer's weed (*ſtruthium album*); all theſe are to be triturated together, and made up with the moſt ſharp honey. With this preparation the parts affected are to be anointed at night; and the medicine carefully to be waſhed off the next morning. James Med. Dict. See FRECKLES.

EPHEMERA, in *Medicine*, an epithet applied to ſomething that only laſts a day; particularly to a ſort of fever, which terminates in the compaſs of twenty-four hours, called by Galen, εφημερος πυρετος, *febris ephemera*, by the Latins, *diaria*. See FEVER.

The word, and the following one, *ephemerides*, are formed of the prepoſition επι, *de*, *of*, and ἡμερα, *dies*, *day*.

Some medical writers expreſs themſelves by *ephemera ſimplex vel plurium dierum*. It is, properly, an attempt of nature to eaſe herſelf of the load of a plethora, either by an abſolute diſcharge of part of the blood by an hæmorrhage, or by reſolving it into ſerum, and expelling it in that form, the ſecretory, and excretory motions, being increaſed beyond their natural degree. The diary fever, properly ſo called, laſts only twenty-four hours; but this differs in nothing, except the time of its duration, from the *ephemeron plurium dierum*, which commonly laſts four days. To this it is to be added, that ſome authors have called the ſudor Anglicus, *ephemera maligna*, a malignant diary fever, as it generally deſtroyed the patient in the ſpace of one day.

The ſimple diary fever uſually ſeizes the patient without any preceding ſhivering, and immediately is attended with a degree of heat of the fleſh, which continues the ſame without intermiſſion or exacerbation, till the cloſe. This is uſually not very violent, and is always attended with pains in the head, ſometimes heavy and dull, ſometimes pulſative and very acute. Such perſons as fall into this fever, from drinking large draughts of cold liquors while they are hot, as is very frequently the caſe, always have a pain in the right hypochondrium. The face is red and inflated in this diſeaſe, and there is a laſſitude and wearineſs in all the limbs, the pulſe is ſtrong and quick, the urine is of a deep orange colour, and depoſits a reddiſh ſediment.

This fever uſually goes off in a moderate ſweat, and ſometimes, though leſs frequently, by a hæmorrhage at the noſe. It is ever of ſhort duration; for if it exceeds the firſt day, it is always terminated, at the utmoſt, on the fourth or fifth. There is either very little, or very bad ſleep, during the whole time. The patient often never cloſes his eyes at all, or, if he ſleeps a little, is never ſenſible himſelf that he has ſlept.

The perſons moſt ſubject to this fever are young men, who have much blood, and feed heartily; and ſuch as have had any habitual diſcharge of blood ſtopped upon them, whether natural, as in the hæmorrhoidal, or menſtrual diſcharges; or artificial, ſuch as frequent bleeding, cupping, and the like: and thoſe who have thrown their blood into violent emotions, by the too free uſe of ſpirituous liquors, too violent exerciſe, unuſual watchings, long ſtay by large fires, a ſudden repreſſion of ſweats by cold water, or by violent paſſions, particularly anger.

Cauſes of it. The principal general cauſes of this fever, are a plethoric diſpoſition, and a commotion of the blood; the accidental ones are a high diet, and ſedentary life, great heat of the body from violent exerciſe, and from the ſun in hot weather; violent ſweating, or heating medicines, injudiciouſly adminiſtered; and ſudden chilling of the body, when much heated.

Prognoſtics in it. The ſimple *ephemera*, when wholly left to itſelf, is of no danger, if the perſon be kept warm, and in a ſtate of reſt; and all that need be done in common caſes, to aſſiſt nature in it, is the frequent drinking of warm diluting liquors. When it is improperly treated, or diſturbed by a wrong regimen, it often has worſe conſequences; and, indeed, the doctor often changes this into an inflammatory or ſynochal fever, properly ſo called. It is known, that matters are properly managed, and that nature is taking her due courſe, if the urine and ſweat are properly excreted.

Method of treatment. When the peculiar diſpoſition of the blood, or other accidents, render this fever worſe than it naturally ſhould be, the proper courſe is to attemperate the violent emotions of the blood with nitrous, and the fixed antimonial medicines, and occaſionally, with the gentle acids, ſuch as lemon-juice, and the like. nd indeed, in all caſes of this kind, the frequent uſe of warm and weak liquors, with lemon-juice among them, is highly to be commended. The free eruption of the ſweat, by which nature attempts to eaſe herſelf of the diſeaſe, is to be promoted by the gentle ſudorifics; nitre, crabs-eyes, and a ſmall quantity of juice of lemons, juſt enough to ſaturate the alkali of the crabs-eyes, prove an excellent medicine, to be repeated in ſmall doſes every three or four hours; and toward night, the ſudorifics ſhould be joined to theſe, ſuch as the contrayerva-root, or the like; and when it is over, there ſhould be given a few doſes of ſome gentle purge, as an infuſion of rhubarb and ſena, or the like. Bleeding is unneceſſary in this fever. Juncker's Conſp. Med. p. 264.

EPHEMERA, or EPHEMERON, in *Natural Hiſtory*, a name given by authors to a ſmall fly, called by us the *day-fly*. It is an inſect found about the mouths of the Rhine, and ſome other rivers in Germany, and ſeems a ſort of middle ſpecies between the May-fly, common with us, and bred from the cadew worm, and the libella, or DRAGON-*fly*. It has four wings, two long, and two ſhort; two ſhort horns, ſix legs, and two very long ſtraight hairs iſſuing from the tail. They are ſeen flying about the ſurface of the water about mid-ſummer, for three days, and no longer; they eat nothing, and their only buſineſs is to drop their eggs on the ſurface of the water, after they have copulated. Theſe eggs, ſinking to the bottom, produce a ſort of worms, or maggots; theſe ſoon hollow themſelves cavities in the clay, where they remain three years, growing every year about an inch in length. When the worm is come to its full growth, it riſes to the ſurface of the water about ſix o'clock in the morning, and there iſſues from it this fly, which lays its eggs, and dies about ſix o'clock the ſame night; ſo that the life of the creature in the fly-ſtate is only about five hours. Swammerdam, Hiſt. Inſ.

Though Swammerdam ſays, that the life of this creature is no more than five hours, yet his own account plainly ſhews that it really lives three years; for it is certainly as much alive in the worm-ſtate as when afterwards it becomes a fly. Baker's Micr. 1743. p. 305.

EPHEMERA, in the Linnæan ſyſtem, makes a diſtinct genus of the *neuroptera* order, diſtinguiſhed by two gibbous protuberances above the eyes, erect wings, and briſtly tail. He enumerates eleven ſpecies of this genus, diſtinguiſhed by their different colours, and the number of hairs in their tail; ſome having two, and others three.

EPHEMERA, is alſo applied among *Botaniſts*, to a kind of flowers which open and expand themſelves at ſun-riſing, and wither or cloſe up again at his ſetting. Such are the dent-de-lion, vulgarly dandelion, and diverſe others.

EPHEMERIDES, in *Aſtronomy*, tables calculated by aſtronomers, ſhewing the preſent ſtate of the heavens for every day at noon; that is, the places wherein all the planets are found at that time.

It is from theſe tables that the eclipſes, conjunctions, and aſpects of the planets, are determined; horoſcopes, or celeſtial ſchemes, conſtructed, &c.

We have *ephemerides* of Origan, Kepler, Argoli, Heckerus, Mezzaracchis, Wing, De la Hire, Parker, &c. S. Caſſini has calculated *ephemerides* of the ſidera medicæa, or ſatellites of Jupiter, which are of good uſe in determining the longitude.

In England the Nautical Almanac, or Aſtronomical *Ephemeris*, publiſhed annually by anticipation, under the direction of the Commiſſioners of Longitude, is the moſt conſiderable. See ALMANAC.

In France, celeſtial *Ephemerides* have been publiſhed by M. Deſplaces, every ten years, from 1715 to 1745: they were afterwards continued by the abbé Caille, with many additions; of which an account may be ſeen in the Hiſtory of the Academy of Sciences for 1743. The Academy of Sciences have likewiſe publiſhed annually, from the beginning of the preſent century, a kind of *ephemeris*, under the title of Connoiſſance des Tems.

EPHEMERUM. See SPIDER-*wort*.

EPHESIA, in *Mythology*, a feaſt inſtituted at Epheſus, in honour of Diana.

EPHESTIA, in *Mythology*, a feaſt celebrated in honour of Vulcan, in which three young *lads run for a prize*.

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EPHESTRIA, were feasts celebrated at Thebes, in honour of Tyresias.

EPHESUS, *temple of.* See DIANA.

EPHETÆ, of εφιημι, *I send forth*, in *Antiquity*, a sort of magistrates among the Athenians, instituted by king Demophoon, to take cognizance of murder, manslaughter, and chance-medley.

Their number was one hundred, whereof fifty were Athenians, and fifty Argians: they were not admitted to the post till upwards of fifty years of age. Draco new modelled it, excluded the Argians out of it, and made it to consist of fifty-one Athenians, each above fifty years of age: Ubbo Emmius de Rep. Athen. says, he transferred to them part of the jurisdiction of the Areopagites. See AREOPAGUS.

EPHIALTES, of επι and αλλομαι, *I leap.* See INCUBUS.

EPHIDROSIS, from εφιδρω, *I sweat*, in the *Medical Writings of the Ancients*, a word used to express a sweat, sometimes slight, and not critical; and at others, a symptomatic one, appearing only on the head, neck, and breast. These are both bad symptoms in many diseases, though they are often mistaken by the injudicious for good signs, and forwarded by hot medicines, to the destruction of the patient. See SWEAT and SWEATING.

EPHIPPIA, of επι and ἵππος, *horse*, denoted certain cloths or housings, which were fastened on a horse by a girth or surcingle, in ancient Greece, before the use of saddles were known. They were composed of different materials, as leather, cloth, and the skins of wild beasts, and sometimes adorned with gold, silver, and precious stones. Berenger's Art of Horsemanship, vol. i. p. 41.

EPHIPPITES. See HIPPURITES.

EPHIPPIUM, Εφιππιον, in *Anatomy*, a part of the SPHENOIDES, called also *sella equina* and *sella turcica.*

EPHOD, אפד, derived from אפד, *aphad, to clothe*, a sacerdotal garment, in use among the ancient Jews, supposed to have been a kind of linen alb, or surplice, wore by persons of distinction, of various characters; the same with what the Latins call *super-humerale.*

It is very hard to say precisely what the *ephod* was; and there is room enough for the interpreters to be divided about it. The only point they are agreed upon is, that it was an upper garment worn over all the rest, immediately under the pectoral or breast-plate. Some hold it had sleeves, others deny it. The generality agree, that it was very short, though some maintain that it hung down to the feet behind.

There were two kinds of *ephods*; the one, common to all who assisted in the temple, being only made of common linen, mentioned in the first book of Samuel, ii. 18; the other, peculiar to the high-priest, mentioned Exod. xxviii. 6. 15. to be made of gold, of blue, and of purple, of scarlet, and fine twined linen, with cunning work; having two shoulder-pieces, with a curious girdle of the same matter, whereon were two onyxes, with the names of the children of Israel engraved thereon.

It is also expressed in the second book of Samuel, vi. 14. that upon the removal of the ark of the covenant from the house of Obed-Edom, David danced for joy, girt with a linen *ephod*; whence some authors have concluded, that the *ephod* was also a regal garment, worn on solemn occasions.

EPHORI, Εφοροι, magistrates established in ancient Sparta, to balance and check the power and authority of the kings; as at Rome, there were tribunes created to controul the power of the consuls.

The word is formed of the Greek, εφοραω, *intueor*, formed of the preposition επι, and the verb οραω, *to see*; whence εφορος, q. d. *inspector, overseer.*

Lycurgus, being sensible that a perfect understanding between the prince and the people, was the basis and foundation of both their happiness, to maintain that good understanding, established *ephori*, or inspectors, as a kind of mediators, who should have an eye to the measures and conduct of both sides, and preserve so equal a balance between them, that the regal power should never decline into severity and tyranny, or the liberty of the people run into licence and rebellion.

This is the account of their institution given by Herodotus and Xenophon. Her. lib. i. Xen. de Rep. Lacedem.

The authority of the *ephori* was very great: they presided in popular assemblies, collected their suffrages, declared war, made peace, treated with foreign princes, determined the number of forces that should be raised, appointed the funds to maintain them, and distributed rewards and punishments in the name of the state: they likewise held a court of justice, enquired into the behaviour of all magistrates, inspected the education and conduct of youth, had a particular jurisdiction over the *helotes*, and by degrees drew the whole administration into their own hands. On certain occasions, they expelled, and even put to death the kings; and abolished or suspended the power of the other magistrates, calling them to account at pleasure. Agesilaus, in the height of all his conquests, which even struck terror on the great king of Persia, stopped, and turned back, out of deference to the *ephori*, when they recalled him.

Some authors deny, that the *ephori* were established by Lycurgus, dating their origin 130 years after the time of that legislator.

Thus Plutarch, in his Life of Cleomenes, ascribes their institution to Theopompus, king of Sparta, which is also confirmed by the authority of Aristotle. Polit. lib. v. The *ephori* were five in number, and annually chosen by the people out of their own body. The year was denominated from the first election of these magistrates; and the Lacædemonian armies took their names from the principal *ephori*, as those of Athens did from their first ARCHON.

EPHYDOR, Εφυδωρ, in *Antiquity*, an officer in the Athenian courts of justice, who was to provide the plaintiff and defendant with equal water hour-glasses. When the glass was run out, they were not permitted to speak any farther; and therefore we find them very careful not to lose or mispend one drop of their water. Whilst the laws quoted by them were reciting, or if any other business happened to intervene, they gave order that the glass should be stopped. Pott. Archæol. Græc. lib. i. cap. 21. lib. i. p. 118.

EPHYDRUM, Εφυδρον, in *Botany*, a name given by some of the Greek writers, to the plant now called *equisetum*, or HORSE-*tail.*

EPIALOS, from ηπιος, *gentle*, and ἁλς, *sea*, in the *Medical Writings of the Ancients*, the name of a fever, in which the patient labours under a preternatural internal heat, while he at the same time shivers with cold. It has by some been called the *shivering-fever*; and the Romans named it *quercera.* Galen says it proceeds from a putrified acrid phlegm. The word is, by some, also applied to any gentle fever, or feverish complaint; and by others, to the cold or shivering fit preceding a fever. Hippocrates calls by this name that peculiar fever which attends young women, whose menses are stopped by taking cold, or other accidents.

EPIBATÆ, Επιβαται, among the Greeks, marines or soldiers who served on board the ships of war. They were armed in the same manner as the land-forces, only that more of them wore full or heavy armour. Pott. Archæol. Græc. tom. ii. p. 140.

EPIBATERION, a poetical composition, in use among the ancient Greeks. When any person of condition and quality returned home after a long absence or journey, into another country, he called together his friends and fellow-citizens, and made them a speech, or rehearsed them a copy of verses, wherein he returned solemn thanks to the immortal gods for his happy return; and ended with an address by way of compliment to his fellow-citizens.

These verses made what the Greeks call επιβατηριον, *epibaterium*, of επιβαινω, *I go abroad.* At going away they had another, called *apobaterium.*

EPIC *poem*, an heroic poem, or a poem reciting some great and signal transactions of a hero; called also *epopœia.*

Such are the Iliad and Odyssey of Homer, the Æneid of Virgil, the Gierusalemme of Tasso, the Paradise Lost of Milton, and the Henriade of Voltaire, which are the principal poems of the *epic* kind.

An *epic* poem, according to Bossu, is a discourse invented with art, to form the manners, by instructions disguised under the allegory of an important action related in verse, in a probable, entertaining, and surprising manner.

The *epic* poem is distinguished from comedy, in that the action of the latter is not important, nor is related by the poet, but acted by the persons introduced for that purpose; which circumstance, likewise, distinguishes it from tragedy. It differs also from tragedy in the event, or conclusion; which, in the latter, is generally unfortunate, but never so in the former.

Nor is it a philosophical poem, as that of Lucretius, or the Creation of Sir R. Blackmore; nor a treatise of agriculture, or the like, as the Georgics of Virgil; those poems not being intended to form the manners; beside, that the instructions they contain are naked, simple, and direct, without any disguise or allegory. Which second circumstance likewise distinguishes it from a treatise of morality, written in verse; or a simple history in verse, as the Pharsalia of Lucan, the Punic War of Silius, or the Civil Wars of Sam. Daniel; add, that its being confined to one important action, distinguishes it from a poem which relates all the actions of a person's life, as the Theseid and Achilleid of Statius, which are what we properly call *heroic poems.*

M. de la Motte, indeed, in his controversy with Madam Dacier,

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Dacier, on the ſubject of Homer, maintains, that the whole life of a hero may juſtly be made the ſubject of an *epic* poem; and even that the Lutrin of M. Boileau might paſs for an *epic* poem; but he ſeemed afterwards to return to the common ſentiment. In effect, the queſtion is not as to the ſenſe which may be annexed to the words *epic poem*, but the ſenſe which cuſtom has actually annexed to them.

If we had only regard to the etymology of the word *epic*, of ἔπος, *verſe, poetry*, from ἔπω, *dico, I ſpeak, relate*) all poems wherein the poet ſpeaks or rehearſes things himſelf, without making the perſons of his poems ſpeak, except at ſecond-hand, as he relates what they ſpoke on this or that occaſion, would be properly *epic* poems; and ſo there is not an epigram, ſonnet, or madrigal, but would come under that denomination: but this were wild.

In effect, the term *epic* poem is only attributed to a compoſition whoſe ſubject is great, inſtructive, and ſerious; that only comprehends one ſingle principal event, to which all the reſt refer; which principal action is to be terminated in a certain ſpace of time, ordinarily about a year. It is true, all this is arbitrary; but the ſenſe of all words is ſo too; and in matters of language we muſt be guided by cuſtom.

If M. de la Motte had only pretended, that one might make a fine inſtructive poem on the whole life of a hero, or an agreeable and diverting poem on ſome humorous adventure, all the world would have been on his ſide. But it is enough that cuſtom has not thought good to apply the term *epic* either to ſubjects of too much extent, and that are crouded with two many incidents no-way connected together; or to burleſque poems, as the Batrachomyomachia of Homer, the Secchia Rapita of Taſſoni, the Défaite de Dulot, the Lutrin of Boileau, the Hudibras of Butler, the Rape of the Lock of Mr. Pope, or the Diſpenſary of Dr. Garth.

The *epic* poem, then, as appears from what was above obſerved, bears a relation or analogy to four things, hiſtory, morality, fable, and poetry. To *hiſtory*, as both of them relate one or more actions; but then the actions of hiſtory are ſingular, ſo that the epopœia is no hiſtory, nor kind of hiſtory.

To *moral philoſophy*, as both of them conſiſt of inſtructions for forming the manners; but the action and allegories diſtinguiſh it herefrom.

But it relates entirely to poetry and fable, as being ſtrictly a poem and a fable.

The nature of the *epic* poem is finely drawn by the great critic abovementioned: the *epic* poets, ſays father Boſſu, have done that with regard to morality which the ancient heathen divines did with regard to divinity. The too great diverſity of divine actions and perfections, ſo very diſproportionate to our comprehenſion, obliged the latter to divide a ſingle idea of a ſimple eſſence, God, into ſeveral perſons, to whom they attributed ſeveral names, Jupiter, Juno, Neptune, &c. And, on the contrary, the nature of moral philoſophy, which never preſcribes rules for particular things, led the poets to collect into one ſingle idea, or into one and the ſame perſon, and one apparently ſingular action, whatever of that kind was found in different perſons and different actions.

Thus Ariſtotle, Ου ϛοχαζεται η ποιησις ονοματα, &c. Poetry, ſays he, teaches moral philoſophy, not by relating only, in the manner of an hiſtorian, what Alcibiades, for inſtance, did or ſuffered; but by propoſing what ſome perſon, named as the poet thinks fit, would probably or neceſſarily have done on the like occaſion: and thus it is that he ſhews either the unhappy conſequences uſually attending imprudent ſchemes or ill actions; or the reward of good actions, and the ſatisfaction reſulting from a deſign laid in virtue, and conducted with prudence. So that in the *epic* poem, according to Ariſtotle's ſentiment, the perſons and actions, however named, are all to be feigned, allegorical and univerſal, not hiſtorical and ſingular.

But the poets, thus taking on them the office of moral philoſophers, did not ceaſe to be divines. On the contrary, their morality itſelf frequently obliges them to introduce the deity in their works; as the knowlege, fear, and love of God, are the firſt and moſt ſolid foundations of all morality. The preſence of the divinity, and the ſhare ſo auguſt a perſonage was ſuppoſed to have in the action, obliged the poet to make the action great and important, and to have it tranſacted by kings and princes. The ſame likewiſe obliged them to think and ſpeak in a manner elevated above the common pitch of men, and equal, in ſome meaſure, to the dignity of the divine perſons introduced. To which end ſerves the poetical and figurative language, with the majeſty of heroic verſe. Add, that as ſo much of the divine and miraculous might ruin the probability, they were hereby obliged to have recourſe to ſeveral rules to maintain the ſame.

Thus much the poets were driven to by the ſubſtance of the things they had choſen for the matter of their poems and inſtructions. The manner of delivering them uſefully and methodically, obliged them to ſeveral other neceſſary rules.

The *epic* poem is intended more for the manners and habits, than for the paſſions. Theſe latter riſe all at once, and their violence is but of ſhort duration; but the habits are more calm and impreſſed, or quitted more leiſurely. Conſequently, the *epic* action could not be included in the ſpace of a day, as that of the theatrical. A longer time was neceſſary than is required for tragedy, which is altogether for the paſſions.

This diſtinction has introduced great difference between tragedy and *epic* poety. The tragic violence requires a more lively and animated repreſentation than a mere recital: accordingly, it is wholly thrown into action, and the poet never ſpeaks at all, as he does in the epopœia, where there are no actors. An *epic* poem, properly ſo called, ſhould be written in honour of the country and religion of the author, between which and the hero there is a near relation, and therefore he ought at leaſt to come off in triumph. See farther of the nature of the *epic* poem under FABLE. For its matter, ſee ACTION. For its form, ſee NARRATION. For its verſification, ſee HEXAMETER. See alſo MANNERS, CHARACTERS, MACHINE, &c.

EPICALYMMA, a word uſed by ſome of the *Old Writers on Shell-fiſh*, and not well underſtood by their commentators.

EPICARPIUM, Ἐπικαρπιον, formed of ἐπι, *on*, and καρπος, *wriſt*, in *Medicine*, a kind of remedy, uſually in form of a cataplaſm or plaſter, conſiſting of ſharp, penetrating ingredients, as garlick or onion, ſpider's-web, hellebore, camphor, Venice treacle, &a. applied round the wriſt, at the beginning of the acceſs of a fever, to prevent the growth of the ſame.

EPICAUMA, from καιω, *I burn*, in *Medicine*, a cruſty ulcer that ſometimes happens to the black of the eye.

EPICEDION, Ἐπικηδιον, formed of ἐπι, *upon*, and κηδος, *funeral*, in the *Greek and Latin Poetry*, a poem, or poetical compoſition, on the death of a perſon.

At the obſequies of any man of figure, there were three kinds of diſcourſes uſually made; that rehearſed at his buſtum or funeral pile, was called *nenia*; that engraven on his tomb, *epitaph*; and that ſpoken in the ceremony of his funeral, *epicedion*. We have two beautiful *epicedions* in Virgil, that of Euryalus, and that of Pallas.

EPICERASTICS, Ἐπικερασικα, formed of ἐπι and κεραννυμι, *I moderate*, in *Medicine*, remedies, which, by their temperate moiſture, ſoften the acrimony of a humour, and aſſuage the painful ſenſation of a part irritated or afflicted by it; ſuch are the roots of althæa, mallows, liquorice; leaves of lettuce, mallows, water-lily, purſlain; the ſeeds of flax, poppy, &c. See EMOLLIENTS.

EPICHIREMA, Ἐπιχειρημα, in *Logic*, an argumentation, conſiſting of four or more propoſitions, ſome whereof are proofs of others.

Thus, that oration of Cicero for Milo may be reduced to the *epichirema*: "Thoſe who way-lay a man to kill him, "it is lawful for him to kill, as is allowed by the laws of "nature and nations, and by the practice of the beſt "men; but Clodius way-laid Milo with that view, as "appears from his forming an ambuſcade before his "country-houſe, and from his proviſion of weapons, "ſoldiers," &c. Therefore it was lawful for Milo to kill Clodius.

EPICHIROTONIA, among the Athenians. It was ordained by Solon, that once every year the laws ſhould be carefully reviſed and examined; and if any of them were found unſuitable to the preſent ſtate of affairs, they ſhould be repealed. This was called ἐπιχειροτονια των νομων, from the manner of giving their ſuffrages, by *holding up their hands*. See a farther account of this cuſtom in Pott. Archæol. Græc. lib. i. cap. 26. tom. i. p. 142.

EPICHORDIS, from χορδη, *an inteſtine*, in *Anatomy*, a name given by ſome to the meſentery.

EPICLEROS, Ἐπικληρος, among the Athenians, a daughter that had no brothers, and therefore inherited her father's whole eſtate. See EPIDICASIA.

EPICŒNE, Ἐπικοινον, in *Grammar*, a term applied to nouns, which, under the ſame gender and termination, mark, indifferently, two kinds of ſexes. See GENDER.

Such, in Latin, is, *aquila, veſpertilio*, &c. which ſignify equally a male or female eagle, or bat.

Grammarians diſtinguiſh between *epicœne* and common. A noun is ſaid to be common of two kinds, when it may be joined either with a maſculine or a feminine article; and *epicœne*, when it is always joined to ſome one of the two articles, and yet ſignifies both genders.

EPICOLIC *regions* (from ἐπι, *ſupra, upon*, and *colon*, the *gut*,

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gut, ſo called) a name given by Dr. Gliſſon to that ſpace on both ſides, over the colon.

EPICRANIUM, in *Anatomy*, a name given by Albinus to the fleſhy covering of the head, divided by authors into ſeveral different muſcles. The head is covered with a thin coat: the hinder parts of this coat are called the occipital muſcles, and the forepart the frontal muſcles.

EPICRASIS, in *Medicine*, is a gradual evacuation of ill humours in the blood.

EPICRISIS, Ἐπίκρισις, in *Rhetoric*, a clear and brief declaration of the ſpeaker's judgment concerning the ſubject in hand. Thus, *ego ſic ſtatuo, in optimo imperatore quatuor hâs res ineſſe oportere*, &c. Voſſ. Rhet. lib. vi. p. 495.

EPICUREANS, a ſect of ancient philoſophers, who adhered to the doctrines and opinions of Epicurus.

Epicurus was an Athenian, and the ſon of Neocles, born in the third year of the 109th Olympiad, and conſequently 341 years before Chriſt. He ſpent his youth partly in the iſle of Samos, and partly at Teos, and did not return to Athens till he was eighteen years old: whence he removed at the age of twenty-three to Colophon, and ſojourned in ſeveral places before he fixed again at Athens, in the thirty-ſeventh year of his age. He was the diſciple of Pamphilus the Platonick; and he ſtudied the writings of Anaxagoras, Archelaus, Metrodorus, and Democritus. He began to form his ſchool at Mitylene and Lampſachus about the thirty-ſecond of his life; though he afterwards removed to Athens, where he philoſophized chiefly in his garden, teaching a great number of diſciples, who flocked to him from all the cities of Greece and Aſia, and even from Egypt, and who lived in common with their maſter. His own life was exemplary, though it has not eſcaped calumny. He died of the ſtrangury at ſeventy-two years of age. His memory was greatly reſpected by his followers, and his doctrine reverenced as an oracle; and as long as learning flouriſhed in Greece, and Rome was preſerved from the Barbarians, the ſchool and diſcipline of Epicurus continued eminent.

His birth-day continued to be obſerved in Pliny's time; and the whole month in which he was born was obſerved as a perpetual feſtival. Cicero de Fin. lib. v. init. and Plin. lib. xxxv. cap. 2.

The noble poet Lucretius, who has given us a beautiful ſyſtem of *Epicureaniſm* in fine Latin verſe, prefers its father Epicurus to all other philoſophers, whom, he makes no ſcruple to ſay, he obſcured as much as the ſun does the other ſtars. It is ſaid he firſt taught grammar; till, upon reading Democritus's books, he began to apply himſelf to philoſophy.

From Democritus he learned the doctrine of atoms, or corpuſcles, which he afterwards made the baſis of his phyſics. Clem. Alexand. Strom. 6. advances, that Epicurus ſtole his chief doctrines from Democritus: but it is certain he greatly improved and illuſtrated them. Diog. Laertius aſſures us, he compoſed an infinite number of volumes. Diog. Laert. in Prœom. lib. x. p. 26.

This philoſophy conſiſted of three parts; *canonical*, κανονικον; *phyſical*, φυσικον; and ηθικον, *ethical*, which he explained briefly in three epiſtles.

The firſt, as Laertius relates, was about the canons, or rules of judging; wherein, rejecting the uſe of logic, he eſtabliſhed the ſenſes, paſſions, and anticipations, as the criterions, or judges of truth.

The canons of ſenſe are the following four: ſenſe is never deceived; and therefore every ſenſation, and every perception of an appearance is true. Opinion ſucceeds ſenſe, and is ſuperadded to ſenſation, and capable of truth or falſhood: all opinion atteſted, or not contradicted by the evidence of ſenſe, is true, and the contrary opinion is falſe. The canons of anticipation are alſo four: all anticipation, which is in the mind, depends on the ſenſes, by incurſion, proportion, ſimilitude, or compoſition. Anticipation, or prenotion, is, as it were, the definition of the thing, without which we cannot enquire, doubt, think, nor ſo much as name any thing. Anticipation is the principle in all diſcourſe, as being that to which we have regard, when we infer that one thing is the ſame or different, joined with or disjoined from another; that which is not manifeſt ought to be demonſtrated out of the anticipation of a thing that is manifeſt. The canons of paſſion likewiſe are four: all pleaſure, which hath no pain in it, is to be embraced; all pain, that hath no pleaſure with it, is to be ſhunned; all pleaſure, which hindereth a greater pleaſure, or procureth a greater pain, is to be ſhunned; all pain, which putteth away a greater pain, or procureth a greater pleaſure, is to be embraced.

In the ſecond, he laid down atoms, ſpace or vacuum, and gravity, as the firſt principles of all things. The univerſe he taught, conſiſted of atoms or corpuſcles, of various forms, magnitudes, and weights, which having been diſperſed at random through the immenſe inane, or ſpace, fortuitouſly concurred into innumerable ſyſtems or worlds, which were thus formed, and afterwards, from time to time increaſed, changed, and diſſolved again, without any certain cauſe or deſign; without the intervention of any deity, or the intendance of any providence. See ATOMICAL and CORPUSCULAR *philoſophy*.

Not that he denied the exiſtence of a God; on the contrary, he aſſerted it; but he thought it beneath the majeſty of the Deity to concern himſelf with human affairs.

Thus Epicurus denied a providence, and every kind of natural and moral adminiſtration of the Deity. But though he adopted the notion of Leucippus and Democritus, concerning the formation of the world by the fortuitous concourſe of atoms, he rejected the opinion of FATE. In this particular, he abandoned the ſyſtems of atoms, and the neceſſitating deſtiny, ariſing from the external and innumerable laws of motion, to which Democritus aſcribed the production of the world, and maintained the liberty of human actions. But nothing can be more abſurd than his reaſoning on this ſubject. He gave his atoms a motion of declination, wherein he eſtabliſhed the ſeat, ſource, and principle of free actions; pretending, that by this means, there were events independent of fatal neceſſity. Before him, no other motion was admitted in atoms but that reſulting from their weight and their reflexion; the firſt of which was always in perpendicular lines, and *in vacuo* ever the ſame; nor was it changed, except when one atom ſtruck againſt another. Epicurus on the contrary, ſuppoſed, that even in the midſt of the vacuum atoms did ſomewhat decline from the direct line; and hence, he ſaid, proceeded liberty. Thus alſo he accounts for the concourſe of various atoms in the production of the world. Cicero has expoſed the abſurdity of this notion of declination in his book De Fato, cap. 10. See alſo De Fin. lib. i. cap. 6.

The theology of Epicurus was not only eſſentially defective in his diſbelief of providence, but likewiſe in his notion of the mortality of the ſoul, and rejection of a future ſtate. Death, according to his ſyſtem, was a mere privation of ſenſe; when the body was diſſolved, the ſoul was diſſipated, had no longer the ſame faculties, nor was any longer moved, nor had any ſenſe. The ſoul was diſſipated into the principles and little bodies of which its contexture was compoſed; and he argued this diſſipation of the ſoul from its being compounded, and having a beginning. Moſheim has, therefore, juſtly obſerved, that of all the philoſophers, the *Epicureans* enjoyed the greateſt reputation, and had undoubtedly the greateſt number of followers, becauſe their opinions tended to encourage the indolent ſecurity of a voluptuous and effeminate life, and to baniſh the remorſe and terrors that haunt vice, and naturally incommode the wicked in their ſenſual purſuits. Eccl. Hiſt. vol. i. p. 138. 8vo.

As to ethics, his firſt principle, or the ſupreme felicity of man, he held, was pleaſure: which ſome, as hereafter obſerved, underſtand of mental, and others of carnal pleaſure.

The *Epicureans* have, in all ages, been decried for their morals, and their attachment to the pleaſures of ſenſe: ſeveral authors, particularly Cicero among the ancients, and Gaſſendus among the moderns, have endeavoured to vindicate them from this charge; by ſhewing that the pleaſure wherein their maſter Epicurus places the ſummum bonum, or ſupreme happineſs of this life, was not any ſenſual, or brutal pleaſure, but a contentment, and tranquillity of mind, exempt from all tumultuary paſſions, &c.

This opinion ſeems juſt, and well-grounded; but, without entering into the queſtion, which Gaſſendus, Du Rondel, and others, have exhauſted, it is certain, that in the common uſe of the word, *Epicurean* is underſtood to ſignify an indolent, effeminate, and voluptuous perſon, who only conſults his particular and private pleaſure, without concerning himſelf with any thing ſerious.

In effect, there were always two kinds of *Epicureans*; the rigid, and remiſs; the rigid *Epicureans* were thoſe ſtrictly attached to the ſentiments of Epicurus, who placed all their happineſs in the pure pleaſures of the mind, reſulting from the practice of virtue. The looſe or remiſs *Epicureans*, taking the words of that philoſopher in a more groſs ſenſe, placed all their happineſs in pleaſures of the body, in eating, drinking, loving, &c. The former kind, who were the genuine *Epicureans*, called the other the *ſophiſts of their ſect*. Stanley's Hiſt. of Philoſophy, part xiii. Gaſſendus de Vita & Moribus Epicuri. Bayle, art. Epicurus.

EPICYCLE,

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EPICYCLE, in *Aſtronomy*, a circle whoſe center is on the circumference of another circle which bears it, and which for that reaſon is called its *deferent*.

The word is formed of the Greek επι, *upon*, and κυκλος, *circle*, q. d. *a circle on a circle*.

As aſtronomers invented an eccentric circle to ſolve the apparent irregularity of the planets, and their different diſtances from the earth; they likewiſe invented a little circle to ſolve the ſtations and retrogradations of the planets: this circle, which they call *epicycle*, has its center in the circumference of another greater, which is the eccentric of a planet.

In this eccentric the center of the *epicycle* moves; carrying with it the planet fixed in its circumference, the center of the planet, all the way, moving regularly along the circumference of the *epicycle*, when downwards, according to the order of the ſigns, and when upwards, contrary to it.

The higheſt point of the *epicycle* is called the *apogee*, and the loweſt the *perigee*.

The great circle, in whoſe circumference the center of the *epicycle* is placed, is alſo called the *deferent of the epicycle*, whoſe center is in the orbit of the earth, according to the hypotheſis of Copernicus; but in that of Ptolemy, who ſuppoſed the heavens ſolid, the *epicycle* was a ſphere, which revolved with the moon, of the thickneſs allowed its heaven or orbit; and which ſometimes ſhewed it higher, and ſometimes lower. See *Ptolemaic* SYSTEM.

"The aſtronomers, who deny the motion of the earth, "in order to render the phænomena of the motions of "the planets more conſiſtent with the motion of the ſun, "have affixed the orbit of the earth, as an *epicycle* to the "orbit of the planets; ſo that the planet ſhould proceed "in an *epicycle*, while it is carried through its orbit round "the ſun; but this is far from anſwering their expecta-"tions." Wolf. Elem. Math. tom. ii. p. 501.

"Ricciolus, though a zealous enemy of the motion of "the earth, could not make any aſtronomical tables that "ſhould but tolerably agree with obſervation, without "ſuppoſing the earth to move; not, though he called in "all the foreign and forced aſſiſtances of changeable *epi-*"*cycles*, liable to continual increaſe and decreaſe, and va-"rioufly inclined to the ecliptic." De Chales Aſtron. Reform. lib. x. cap. 1. fol. 353, &c.

Epicycles have likewiſe been introduced by Dr. Halley and Mr. Machin, to account for the inequalities of the moon's motion. See MOON.

EPICYCLOID, in *Geometry*, denotes a curve generated by the revolution of a point of the periphery of a circle, along the convex or concave part of another circle.

A point of the circumference of a circle, proceeding along a plane in a right line, and at the ſame time revolving on its center, deſcribes a cycloid.

And if the generating circle, in lieu of moving on a right line, moves along the circumference of another circle, whether equal or unequal, the curve deſcribed by any point in its circumference is called an *epicycloid*.

If the generating circle proceeds along the convexity of the periphery, it is called an *upper*, or *exterior epicycloid*: if along the concavity, a *lower*, or *interior epicycloid*.

In an *epicycloid*, the part of the circle the generating point moves along, is called the *baſe of the epicycloid*: thus in *Tab. Geom. fig.* 58. DB is the baſe of the *epicycloid*, V its vertex; VB its axis; DPV half of the *exterior epicycloid*, made by the revolution of the ſemicircle VLB (which is called the *generant*) along the convex ſide of the baſe DB; as DPU is the *interior epicycloid*, formed by the generant's revolving along the convex ſide of the baſe.

The length of any part of the curve, which any given point in the revolving circle has deſcribed, from the time it touched the circle whereon it revolved, is to double the verſed ſine of half the arch which all that time touched the quieſcent circle, as the ſum of the diameters of the circles to the ſemidiameter of the quieſcent circle; provided the revolving circle moves upon the convex ſide of the quieſcent circle; but if upon the concave ſide, as the difference of the diameters to the ſemidiameter.

Dr. Halley gives us a general propoſition for the meaſuring of all *cycloids* and *epicycloids*: thus, the area of a cycloid, or *epicycloid*, either primary, or contracted, or prolate, is to the area of the generating circle; and alſo the areas of the parts, generated in thoſe curves, to the areas of analogous ſegments of the circle; as the ſum of double the velocity of the center, and velocity of the circular motion, to the velocity of the circular motion. The demonſtration hereof, ſee in Phil. Tranſ. N° 218.

Spherical epicycloids are formed by a point of the revolving circle, when its plane makes an invariable angle with the plane of the circle on which it revolves. Meſſrs. Bernouilli, Maupertuis, Nicole, and Clairaut, have demonſtrated ſeveral properties of theſe *epicycloids*, in Hiſt. Acad. Sc. for 1732.

EPICYEMA, from κυω, *I conceive*, a word uſed by Hippocrates to ſignify a fœtus, or a falſe conception, or mole coming on after the conception of a former or regular fœtus.

EPIDAURIA, Επιδαυρια, in *Antiquity*, a feſtival celebrated by the Athenians, in honour of Eſculapius.

EPIDELOS, a word uſed by Hippocrates, for a youth in the time of his growth, from the age of ſeven to that of fourteen. The ſame author alſo uſes it in a very different ſenſe, expreſſing by it the obſervable days in a diſeaſe, ſuch as the fourth, eighth, and eleventh, which indicate what ſort of criſis is to be reaſonably expected on the great critical day.

EPIDEMIA, Επιδημια, in *Antiquity*, feaſts of Apollo at Delphos, and Miletus; and of Diana at Argos.

Theſe feaſts bore the name *epidemia* (from επι, *in*, and δημος, *people*) becauſe theſe gods were imagined to be preſent on thoſe days among the people. Accordingly, on the laſt day of the *epidemia* they ſung an hymn called αποπεμπτικος, to bid them adieu, and ſet them forwards on their journey.

As thoſe gods could not be every where, and yet were honoured in many different places, there were times allowed them to paſs from one place to another, to receive the vows of their adorers. See Scaliger, Poet. lib. iii. cap. 114.

EPIDEMIA were alſo private feſtivals, and times of rejoicing, when a friend, or a relation, had returned from a journey. Pott. Archæol. Græc. lib. ii. cap. 20. tom. i. p. 394.

EPIDEMIC, Επιδημιος, denotes a general or ſpreading diſorder, as a plague, ariſing from ſome corruption or malignity in the air, which ſeizes great numbers of people in a little time.

The word is Greek, formed of επι, and δημος, *populus*, *people*; ſuch diſeaſes running among all kinds of people, of whatever age, ſex, quality, &c. as ariſing from a common or general cauſe.

The Latins call them *populares morbi*, *popular diſeaſes*; in oppoſition to thoſe called *ſporadici*, which are only here and there, as ariſing from private or particular cauſes. See SPORADIC.

Epidemic diſeaſes differ from endemial; which imports diſeaſes peculiar to ſome particular country, region, or people; whereas *epidemic* diſeaſes are ſuch as are peculiar to certain ſeaſons.

Pertinent to the preſent ſubject are the obſervations of the celebrated Boerhaave on *epidemical* diſeaſes. We muſt remark, ſays this author, that though every particular diſeaſe of the fluids in various *epidemical* conſtitutions, appear to inattentive obſervers, the ſame with regard to their names, ſigns, and, in ſome meaſure, in their conſequences; yet the ſame diſeaſes appearing in one *epidemical* conſtitution, differ exceedingly from thoſe produced in another, with reſpect to their obſcure natures; their appearances not obſervable, except by the judicious; the various times of their increaſe, ſtate, coction, criſis, effect, event, and method to be purſued in their cure. Hence it is evident that they require a different adminiſtration of the non-naturals, different treatment and medicines. This variety, however, in *epidemical* diſtempers, is ſo obſcure, that phyſicians have not yet been able to deduce it from any abuſe of the non-naturals; and yet there are many circumſtances that render it highly probable, that the cauſes reſide in the air, but depend more upon the inexplicable variety of exhalations contained therein, which by their mixture with the fluids of the body, or their ſtimulus, injure the human machine, than upon any change in the ſenſible qualities thereof. But it is very ſurpriſing, that theſe *epidemical* diſorders ſhould be principally propagated by contagion, received from one, by another perſon unaffected.

Upon the invaſion of any unknown *epidemical* diſtemper, the phyſician will receive ſome information with reſpect to the cure; firſt by reducing the diſtemper to ſome more known ſpecies, which it moſt reſembles; ſecondly, by obſerving its tendency at the vernal and autumnal equinoxes, at which ſeaſons it is generally moſt prevalent; thirdly, by attending to the ſpontaneous phænomena, which precede, accompany, or follow, the recovery or death of the patient, and the different ſtates of the diſorder; fourthly, by diligently remarking the benefit or injury received, from whatever the patients are unavoidably obliged to do, as from whatever is taken into, or diſcharged out of the body; fifthly, by comparing the caſes of many patients labouring under the diſtemper, at the ſame time; ſixthly, by abſtaining from all remedies which are dubious, which exagitate, and induce a conſiderable change in the humours, and thereby obſcure the genius of the diſeaſe.

From theſe circumſtances, duly attended to, the curative indication may be diſcovered. See *Peſtilential* DISEASES.

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EPIDENDRA, from επι, *upon*, and δενδρον, *tree*, in *Natural Hiſtory*. a word uſed by Sir Hans Sloane, and ſome other authors, to expreſs thoſe plants which grow upon others, ſuch as the MISLETOE, which grows upon the apple-trees, &c. Theſe are more commonly diſtinguiſhed by the name of paraſitical plants. See DODDER.

EPIDENDRUM, in *Botany*. See VANILLA.

EPIDERMIS, in *Anatomy*, the cuticle, or ſcarf-ſkin.

The word is formed of the Greek επι, *on, over*; and δερμα, *ſkin*.

Some hold the *epidermis* to be formed of the excrements of the *derma*, or true ſkin. Hippocrates is of opinion, it is engendered by cold; as on blood, broth, or the like, when cold, we ſee a pellicle formed.

But it is now paſt doubt, that it is produced at the ſame time, and after the ſame manner, with the other parts: it being found in fœtuſes of all ages, in the womb: it has neither veins, arteries, nor nerves; whence it is inſenſible. See CUTICULA.

EPIDICASIA, Επιδικασια, among the Athenians. Daughters inheriting their parents eſtate, were obliged to marry their neareſt relation; which gave occaſion to perſons of the ſame family to go to law with one another, each pretending to be more nearly allied to the heireſs than the reſt. The ſuit was called επιδικασιας δικη; and the virgin, about whom the relations conteſted, επιδικος. Pott. Archæol. Græc. lib. i. cap. 24. tom. i. p. 147.

EPIDIDYMIS, in *Anatomy*, a little, round body, on the back of each TESTICLE; called alſo PARASTATA.

The word is formed of επι, *upon*, and διδυμος, *twin, teſticle*. See FISTULA.

EPIDOTES, from επιδιδωμι, *I cauſe to grow*, in *Mythology*, deities which were ſuppoſed to preſide over the growth of infants.

EPIDROMUS, of επι and δρομος, *courſe*, in the *Ancient Shipping*, a ſail near the ſtern, which was the largeſt but one in the ſhip.

EPIGÆA, *Trailing Arbutus*, in *Botany*, a genus of the *decandria monogynia* claſs. Its characters are theſe: the flower hath a double empalement, the outer compoſed of three, and the inner of one leaf, divided into five parts; the flower is of a ſalver-ſhape, and hath ten ſlender ſtamina of the length of the tube. In the center is ſituated a globular germen, which afterward becomes a depreſſed five-cornered fruit, with five cells, containing ſeveral ſeeds. There is one ſpecies, a native of North America.

EPIGASTRIC *region*, in *Anatomy*, is a name given to the upper part of the ABDOMEN; reaching from the cartilago xiphoides, almoſt to the navel.

It is uſually divided into three parts: the ſides, or lateral parts, called *hypochondria*; and the middle, the *epigaſtrium*.

There are alſo two *epigaſtric* veins, and as many arteries. The arteries are branches of the iliac external arteries; the veins diſcharge themſelves into the iliac external veins. See *Tab. Anat. (Angeiol.) fig.* 1. N° 57. *fig.* 6. N° 3.

EPIGASTRIUM, of επι, *upon*, and γαστηρ, *belly*, in *Anatomy*, the middle part of the *epigaſtric* region.

EPIGINOMENA, of επιγινομαι, *I ſupervene*, in *Medicine*, are new ſymptoms which occur in the progreſs of a diſeaſe. See EPIPHÆNOMENA.

EPIGLOTTIS, of επι, *upon*, and γλωσσα, or γλοττα, *tongue*, in *Anatomy*, the cover, or lid, of the LARYNX.

The *epiglottis* is a thin, moveable cartilage, made in form of a leaf of ivy, or a little tongue, and therefore likewiſe called lingula; ſerving to cover the cleft, or rima, of the larynx, called *glottis*.

Galen takes the *epiglottis* to be the principal organ, or inſtrument, of voice; ſerving to vary, modulate, and render it harmonious.

Its baſe, which is pretty broad, is in the upper part of the cartilago ſcutiformis, and its point, or tip, turned towards the palate. It is only ſhut by the weight of the piece in ſwallowing; though not ſo exactly, but that a crum, or a drop, ſometimes eſcapes through the trachea.

EPIGLOUTIS, a word uſed, by ſome of the old writers in *Medicine*, to expreſs the upper part of the buttock.

EPIGONATIS, a name given, by ſome anatomiſts, to the PATELLA.

EPIGONIUM, Επιγονιον, a muſical inſtrument among the ancients, with forty ſtrings, ſo called from its inventor Epigonius, a native of Ambracia, a city of Epirus. Mem. Acad. Inſcript. vol. v. p. 167.

EPIGRAM, in *Poetry*, a ſhort poem, or compoſition in verſe, treating only of one thing, and ending with ſome point, or lively ingenious thought.

The word is formed of επιγραμμα, *inſcription*, of επιγραφειν, *to inſcribe*, or *write upon*.

Epigrams then, originally, ſignify *inſcriptions*, and they derive their origin from thoſe inſcriptions placed by the ancients on their tombs, ſtatues, temples, triumphal arches, &c. See INSCRIPTION.

Theſe, at firſt, were only ſimple monograms: afterwards, increaſing their length, they made them in verſe, to be the more eaſily retained: Herodotus, and others, have tranſmitted to us ſeveral of them.

Such little poems retained the name of *epigrams*, even after the deſign of their firſt inſtitution was varied, and people began to uſe them for the relation of little facts and accidents, the characterizing of perſons, &c.

The Greeks confine their *epigrams* to a very narrow compaſs; for though, in the Anthology, we here and there meet with a very long one; yet, ordinarily, they do not exceed ſix, or, at moſt, eight verſes. The Latins were not always ſo ſcrupulous, and the moderns much leſs, as to theſe bounds.

M. le Brun, in the preface to his *Epigrams*, defines an *epigram* a little poem, ſuſceptible of all kinds of ſubjects, and ending with a lively, juſt, and unexpected thought; which are three qualifications eſſential to the *epigram*; particularly the firſt and laſt of them, viz. brevity, and the point or cloſe of the *epigram*.

To attain brevity, only one thing is to be aimed at in the poem, and that to be purſued in the conciſeſt terms poſſible. Authors are much divided, as to the length the *epigram* is to be confined to: the ordinary limits are from two to twenty verſes; though we have inſtances, both among the ancients and moderns, where they extend to fifty. But ſtill it is allowed, that the ſhorter the better, and more perfect, as it partakes more of the nature and character of this kind of poem. The point or turn is a quality much inſiſted on by the critics, who require the *epigram* conſtantly to cloſe with ſomething poignant and unexpected, to which all the reſt of the compoſition is only preparatory. Others there are, who exclude the point, and require the thought to be equally diffuſed throughout the whole poem, without laying the whole ſtreſs on the cloſe: the former is uſually Martial's practice, and the latter that of Catullus. Which is the moſt beautiful and perfect manner, is diſputed by a third claſs of critics.

The Greek *epigrams* have ſcarce any thing of the point, or briſkneſs, of the Latin ones: thoſe collected in the Anthology, have moſt of them a remarkable air of eaſe and ſimplicity, attended with ſomething juſt and witty; ſuch as we find in a ſenſible peaſant, or a child that has wit. They have nothing that bites, but ſomething that tickles. Though they want the ſalt of Martial, yet to a good taſte they are not inſipid; except a few of them, which are quite flat and ſpiritleſs. However, the general faintneſs, and delicacy of the pleaſantry in them, has given occaſion for a *Greek epigram*, or *epigram à la Greque*, to denote, among the French, an *epigram* void of ſalt or ſharpneſs.

It is principally the point that characterizes the *epigram*, and diſtinguiſhes it from the madrigal. See POINT.

In the modern verſification, as obſerved by F. Mourgues, the *epigram* and madrigal are diſtinguiſhed by the number of verſes, and the cloſe. 1. By the number of verſes, which in the modern *epigram* does not go beyond eight, nor in the modern madrigal, comes ſhort of ſix; and, 2. In that the cloſe, or period, of the *epigram*, has always ſomething more lively and ſtudied than that of the madrigal.

The *epigram* is the loweſt, and leaſt conſiderable, of all the productions of poetry; and it is in general rather an effect of good luck, than of art, to ſucceed therein.

The fineſſe, and ſubtilty, of the *epigram*, M. Boileau obſerves, ſhould turn on the words, rather than the thought; which ſeems very little to the credit of this kind of compoſition, as it reduces it to the nature of the pun, or equivoque. F. Bouhours confirms the hint, in adding, that the equivoque is what uſually ſhines the moſt in the *epigram*.

One great beauty of the *epigram* is, to leave ſomething for the reader to gueſs, or ſupply. Nothing pleaſes the mind ſo much, as to find ſomething of itſelf in the objects preſented it; nor does any thing diſguſt it more than to preclude it from ſhewing and exerciſing a faculty it values itſelf for. Segrais.

The *epigram* admits of great variety of ſubjects: ſome are made to praiſe, and others to ſatirize, which laſt are much the eaſieſt; ill-nature ſerving inſtead of point and wit. Boileau's *epigrams* are all ſatires on one or another. Thoſe of des Reaux are all made in honour of his friends; and thoſe of Mad. Scudery are ſo many eloges. The *epigram* being only a ſingle thought, it would be ridiculous to expreſs it in a great number of verſes; it muſt have its unity like the drama. The comedy has an action for its ſubject, and the *epigram* a thought.

EPIGRAPHE, Επιγραφη, *Superſcription*, an inſcription on a building, to ſignify its uſe, occaſion, the time when, and the perſons by whom it was built.

EPIGRAPHES, Επιγραφεις, among the Athenians, officers that rated all thoſe of whom taxes and contribu-

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tions were required, according to every man's ability, kept the public accounts, and profecuted fuch as were behind-hand with their contributions. Potter, Archæol. Græc. lib. i. cap. 14. tom. i. p. 81.

EPILEPSY, formed of ἐφιλαμβανω, *I furprife*, or *feize hold of one*, in *Medicine*, a convulfion, either of the whole body, or fome of its parts; attended with a deprivation of the fenfes and underftanding; and returning from time to time in fits, or paroxyfms.

In Engliſh it is uſually called the *falling ſickneſs*, becauſe people fall down when attacked by it. The Latins call it *comitialis morbus*, becauſe when any body was ſeized with it in a comitia, or aſſembly of the Roman people, they preſently broke up the aſſembly, as deeming it an unhappy preſage.

Some call it the *morbus ſacer*, as ſuppoſing it ſent by way of immediate puniſhment from God. Others, *morbus caducus*; others *Herculeus*, *ſonticus*, *lues deifica*, &c.

The *epilepſy* is generally preceded by uncommon wearineſs, pain of the head, dullneſs, giddineſs, noiſe in the ears, dimneſs of ſight, palpitation of the heart, diſturbed ſleep, difficult breathing, inflation of the bowels with wind, the evacuation of great quantities of thin urine, pale complexion, coldneſs at the extremities, and a ſenſation of cold air, aſcending in a kind of ſteam towards the head.

The patient ſeized with this diſorder, falls inſtantly and ſuddenly down; or rather throws and precipitates himſelf violently to the ground. When down, he grinds his teeth, foams at the mouth, makes an unuſual noiſe, and frequently ſhakes his head; his arms, legs, neck, back, &c. either becoming rigid, or variouſly diſtorted; his thumbs are drawn on towards the palm of his hands; and as all the parts are in a violent contraction, there is frequently an involuntary flux of urine, ſeed, and fecal matter. After ſome time he returns to himſelf; only retaining a head-ach, heavineſs, wearineſs of the limbs, &c.

Etmuller more accurately diſtinguiſhes the diſeaſe into three degrees: the firſt, or loweſt, is much the ſame with the higheſt degree of a vertigo.

In the ſecond, there ariſe various agitations and geſticulations; and the ſenſes, both external and internal, either remaining, or being tranſported into a delirium, they dance, ſing, laugh, weep, talk idly, ſhriek, and beat their breaſts. Sometimes they remember all after the fit is over, and ſometimes nothing at all of what has paſſed.

In the third degree, which alone is ordinarily called the *epilepſy*, they loſe the uſe both of reaſon and ſenſe; fall, or fling themſelves down, foam, grind their teeth, and bite their lips, with the other circumſtances above related. Thoſe affected with the ſecond degree, have been often ſuppoſed to be *poſſeſſed by the devil*. See DÆMONIAC.

The paroxyſms, according to the diverſity of cauſes, are longer or ſhorter, and fewer or more frequent. Some have obſerved that they generally return at ſtated periods, as on certain days, hours, or months, or on the changes of the moon, eſpecially at the new and full moon; but there is reaſon to think, from later obſervations, that this is a vulgar error. See LUNATICS.

Women are uſually ſeized with theſe paroxyſms at the time of the return of the menſes; and what is moſt obſervable is, that they are frequently occaſioned by ſeemingly ſlight cauſes; commotions of the mind, a colder ſeaſon than ordinary, the uſe of ſtrong liquors, cloſe application of the mind to any thing, and, finally, the uſe of venery often bring on theſe fits. Infancy and youth are the times of life moſt ſubject to this diſorder, which often goes off at the time of puberty: it more frequently attacks men than women, and is very difficult of cure, eſpecially if the patient is more than twenty years of age; and after forty a cure is hardly to be expected. When *epileptic* fits continue long, and return frequently, there is little proſpect of relief; and it is a very unfavourable ſymptom, when the patient is ſeized with the fits in his ſleep.

The cauſe of this diſeaſe, Boerhaave attributes to too much action of the brain on the motory nerves, and none on the ſenſative ones. Some are pleaſed to account for it, from the abundance of ſharp humours mixing with the animal ſpirits, and giving them extraordinary and irregular motions, and directions; whence ariſes its diſtinction from a ſyncope, and apoplexy, which take away all motion as well as ſenſe. See SYNCOPE, and APOPLEXY.

The cauſe of this terrible diſorder appears to be a ſtricture of that membrane which ſurrounds the brain and the ſpinal marrow. The cauſes are very various, and thence alſo the diſeaſe varies in its ſpecies and appearance. The moſt terrible and mortal *epilepſies* have been brought on by external violence, by blows, wounds, fractures, and depreſſions of the cranium. Theſe are generally preceded by pains of the head, and a torpor of the ſenſes; and in theſe, after the patient's death, corrupted blood or ſerum is always found either between the dura and pia mater, or between the dura mater and cranium. Chronical *epilepſies*, returning at ſtated periods, are alſo frequently occaſioned by certain acute bony protuberances ariſing internally in the baſis of the cranium, and ſometimes in the lateral ſinus. It is eaſy to ſee that this ſpecies of *epilepſy* is incurable; yet medicine can do great ſervice in it, by keeping the brain in ſuch a condition, that its preſſure on theſe protuberances may not be enough to produce a violent fit.

Polypoſe concretions in the jugular veins, and obſtructions of the ſinuſes of the dura mater, are alſo cauſes of incurable *epilepſies*. The paſſions of the mind alſo, as anger, fear, and the like, contribute greatly to bring on *epilepſies*, as they act immediately upon the nervous parts, and either conſtringe or dilate them preternaturally, which cannot be done very often without inducing a bad habit. Infants are often rendered *epileptic* either from ſucking the milk of a nurſe in a violent fit of paſſion, or from the violent commotions of mind the mother was ſubject to while pregnant. The terror of the ſight of one perſon in an *epileptic* fit, has frequently thrown another into the ſame diſorder; and it has been often known, that a ſtrong propenſity to venery, from a natural redundancy of ſemen, being ſuppreſſed by chaſtity, has brought on this diſeaſe. Women have fallen into it from violent love alſo, and have, in that caſe, found their cure in marriage. Exceſſive drinking, intenſe ſtudy, worms, teething, and the infection of the ſmall-pox, &c. may be reckoned among the cauſes of this diſorder.

M. Poupart, from a diſſection of an *epileptic* perſon, wherein, immediately under the dura mater, was found a deal of white, thick, viſcid, pituita, glued, and, as it were, incorporated with the membrane, thinks, that this might be the cauſe of the diſeaſe; the exceſſive quantity of ſuch thick lympha, loading the brain, and obſtructing its neceſſary motions. The firſt cauſe, he judges, might be the ſpongeouſneſs of the dura mater, which imbibed the ſeroſities of the brain.

He adds, that he knew an *epileptic* perſon, who, upon the firſt approach of his diſorder, rubbed his forehead with his hand, and bent his head as far backward as he could, reſting it againſt a wall, and by that means ſecured himſelf againſt the convulſion. It is probable, that by this he gave a motion to the lympha, and drove it from the place which before it diſturbed.

The *epilepſy* is either *idiopathic*, or *ſympathetic*: it is idiopathic, when it ariſes merely from a diſorder of the brain, or ſpirits; and ſympathetic, when it is preceded by ſome other diſeaſe which brings it on.

In the cure of an *epilepſy*, the firſt intention muſt be to correct and expel from the body the remote material cauſes of the diſorder; ſecondly, to mitigate the ſpaſms of the dura mater, and nervous parts, by medicines of a ſedative and corroborating nature; the former to check and allay the violent motion of the fluids, the other to reſtore the due tone and natural elaſticity to the parts, the weakneſs of which, occaſioned by a former fit, gives frequent occaſions for ſucceeding ones. Of the firſt kind are poppy ſeeds, or flowers, ſaffron, nutmeg, and the like; and among the chemical medicines, the *ſpiritus nitri dulcis*, when truly prepared. Of the corroboratives to be given in *epileptic* caſes, roſemary, rue, lavender, cardamom ſeeds, and ambergriſe, ſpirit of hartſhorn, and the oil of hartſhorn, made pure by frequent rectifications, are alſo greatly beneficial. The decoctions of the woods, as guaiacum, ſaſſafras, and the like, are alſo good remedies; and ſeveral *epilepſies* have been known to be perfectly cured by taking half a pint of a ſtrong decoction of guaiacum twice a day, with a few drops of ſpirit of vitriol in each doſe, and making all the while a weaker decoction ſerve for the common drink. It is neceſſary, however, if there be a redundance of blood, to begin the cure with frequent bleedings. Cupping on the parts near the head is alſo of great ſervice, and ſometimes opening the jugular vein is neceſſary, by which alone patients have ſometimes been cured.

But though theſe are the methods of cure, in ſome caſes, yet in others, where the diſeaſe has had a different origin, very different means are required. When the diſeaſe is hereditary, or proceeds from a wrong formation of the brain, a cure is not to be expected. When it is owing to a debility, or too great an irritability of the nervous ſyſtem, ſuch medicines as tend to ſtrengthen the nerves may be uſed, as the Peruvian bark and ſteel, or the *anti-epileptic* electaries, recommended by Fuller and Mead. The electary may be made by mixing an ounce of powdered bark, and half an ounce of powdered tin, and as much of wild valerian root, with ſimple ſyrup.

Dr.

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Dr. Mead directs a dram of an electary, similar to this, to be taken evening and morning, in the *epilepsy*, for the space of three months. The powdered tin is added, because the *epilepsy* often proceeds from worms.

When an *epilepsy* arises from an impure serum, lodged in the vessels and membranes of the head; which too often happens from the sudden drying up of old ulcers, stopping of issues, or the like means; then the intention of cure consists in the discussion, evacuation, and derivation of the serum to other parts. For this purpose cathartics are to be exhibited, and setons. Issues and blisters are of singular service. Nature has been known to cure *epilepsies* of this kind, by an eruption of pimples all over the body. And there is recorded in Willis a memorable instance of a girl, subject to frequent returns of *epileptic* fits; who, in one of them, happening to fall with her head into the fire, and so accidentally cauterising it, remained well so long as the ulcers discharged any thing; but when they dried up, the former fits returned.

In *epilepsies* arising from violent emotions of the mind, in which acrid, bilious, and acrimonious humours are conveyed into the nervous system, the use of whey, mineral waters, and proper regimen, added to the sweetening powders, usually produce a cure. Acidulated medicines are also highly proper, and spirit of vitriol, or *spiritus nitri dulcis*, are of very singular efficacy. When an *epilepsy* arises merely from pain, as that of the stone, the tooth-ach when violent, or spasms of the stomach or intestines, then clysters of oil are of very great use; and after these, bleeding is usually very proper.

In the *epilepsies* of infants, arising from gripes, corrupted milk, or difficult dentition, great benefit is to be had from clysters of milk, with a little Venice soap dissolved in it. A few grains of cinnabar, given internally, often prove also of singular benefit; and musk is known to be a remedy second to none in these cases. When *epilepsies* are caused by worms eroding the inner coats of the intestines, after the use of the common *anti-epileptic* remedies, the medicines for worms must be given, and their use continued, till, by the symptoms ceasing, there is reason to think these pernicious animals are destroyed.

When an *epilepsy* returns at stated periods, or at the changes of the moon, the cause is usually in the stomach or duodenum, or its adjacent parts, the biliary ducts and pancreas. In this case therefore there should always be a clyster given, and afterwards a vomit, before the expected fit.

In the time of the paroxysms of *epilepsies*, people ought to abstain from the use of substances that are too volatile, spirituous, fragrant, or fetid; for all these fill the head with vapours; nor should such things be exhibited as promote sneezing or vomiting, since they derive the humours to the head, and often recal the paroxysms. The most useful means, in the fit, are to keep the patient in an erect posture, to rub his hands and feet. In all kinds of *epilepsies*, it is proper to abstain from wine and malt liquors, and to drink only water. Opiates, and too volatile medicines, must be very cautiously given to children, and persons of tender habits; and when *epilepsies* return from the slightest causes, it is proper to abstain from a load of medicines, and trust to nature and a proper regimen alone. In this regimen the patient must abstain from all strong liquors, from great heat, or excessive cold, from venery, from seeing any terrible sight, from anxiety of mind, and from business. Young persons are to abstain from fruit; and all violent emotions of the mind are carefully to be avoided.

Many physicians have prescribed the root of the wild valerian, as a remedy which is alone capable of curing this terrible disease. Hoffman extols the use of ambergrise in this disorder. Oper. tom. iii. § 1. cap. 1. § 4. as also of musk, ib. § 9. Ten or twelve grains of it, with the same quantity of factitious cinnabar, may be made up into a bolus, and taken every night and morning. He recommends also the spirit of hartshorn, or of ivory, either simple or succinated. The decoctions of the woods guaiacum, sassafras, santals, &c. are also useful, ib. § 4. He advises great caution in the use of opiates, in cases of children, and weak persons. Ib. Cautel. Pract. § 5.

Sir John Colbatch has an express treatise on the MISLETOE of the oak, to prove that it is a specific in this disease.

The *epilepsy* has been sometimes cured by ELECTRICITY.

EPILESMON, from επιλανδω, *I cause to forget*, a term used, by the old writers in *Medicine*, to express loss of memory.

EPILOBIUM, in *Botany*. See WILLOW-*herb*.

EPILOGUE, EPILOGUS, in *Oratory*, &c. The peroration, or last part of a discourse, or treatise; containing ordinarily a recapitulation of the principal matters delivered.

The word is Greek, επιλογος, formed of the verb επιλεγω, *I say after*; the *epilogue* being the end, or conclusion, of a discourse.

EPILOGUE, in *Dramatic Poetry*, is a speech addressed to the audience, when the play is over, by one of the principal personæ, or actors in the piece; containing usually some reflections on certain incidents in the play, particularly those of the part of the person who speaks it.

In the modern tragedy, the *epilogue* has usually somewhat of pleasantry in it; intended, perhaps, to compose the passions raised in the course of the representation, and send the audience away in good humour; though how far that design is good and laudable, will bear some dispute: an ingenious author in the Spectator compares it to a merry jig on the organ, after a good sermon, to obliterate any impressions that might have been made thereby, and send the people away just as they came.

In effect, though the *epilogue*, in this sense, may seem an abuse, yet has it the countenance of antiquity; the Romans had something of the same nature, though under another name. Their exodium was a kind of farce, brought on the stage when the tragedy was over: *ut quicquid lacrymarum ac tristitiæ cepissent ex tragicis affectibus, hujus spectaculi risus detergeret*, says the scholiast of Juvenal.

The *epilogue* is but of modern date, much later than the prologue. Many, indeed, have taken the exodium of the ancient Greek drama for an *epilogue*, because Aristotle defines it, to be a part rehearsed after the chorus had sung for the last time; but, in reality, it was of a quite different nature. The exodium was the last of the four parts of the tragedy; containing the unravelling and catastrophe of the plot, and answering to our last, or fifth act.

EPIMEDIUM, in *Botany*. See BARRENWORT.

EPIMELIS, a name given, by the old writers in *Medicine*, to a species of medlar, or, as some will have it, to a kind of summer-apple.

EPIMETRON, of επι, and μετρον, *measure*, in *Antiquity*, an allowance given the tax-gatherers in the Roman provinces, over and above the just quantity of wine or grain they were obliged to furnish. The *epimetron*, or over-measure, in different provinces, was different, being always greater in those that were remote, than in the nearer provinces. The different kinds of things wherein it was given, made likewise a difference in the quantity allowed. The reason of allowing an *epimetron*, or over-measure, was to make good the leakage of the wine, and waste of grain, that would necessarily happen by transporting it to Rome.

The provinces whose taxes were converted into money, and paid in specie, were free from the *epimetron*.

EPIMORIOS, Επιμοριος, *superparticular*, of μειρω, *I divide*, an epithet given, by Galen, to certain differences in the pulses, with respect to their ineqality as to the time of their beating. All times, rythms, or modulations of the pulse, according to number, consist, he observes, of equal, or unequal proportions. Of equal, when the time of the distention is equal to that of contraction; and of unequal, when the one of these exceeds the other; and this inequality may be from certain or uncertain excesses. The certain excesses may be either in multiple proportion, or as number to number, which is the *epimorion*.

EPIMULIS, of επι, *upon*, and μυλη, *whirle bone on the top of the knee*, a name given, by some anatomists, to the patella, or knee-pan.

EPIMYTHION, Επιμυθιον, in *Rhetoric*. See FABLE.

EPINENEUCOS, from νευω, *I nod*, in the old writers of *Medicine*, a word used to denote a sort of unequal pulse, beating differently in the different parts of the same artery; as when it rises strongly against the two middle fingers of the physician who feels it, and weaker at the extremes; this sort of pulse is described by Galen as common to hectic patients, and is called also perineneucos.

EPINEPHELOS, of επι and νεφελη, *cloud*, in the writings of the *Ancient Physicians*, a term used to express the cloudy matter seen floating in the urine in fevers, &c. See ENEOREMA.

EPINEUX *des lombes*, in *Anatomy*, a name given by Winslow, and some other of the French authors, to certain small muscles of the loins, not mentioned by the old anatomists; but called, by Albinus, *inter spinales lumborum*.

EPINICION, Επινικιον, from επι, *on*, and νικη, *victory*, in the Greek and Latin *Poetry*, denotes, 1. A feast, ceremony, or rejoicing, on occasion of a victory obtained. 2. A poem, or composition, on the same subject. Scaliger treats expressly of the *epinicion* in his Poetics, lib. i. cap. 44.

EPINYCTIS, of επι and νυξ, *night*, in the writings of the *Ancient Physicians*, a term used to express a sort of malignant pustule, which commonly breaks out in the night. It is usually of about the bigness of a large pea, and is sometimes white, sometimes black, according to the nature of the humour it contains, and always has a violent

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inflammation all round it; when it is opened there is an efflux of ſanies, and a mucous exulceration is found within; it is attended with violent pain, and uſually breaks out in the upper parts of the body. This is the account Celſus gives of the *epinyctis*; but Paulus and Aëtius underſtand it rather to be a puſtule, which gives no great pain in the day, but is very troubleſome in the night. Both accounts, however, may be right, and it may both firſt appear, and be moſt painful in bed.

EPIPACTIS, in *Botany*, a name uſed, by ſome, for the helleborine, or wild, or baſtard black hellebore. Rondeletius alſo uſes the ſame word as the name of the herniaria, or rupture-wort.

EPIPEDOMETRY, of επι, πους, *foot*, and μετρω, *I meaſure*, in *Mathematics*, ſignifies the meaſuring of figures that ſtand on the ſame baſe.

EPIPETRON, in *Botany*, a name given, by Theophraſtus and Ariſtotle, to a plant, ſuppoſed by many to be the ſame with the empetrum of Dioſcorides. But there is great reaſon to doubt whether the *epipetron* of the two older authors be the ſame plant; and whether, if they mean two different plants by this name, either of them agree with the empetrum of Dioſcorides. Theophraſtus ſays, that his *epipetron* never flowers; and Ariſtotle ſays, that his *epipetron* grows on rocky places, and continues to grow after it is taken up, as the orpin and ſome other plants will do.

EPIPHÆNOMENA, of επι and φαινομενον, *ſymptom*, in the writings of the *Ancient Phyſicians*, a term uſed to expreſs ſuch of the ſymptoms, in certain diſeaſes, as did not uſually appear till the time that the diſeaſe was actually formed, called alſo epiginomena.

EPIPHANES, of επι and φαινομαι, an epithet given to Jupiter, becauſe he manifeſted his preſence by lightning and thunder, &c.

EPIPHANIA, a word uſed, by ſome of the ancient phyſicians, to expreſs the external habit of the body.

EPIPHANY, in *Eccleſiaſtical Antiquity*, the feaſt of kings; a double feſtival, of the firſt rank, ſolemnized on the ſixth of January, commonly called *twelfth day*, in honour of the appearance of Jeſus Chriſt to the three kings, or magi, who came to adore, and bring him preſents.

The *feaſt of Epiphany*, now held in honour of the adoration of the magi, had its firſt inſtitution among the Greeks, from a different object, viz. our Saviour's birth; and was called *theophany*, and *epiphany*, that is, appearance, and manifeſtation, of God.

Pope Julius, who reigned from the year 337 to 352, was the firſt who taught the church to diſtinguiſh the feaſts of the nativity, and *epiphany*. Papebroch. Paſal. ad Conat. p. 23. Act. SS. Maii, tom. vii.

The word in the original Greek, επιφανεια, ſignifies *appearance*, or *apparition*; and was applied, as ſome critics will have it, to this feaſt, on account of the ſtar which appeared to the magi. St. Jerom, and St. Chryſoſtom, take the *Epiphany* for the day of our Saviour's baptiſm, when he was declared to men by the voice, *Hic eſt Filius meus dilectus, in quo mihi complacui: This is my beloved Son, in whom I am well pleaſed.* And accordingly it is ſtill obſerved by the Cophtæ and Ethiopians in that view. See Ludolph. Hiſt. Æthiop. lib. xxi. cap. 2. Others contend, that the feaſt of Chriſtmas, or the nativity of our Saviour, was held in diverſe churches on this day; which had the denomination *Epiphany*, or *appearance*, becauſe of our Saviour's firſt appearance on earth, as at that time. And it muſt be allowed, that the word is uſed among the ancient Greek fathers, not for the appearance of the ſtar to the magi, but for that of our Saviour to the world. In which ſenſe, St. Paul uſes the word επιφανεια, *epiphania*, in his ſecond epiſtle to Timothy, chap. i. ver. 10. Ammianus Marcellinus makes mention of this feaſt, lib. xxi. cap. 2. and obſerves that it was held in January. Upon which paſſage, Valeſius, in his notes, endeavours to ſhew, that the hiſtorian meant by *Epiphany* the feaſt of the nativity.

The heathen writers uſed the word *epiphania* in the like ſenſe, viz. to expreſs the appearance of their gods on earth. And the Chriſtians, after their example, applied it, in the general, to expreſs any appearance, or manifeſtation, of the Deity.

EPIPHONEMA, Επιφωνημα, *Acclamation*, in *Rhetoric*, a ſententious ſort of EXCLAMATION, which is frequently added after a narrative, or rehearſal of any thing remarkable; containing uſually a lively, cloſe reflection on the ſubject there ſpoken of, and intended to give it greater force, and render it more affecting to the hearers.

Such is that of St. Paul, when, after diſcourſing of the rejection of the Jews, and the vocation of the Gentiles, he cries out,

O the depth of the wiſdom and knowlege of God!

Such alſo is that of Lucretius, after relating the ſtory of Agamemnon's ſacrificing his daughter Iphigenia:

Tantum religio potuit ſuadere malorum!

The *epiphonema* is uſually expreſſive of the milder and more gentle paſſions, and is not ſo vehement and impetuous as EXCLAMATION.

EPIPHEOS, in *Botany*, the name given by the ancients to the DODDER, or cuſcuta, which grew upon the ſhrub they called phæos. This was the ſtæbe of the modern Greeks, deſcribed by Honorius Bellus. It was a cuſtom, among the old writers, to name the cuſcuta, or dodder, from the plant it was found growing upon, as they ſuppoſed that it in ſome degree partook of the virtues of that plant. Thus that which grew upon thyme was called epithymum, and that upon the nettle, epiurtica, and that upon flax, epilinum; ſo of many others.

The ſhrub pheos was alſo called ſtæbe by Dioſcorides and Theophraſtus; and hence this dodder was ſometimes called EPISTÆBE.

EPIPHLEBOS, of επι and φλιψ, a *vein*, in the writings of the *Old Phyſicians*, a term uſed to denote ſuch perſons as were lean, and of a hot temperament, and whoſe veins, for that reaſon, appeared uſually very turgid and prominent in the hands, &c.

EPIPHORA, Επιφορα, in *Medicine*, a diſeaſe of the eyes; conſiſting in a preternatural defluxion of rheum, or the matter of tears, occaſioned by the partial or total obſtruction of the puncta lachrymalia, or the ſuccus lachrymalis, or the *ductus ad naſum*, and accompanied, frequently, with heat, redneſs, and twitching.

The word is Greek, formed of επιφερειν, *inferre, to draw or bring into*, becauſe of the pain it occaſions.

Pitcairn calls it a *catarrh of the glands of the eye*. See CATARRH.

The internal cauſes of the *epiphora*, or rheum in the eyes, are, a relaxation of the glands of the eyes, and a too great acrimony, or ſharpneſs, of the ſerous humour ſeparated thereby; which, fretting and vellicating the eye, draws an unuſual quantity of blood and lympha thereto; by which, at length, the cheek becomes excoriated, &c. Children are moſt liable to it, from the frequent uſe and ſtraining of the glands of the eye in crying.

The external cauſes of the *epiphora*, are ſharp duſts, ſtreams, &c. entering the eye, and irritating the ſame; alſo a too cold and ſharp air has frequently the like effect. An inveterate *epiphora* often degenerates into a FISTULA *lachrymalis*.

The cure of the *epiphora* is, 1. By cauſing a revulſion, or derivation of the peccant humour, to ſome other parts, as by veneſection, cupping, bliſtering, or cathartics. 2. By correcting its acrimony by proper remedies. And, 3. By applying aſtringents externally. Lapis calaminaris is much commended.

The term *epiphora* is uſed more generally to denote any impetuous influx of the humours, or an inflammation of the blood to any part of the body; and in this ſenſe it may be applied to any inflammatory tumor.

EPIPHYLLOSPERMOUS *plants*, of επι, φυλλον, *leaf*, and σπερμα, *ſeed*, are the ſame with the capillaries, herbs which bear their ſeed on the back part of their leaves. See CAPILLARY.

EPIPHYSIS, Επιφυσις, in *Anatomy*, a leſſer bone, or bony ſubſtance, adhering, or growing to another, by the intervention of a cartilage.

The word is formed of the Greek, επι, *on*; and φυειν, *to grow, adhere*. The Latins call it *appendix, additamentum, adnaſcentia*, &c.

The ſubſtance of the *epiphyſis* is rare and lax; in young children it is merely cartilaginous; but hardens as they grow in age, and, at length, becomes quite bony.

It is commonly laid down, that there is no regular articulation between the *epiphyſis* and the bone; though it is certain, that there is a reciprocal admiſſion of the heads or extremities of each, into the cavities of the other. See ARTICULATION.

There are ſome bones that have no *epiphyſes* at all, as the lower jaw; others have no leſs than five, as the vertebræ.

The deſign of adding *epiphyſes* to bones, was, to ſupply their defects, and render them longer and bigger at the extremes; and thus to render the articulation more firm, and to give greater force to the action of the muſcles.

EPIPHYSES *vermiformes*, are two eminences of the cerebellum, ſhaped like worms, which keep open the paſſage from the third to the fourth ventricle.

In dilating the third ventricle of the brain, we perceive four eminences, two upper and bigger, called *orbicular protuberances*; and two lower and leſs, called *epiphyſes* of the orbicular protuberances. Dionis.

EPIPLASMA, the ſame with *cataplaſma*. See CATAPLASM.

EPIPLOCE, Επιπλοκη, in *Rhetoric*, the ſame with CLIMAX.

EPIPLOCELE, Επιπλοκηλη, in *Surgery*, a kind of hernia, or tumor, occaſioned by the deſcent of the epiploon, or caul,

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caul, into the ſcrotum. See HERNIA, and ENTERO-EPIPLOCELE.

EPIPLOIC, or EPIPLOID, a term applied to the arteries and veins, diſtributed through the ſubſtance of the *epiploon*, or caul. See *Tab. Anat. (Angeiol.) fig.* 1. *n.* 37. See EPIPLOON, and GASTREPIPLOICA.

EPIPLOIS *dextra*, is a branch of the cœliac artery, which runs through the right ſide of the inner, or hinder leaf of the caul.

EPIPLOIS *poſtica*, is a branch of the cœliac artery, ſpringing out of the lower end of the ſplenica, and running to the hinder leaf of the caul.

EPIPLOIS *ſiniſtra*, is a branch of the cœliac artery, which is beſtowed on the lower and left ſide of the caul.

EPIPLOMPHALUS, or EPIPLOOMPHALON, compounded of επιπλοον, *caul*, and ομφαλος, *navel*, in *Surgery*, a ſpecies of exomphalus, or navel-rupture; being a tumor or ſwelling of the part, occaſioned by the epiploon's falling into it. See EXOMPHALUS, and ENTERO-EPIPLOMPHALUS.

EPIPLOON, in *Anatomy*, a fatty membrane, ſpread over the inteſtines, and entering even into the ſeveral ſinuoſities thereof; called alſo the OMENTUM, and popularly the *caul*.

The word is formed of the Greek επιπλεειν, *to ſwim upon*, becauſe it ſeems to float on the inteſtines.

EPIPLOSARCOMPHALUS, compounded of επιπλοον, *epiploon*; σαρξ, *fleſh*; and ομφαλος, *umbilicus*, *navel*, in *Surgery*, a ſort of tumor, of the exomphalous kind. It is formed of the epiploon, and the fleſh. See EXOMPHALUS.

EPIPOROMA, from πωρος, *callus*, a word uſed, by Hippocrates, and the other old writers, for a callous concretion happening at, and moleſting the joints.

EPISARCIDIUM, from επι and σαρξ, *fleſh*, a name given, by many of the old authors, to an ANASARCA.

EPISCAPHIA, from επι and σκαφη, *boat*, feaſts celebrated by the Rhodians.

EPISCENIA, from επι and σκηνη, *tent*, feaſts celebrated by the Lacedæmonians.

EPISCENIUM, Επισκηνιον, in *Antiquity*, a place upon the top of the theatre, where all the machines for moving the ſcenes were kept. Potter, Archæol. Græc. lib. i. cap. 8. p. 42.

EPISCEPSIS, Επισκεψις, in *Antiquity*, an action brought to prove the *diamartyria*, or proteſtation, that the perſon deceaſed had left an heir, to be falſe and groundleſs. Potter, Archæol. Græc. lib. i. cap. 24. tom. i. p. 128.

EPISCIRA, Επισκιρα, in *Antiquity*, a feſtival celebrated at Scira in Attica, in honour of Ceres and Proſerpine. Potter, Archæol. Græc. lib. ii. cap. 20. tom. i. p. 395.

EPISCHION, from επι and ισχιον, *iſchium*, a name given, by the old Greek writers, to the pubes.

EPISCIROSIS, Επισκιρωσις, the ſame with *epiſcira*.

EPISCOPACY, the quality of epiſcopal government, or that form of church diſcipline, wherein dioceſan biſhops are eſtabliſhed, diſtinct from, and ſuperior to, prieſts or preſbyters. See BISHOP, EPISCOPAL, EPISCOPALIANS, and HIERARCHY.

Epiſcopacy, and *preſbytery*, have been alternately eſtabliſhed and aboliſhed in Scotland.

EPISCOPACIDE, from επισκοπος, *biſhop*, and *cædo*, *I kill*, the crime of murdering a biſhop by one of his own clergy. By the ancient laws of England, the ſame obedience is due from a clergyman to his biſhop, as from a ſervant to his maſter; and therefore the offences of murdering either, are made equal, that is, they are both *petty*-TREASON.

EPISCOPAL, ſomething that belongs to a biſhop.

The word is formed of the Greek επισκοπος, *overſeer*, derived from επισκοπεω, *inſpicio*, *I inſpect*, or *overlook*.

Epiſcopal government, is the government of a dioceſe, wherein one ſingle perſon, legally conſecrated, preſides over the clergy of a whole diſtrict, in quality of head, or ſuperintendent thereof; conferring orders, and exerciſing a ſort of juriſdiction.

The preſbyterians reject the *epiſcopal* eſtabliſhment, and condemn the *epiſcopal* order as a human inſtitution, the mere reſult of pride and ambition.

Among the *epiſcopal* functions, the principal part is that of holding frequent viſitations of the dioceſe.

EPISCOPALES *valvulæ*, called alſo, by ſome, *valvulæ mitrales*, two valves in the pulmonary vein, which prevent the reflux of the blood to the heart.

EPISCOPALIA, is ſometimes uſed in the ſame ſenſe with PONTIFICALIA.

EPISCOPALIA, is alſo uſed to denote ſynodals, or cuſtomary payments, due to the biſhops from the clergy of their dioceſe.

Theſe cuſtomary payments have been otherwiſe called *onus epiſcopale*; and were remitted, by ſpecial privilege, to free churches and chapels of the king's foundation, which were exempt from epiſcopal juriſdiction.

EPISCOPALIANS, or EPISCOPISTS, a name given to thoſe who adhere to the church of England, and particularly to the eccleſiaſtical hierarchy, ſuch as it was in the Romiſh church before the Reformation; who affect the diſcipline of biſhops, prieſts, canons, the office, or liturgy, &c. and retain the greateſt part of the canon law, with the decretals of the popes, more cloſely than the catholics themſelves of ſeveral countries; though, as to matters of doctrine, or faith, they agree in moſt points with the Calviniſts, or Reformed.

In Scotland, the principal diſſenters are the *Epiſcopalians*; lay *Epiſcopalians* enjoy all the ſame civil privileges with thoſe of the eſtabliſhed church. They are under no reſtrictions; tied to no teſts; but are employed in all places of truſt, upon taking the oaths to the government. But the *epiſcopal* miniſters are liable to ſeveral penal laws; many of them being nonjurors.

EPISCOPI *multa*. See MULTA.

EPISCOPISSA, a word uſed by writers of the middle ages, to denote a biſhop's wife.

EPISCOPUS *puerorum*, *biſhop of the boys*, a ludicrous kind of office, formerly exerciſed in churches, in that called the *feaſt of fools*, or the feaſt of the kalends.

The cuſtom was for ſome youth in the feaſt of Epiphany to plait his hair, that he might ſeem to have the tonſure, and to put on epiſcopal garments, and then to exerciſe a ſhew of juriſdiction, and do ſeveral ludicrous actions; for which reaſon he was called the *biſhop of the boys*. This cuſtom obtained among us, long after ſeveral conſtitutions were made to aboliſh it. See INNOCENTS-*Day*.

See diverſe curious particulars concerning this *epiſcopus puerorum*, in John Gregory's Poſthumous Works; and in the Antiquities of the Cathedral Church of Saliſbury, p. 71.

EPISPEMASIA, from επισημαινω, *I ſignify*, in *Medicine*, is the very time that a diſeaſe firſt ſeizes a perſon, and is properly called *ſignificatio*. Blancard.

EPISODE, Επεισοδιον, from επι, *upon*, and εισοδος, *entry*, is commonly conceived to be a ſeparate incident, ſtory, or action, which an hiſtorian, or poet, inſerts, and connects with his principal action; to furniſh out the work with a greater diverſity of events; though, in ſtrictneſs, all the particular incidents, whereof the action or narration is compoſed, are called *epiſodes*.

EPISODE, in *Dramatic Poetry*, was the ſecond part of the ancient tragedy.

The origin and uſe of *epiſodes* is deſcribed by M. Hedelin, and F. Boſſu. Tragedy, in its original, being only a hymn, ſung in honour of Bacchus, by ſeveral perſons, who made a kind of chorus, or concert of muſic, with dancing, and the like; to diverſify the repreſentation a little, and divert the audience, they determined at length to divide the ſinging of the chorus into ſeveral parts, and to have ſomething rehearſed in the intervals.

At firſt, a ſingle perſon, or actor, was introduced, then two, then more; and what the actors thus rehearſed, or entertained the audience with, being ſomething foreign, or additional to, or beſide, the ſong of the chorus, and no neceſſary part thereof, was called επισοδιον, *epiſode*.

And hence tragedy came to conſiſt of four parts, the *prologue*, *epiſode*, *exode*, and *chorus*. The *prologue* was all that preceded the firſt entrance of the chorus. The *epiſode*, all that was interpoſed between the ſingings of the chorus. The *exode*, all that was rehearſed after the chorus had done ſinging. And the *chorus*, was the grex, or company, that ſung the hymn.

And as this recitation of the actors was in ſeveral parts, and inſerted in ſeveral places, it might either be conſidered together, as a ſingle *epiſode*, conſiſting of ſeveral parts; or each part might be called a diſtinct *epiſode*.

Theſe ſeveral *epiſodes* in the ſame tragedy might either be taken from ſo many different ſubjects, or from the ſame ſubject divided into a proper number of recitations, or incidents.

To conſider only the firſt occaſion, and inſtitution, of theſe foreign, or additional pieces, it appears no ways neceſſary, that they ſhould all be taken from one and the ſame ſubject; three or four recitations of different actions, no wiſe related, or connected to each other, would eaſe the actors, and amuſe the people, in the intervals of the chorus, as well as if they were all ſo many parts of the ſame action. By degrees, what was at firſt only an addition to the tragedy, became the principal part thereof. Then the ſeveral pieces, or *epiſodes*, began to be conſidered as one ſingle body, which was not to have parts, or members of different nature, and independent of each other.

The beſt poets took the thing in this light, and drew all their *epiſodes* from the ſame action; which practice was ſo fully eſtabliſhed in Ariſtotle's time, that he lays it down as a rule. Thoſe tragedies wherein this unity and connexion was not obſerved, he calls *epiſodic pieces*.

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EPISODE, in *Epic Poetry*. The term *epiſode*, by being tranſplanted from the ſtage to the *epopœia*, did not change its nature. All the difference Ariſtotle makes between the tragic and epic *epiſodes*, is, that the latter are more ample than the former.

Ariſtotle uſes the word in three different ſenſes: the firſt taken from the enumeration already made of the parts of the tragedy, viz. *prologue*, *chorus*, *epiſode*, and *exode*. Whence it follows, that in tragedy, every thing is *epiſode* that is none of the other parts; ſo that as, among us, there are tragedies without either *prologue*, *chorus*, or *epilogue*, the tragic *epiſode* includes the whole tragedy; conſequently, the epic *epiſode* muſt be the whole poem, in like manner; all there is to retrench from it being the propoſition, and invocation, which ſtand in lieu of the prologue. In this ſenſe, the epopœia, and tragedy, have each only one *epiſode*; and if the parts, or incidents, be ill connected together, the poem will be *epiſodic*, and defective.

But farther; as all that was ſung in the tragedy was called the *chorus*, in the ſingular number, yet this ſingularity did by no means prevent every part or diviſion of the ſame from being called a *chorus*, without making ſeveral *choruſes*; ſo it was with the *epiſode*; each incident, and part of the fable and action, is not only a part of the *epiſode*, but is an *epiſode* itſelf.

The term *epiſode*, therefore, in this ſenſe, ſignifies every part of the action expreſſed in the plan, or firſt draught, of the fable; as the abſence and wanderings of Ulyſſes, the diſorders in his family, and his preſence, which retrieved and ſet all to rights again.

Ariſtotle furniſhes us with a third kind of *epiſode*; in ſhewing, that what is contained and expreſſed in the firſt plan of the fable is proper, and that all the reſt is *epiſode*.

By *proper*, he means what is abſolutely neceſſary; and by *epiſode* what in one ſenſe is neceſſary, and in another not; ſo that the poet is at liberty to uſe, or let it alone.

Thus, Homer, having made the firſt draught of the fable of his Odyſſey, was not at liberty either to make Ulyſſes abſent from his country, or not. His abſence was eſſential; and therefore Ariſtotle ranks it among the things he calls *proper*. But he does not beſtow that appellation on the adventures of Antiphates, Circe, the Sirens, Scylla, Charybdis, &c. The poet was at liberty to have left theſe alone, and to have choſen others in their room; ſo that they are *epiſodes*, diſtinct from the firſt action, to which they are not immediately neceſſary.

This third ſenſe of the word *epiſode* comes to the ſecond: all the difference between them is, that what we call *epiſode*, in the ſecond ſenſe, is the ground, or plan, of the *epiſode*, in the third; and that the third adds to the ſecond certain circumſtances which are only probable, and not neceſſary, as the places, princes, and people, among whom Ulyſſes was caſt by Neptune.

It muſt be added, that in an *epiſode* in the third ſenſe, the incident, or *epiſode* in the firſt ſenſe, whereon it is grounded, is to be extended and amplified; otherwiſe, an eſſential part of the action and fable does not become an *epiſode*.

Laſtly, it is in this third ſenſe that we are to underſtand that precept of Ariſtotle, not to make the *epiſodes*, till after the names of the perſons have been choſen. Homer would not have ſpoken of the fleets and ſhips as he has done; if, in lieu of the names of Achilles, Agamemnon, and Iliad, he had choſen thoſe of Adraſtus, Capaneus, and Thebaid.

Upon the whole, the term *epiſode*, in the epic poem, as uſed by the father of the critics, Ariſtotle, does not ſignify any foreign, or accidental adventure; but the whole narration of the poet, or a neceſſary and eſſential part of the action and ſubject, amplified with probable circumſtances.

Thus, Ariſtotle enjoins, that the *epiſode* be not added to the action, or fetched from elſewhere; but that it be a part of the action; and never uſes the word *adding*, in ſpeaking of *epiſodes*, though it occurred ſo naturally to his interpreters, that they have generally uſed it in their tranſlations and comments. He does not ſay, that after laying the plan, and chooſing the names, the poet is to add the *epiſodes*; but uſes a derivative of the word *epiſode*, επεισοδιω, as if in Engliſh we ſhould ſay, *epiſodify* his action.

From what has been ſaid, we may venture to define *epiſodes* to be neceſſary parts of the action, extended and filled up with probable circumſtances. Now, an *epiſode* is only a part of an action, and not a whole action; and this part of the action, which is the baſe, or ground of the *epiſode*, muſt not, when *epiſodified*, retain any thing of the ſimplicity which it had when firſt expreſſed in general, in the plan of the fable.

The ſubject of a poem may be lengthened two ways; either by the poet's making uſe of a great many of his *epiſodes*; or by his amplifying, and giving a greater extent to every one. By this latter method, chiefly, it is, that the epic poets lengthen their poems much beyond the dramatic. It muſt be added, that there are certain parts of an action, which, of themſelves, do not naturally preſent or afford more than one *epiſode*; ſuch as the death of Hector, of Turnus, or the like; whereas there are other parts of the fable more copious and fertile, and which oblige the poet to make diverſe *epiſodes* on each, though laid down in the firſt plan with as much ſimplicity as the reſt: ſuch are the battles of the Trojans and Grecians; the abſence of Ulyſſes; the wanderings of Æneas, &c. For Ulyſſes's abſence ſo many years from his own country, required his preſence elſewhere; and the deſign of the fable was to throw him into ſeveral dangers, and different countries. Now each peril, and each new country, furniſhed an *epiſode*, which the poet might uſe, if he pleaſed.

The reſult of the whole is, that *epiſodes* are not actions, but parts of actions; that they are not added to the action and matter of the poem, but make the action and matter themſelves, as the members make the body; that, of courſe, they are not to be fetched from elſewhere, but raiſed from the ground, or baſis, of the action; that they are not united and connected with the action, but with one another; that all the parts of an action are not ſo many *epiſodes*, but only ſuch as are amplified, and extended with particular circumſtances; and, laſtly, that their union with each other is neceſſary in the ground of the *epiſode*, and probable in the circumſtances.

EPISODIC, in *Poetry*. A fable is ſaid to be *epiſodic*, when it is ſwelled with unneceſſary incidents; and its epiſodes are not neceſſarily, nor properly, connected with each other.

Ariſtotle lays it down, that thoſe tragedies are moſt defective, whoſe epiſodes have no connexion, or dependence on each other, which he calls *epiſodic*, q. d. *ſuperabundant in epiſodes*; becauſe ſo many little epiſodes can never compoſe one whole one, but neceſſarily remain in a vicious plurality.

If an epiſode be uſed, the names and circumſtances whereof are unneceſſary, and whoſe ground and ſubject make no part of the action, that is of the matter of the poem, ſuch an epiſode renders the fable *epiſodic*. This irregularity is diſcovered, when one may take away a whole epiſode, without ſubſtituting any thing in its room; and yet leave no chaſm, or defect, in the poem. The hiſtory of Hypſipyle, in Statius's Thebaid, affords an inſtance of theſe faulty epiſodes. If the whole ſtory of that illuſtrious nurſe were retrenched, the ſequel of the principal action would be the better for it. Nor would any body imagine he had forgot any thing, or that there was any member of his action wanting. Boſſu, and Ariſt. Poet. cap. 9.

EPISPASTIC, formed of επι and σπαω, *trabo*, *I draw*, in *Medicine*. See BLISTER.

EPISPHÆRIA, from επι and σφαιρα, *a ſphere*, in *Anatomy*, are windings and turnings in the outer ſubſtance of the brain, that the ſanguiferous veſſels may paſs more ſecurely.

EPISTÆBE, in *Botany*, a name given to the cuſcuta, or dodder, found growing on the plant ſtæbe of the ancient Greeks. See EPIPHÆOS.

EPISTAPHILINS, in *Anatomy*, a name given by Winſlow, and other of the French authors, to a muſcle called by Morgagni, the *columellæ muſculus teres*, and the *azygos uvulæ*, which laſt name has been continued to it by moſt authors. Douglas calls it the *palatoſtaphilinus*, and ſome of the French, the *muſcle de la luette*.

EPISTATES, Επιστατης, derived from επι, *over*, and ιστημι, *I ſtand*, in *Antiquity*, a perſon who has the command and direction of an affair, or of a people.

The term is of conſiderable uſe, in ſpeaking of the government of Athens, where the *epiſtates* was the ſenator in command for that day, or whoſe turn it was to preſide that day. The conſtitution was this: the ten tribes of Athens formed by Cliſthenes, elected every year by lot, each of them, fifty ſenators, which made a ſenate of five hundred. Every tribe had the precedence in its turn, and ſurrendered it again ſucceſſively to another. The fifty ſenators in office were called *prytanes*; the particular place where they aſſembled, *prytaneum*; and the term, or duration of their office, viz. thirty-five days, *prytanea*. During theſe thirty-five days, ten of the fifty *prytanes* preſided weekly, under the name of *proedri*; and of theſe *proedri* there was one to preſide each day of the week, under the title of *epiſtates*.

No perſon was allowed to hold this office more than once in his whole life, leſt he ſhould acquire too much the taſte of dominion: the ſenators of all the other tribes

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tribes ſtill voted, according to the order the lot had given them; but the *prytanes* laid the buſineſs before them, and the *epiſtates* took their votes and opinions.

It muſt be added, that of the ten *proedri*, of each week, there were but ſeven that would preſide, each his day, in quality of *epiſtates*; the ten *proedri* elected the ſeven *prytanes*.

EPISTEMONARCH, derived from ἐπιστημη, *knowlege*, and ἀρχη, *command*, a dignitary, in the *Ancient Greek Church*, appointed to watch over the actions of the church, and to inſpect or ſuperintend every thing relating to the faith, in quality of a cenſor. His office anſwered pretty much to that of *magiſter ſacri palatii* at Rome.

EPISTITES, from ἐφιστημι, *I keep off*, in *Natural Hiſtory*, the name of a ſtone, deſcribed by the writers of the middle ages, as being of a beautiful red, and ſhining very elegantly. It was renowned for its many magical virtues, according to the idle tradition of thoſe times; they ſaid it drove away all noxious animals, and kept off ſtorms from the place where any one was who had it about him.

EPISTLE, a LETTER *miſſive*.

The word is formed of ἐπιστελλω, *I ſend*.

The term *epiſtle* is now ſcarce uſed, but for letters wrote in verſe, and letters dedicatory.

In ſpeaking of letters written by moderns, or rather in the modern languages, we never uſe the word *epiſtle*. Thus, we ſay, the letters, not *epiſtles*, of the cardinal D'Oſſat, of Voiture, of Balzac, of Howel, of Pope, &c. but thoſe wrote by the ancients, or rather in the ancient languages, we call *epiſtles*: as the *epiſtles*, not letters, of Cicero, Pliny, Seneca. The *epiſtles* of St. Paul, St. Peter, St. John, &c. to the Romans, Corinthians, &c.

A TABLE of St. Paul's *Epiſtles* in the Order of Time, with the Places where, and the Times when they were written.

Epiſtles.	*Places.*		*A. D.*
1 Theſſalonians, 2 Theſſalonians	Corinth		52
Galatians	Corinth, or Epheſus	Near the end of, or the beginning of	52, 53
1 Corinthians	Epheſus	The beginning of	56
1 Timothy	Macedonia		56
Titus	Macedonia, or near it	Before the end of	56
2 Corinthians	Macedonia	About October	57
Romans	Corinth	About February	58
Epheſians	Rome	About April	61
2 Timothy	Rome	About May	61
Philippians	Rome	Before the end of	62
Coloſſians	Rome	Before the end of	62
Philemon	Rome	Before the end of	62
Hebrews	Rome, or Italy	In the ſpring of	63

A TABLE of the Seven Catholic *Epiſtles*, ſo called, becauſe they were written to Chriſtians in general, and the Revelation, with the Places where, and the Times when they were writ.

Epiſtles.	*Places.*		*A. D.*
The *Epiſtle* of St. James	Judæa	61 or beginning of	62
The 2 *Epiſtles* of St. Peter	Rome		64
St. John's 1ſt *Epiſtle*	Epheſus	About	80
His 2d and 3d *Epiſtles*	Epheſus	Between	80 and 90
The *Epiſtle* of St. Jude	Unknown		64 or 65
The Revelation of St. John	Patmos, or Epheſus		95 or 96

See Lardner's Credibility of the Goſpel Hiſtory, vol. xvi. and vol. xvii.

Learned writers are not abſolutely agreed as to the dates of theſe ſeveral *epiſtles*, nor the places whence they were written. It would lead us too far to examine and produce the various authorities and arguments that have been uſed for ſettling theſe particulars: we ſhall only mention that Dr. Doddridge dates the 1ſt *Epiſtle* to the Corinthians about the year 57; and the 2d *Epiſtle* in 58; thoſe to the Epheſians, Philippians, Coloſſians, and Philemon, in 63; the 1ſt to Timothy, in 58 or 65; the 2d to Timothy, in 66 or 67; the *Epiſtle* to Titus, between St. Paul's firſt and ſecond impriſonment at Rome; the *Epiſtle* of St. James, in 60 or 61; the 1ſt of Peter, in 61; the 2d, in 67; that of St. Jude, ſome time after the 2d of Peter, according to Dr. Mills, in the year 90.

As to the general deſign of theſe ſeveral *epiſtles*, it is obſerved by Dr. Doddridge, who is deſervedly eſteemed an excellent and uſeful expoſitor, that the *Epiſtle* to the Romans is intended to fix in the minds of the Chriſtians to whom it is addreſſed a juſt ſenſe of the excellency of the goſpel, and to engage them to act in a manner agreeable to their profeſſion of it: the *Epiſtles* to the Corinthians are deſigned to reſolve ſome important queries propoſed by them, and to correct the various criminal irregularities and diſorders, of which they were guilty: the principal deſign of the *Epiſtle* to the Galatians was to aſſert and vindicate the apoſtle's authority and doctrine, and to confirm the churches of Galatia in the faith of Chriſt, eſpecially with reſpect to the important point of juſtification; to expoſe the errors that were introduced among them, and to revive thoſe principles of Chriſtianity which he had already taught them. In the *Epiſtle* to the Epheſians, the apoſtle endeavours to eſtabliſh them in the faith; and to this end to give them more exalted views of the divine love and the excellence of Chriſt; to ſhew them that they were now, though Gentiles, made partakers of equal privileges with the Jews; to encourage them, by his own example and concern for their welfare; and to engage them to the practice of duties becoming their Chriſtian character. The *Epiſtle* to the Philippians is deſigned to comfort them under the concern they felt on his account; to check a party-ſpirit that had broke out among them, and to promote union and affection; to guard them againſt the ſeduction of judaizing teachers; to ſupport them under their trials, and to inſpire them with an ambition of excelling in ornamental and diſtinguiſhed attainments. The *Epiſtle* to the Coloſſians is deſigned to excite them to a temper and conduct worthy of their ſacred character, and to ſecure them from the influence of thoſe pagan ſophiſts or Jewiſh bigots, who endeavoured to ſeduce them from the purity of the Chriſtian faith. The two *Epiſtles* to the Theſſalonians are intended to confirm them in their adherence to the Chriſtian faith, and to engage them from the ſufferings they had already endured, and the extraordinary character they had hitherto maintained, to make great advances, and to excel ſtill more in religion and virtue; and alſo to rectify ſome erroneous apprehenſions they entertained about the coming of Chriſt, and to direct them in the proper exerciſe of Chriſtian diſcipline. The firſt *Epiſtle* of Timothy was partly intended to direct him in managing the affairs of the church, and chooſing proper perſons for the various offices it required; and partly to caution him againſt the influence of judaizing teachers, to urge him to pay a conſtant regard to the intereſts of practical religion, and to animate him to diligence, fidelity, and zeal. The ſecond *Epiſtle* prepares Timothy for the ſufferings that awaited him, forewarns him of the apoſtacy that was beginning to appear in the church, and animates him to the perſevering diſcharge of every part of the miniſterial office. The *Epiſtle* to Titus contains a variety of prudential inſtructions and cautions. The deſign of the *Epiſtle* to the Hebrews was to confirm the Jewiſh Chriſtians in the faith and practice of the goſpel, which they might be in danger of deſerting through the inſinuations or ill-treatment of their perſecutors. St. James, in his *Epiſtle*, aims to correct thoſe errors both in doctrine and practice into which the Jewiſh Chriſtians had fallen, which might otherwiſe have produced fatal conſequences; and then to eſtabliſh the faith and animate the hope of ſincere believers under their preſent and approaching ſufferings. The *Epiſtles* of St. Peter are deſigned to induce the Chriſtian converts in various parts of the world to maintain a conduct inoffenſive and amiable; to ſupport them under their trials, and to encourage their conſtancy, notwithſtanding the artifices of falſe teachers, and the perſecution of their moſt inveterate enemies. The leading deſign of St. John in his firſt *Epiſtle*, is to evince the vanity of faith ſeparate from morality; to inſpire the minds of Chriſtians with mutual charity, and to guard them againſt the ſnares and efforts of Antichriſt, and of all who were endued with his ſpirit. The *Epiſtle* of Jude deſcribes the characters of the falſe teachers, repreſents the divine judgments which ſuch perſons had reaſon to expect, and thus cautions Chriſtians againſt being perverted by them. See Doddridge's Fam. Expoſitor, vol. iv, v, and vi. in the general introduction prefixed to each *epiſtle*.

EPISTOLARES, among the Romans, under-ſecretaries to the *magiſter ſcrinii epiſtolorum*, or ſecretary who wrote the emperor's letters. They were thirty-four in number. See MAGISTER.

EPISTOLARY, a term uſed in the phraſe *epiſtolary ſtyle*.

As the matter of an epiſtle is the ſame with that of converſation, it ſhould not differ in the manner of expreſſion; and therefore, all pomp and ſtudy of language is not only needleſs but very improper: the moſt plain and eaſy way of conveying our thoughts muſt certainly be beſt, as being moſt natural. Purity in the choice of words, and juſtneſs of conſtruction, joined with perſpicuity, are the chief properties of this ſtyle: to which purpoſe Cicero obſerves, that in writing letters we make uſe of common words and expreſſions. Ad Fam. lib. ix. cap. 21. And Seneca ſays, I would have my letters be like my diſcourſes, when we either ſit or walk together, unſtudied and eaſy. Ep. 75. ad Lucill. However, as the ſubjects

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ſubjects of epiſtles are various, they will neceſſarily acquire ſome variety in the manner of expreſſion. If the ſubject be weighty and momentous, the language ſhould be ſtrong and ſolemn; in things of a lower nature, more free and eaſy; and upon lighter matters, jocoſe and pleaſant. In exhortations, it ought to be lively and vigorous; in conſolations, kind and compaſſionate; and in adviſing, grave and ſerious. In narratives, it ſhould be clear and diſtinct, in requeſts, modeſt; in commendations, friendly, without adulation; in proſperity, chearful; and mournful in adverſity. In a word, the ſtyle ought to be accommodated to the particular nature of the ſubject about which it is converſant. Beſides, the different character of the perſon to whom the letter is written, requires a like difference in the modes of expreſſion. Superiors ſhould be addreſſed with reſpect; inferiors, with courteſy; and equals, with civility. Old men and young, the grave and facetious, courtiers and philoſophers, friends and ſtrangers, require ſome variety in the mode of addreſs. The Epiſtles of Cicero, the ſtyle of which is plain and ſimple, and yet pleaſant and engaging, furniſh a proper model in this reſpect. Ward's Or. vol. ii. p. 213, &c. See STYLE.

EPISTOLARY, is ſometimes alſo applied to authors who have wrote epiſtles or letters. The principal *epiſtolary* authors are Sidonius Apollinaris, Tully, the younger Pliny, Seneca the philoſopher, Petrarch, Politian, Buſbequius, Eraſmus, Lipſius, Muretus, Aſcham, Milton, Petau, Launoi, Sarau, Balzac, Voiture, &c.

EPISTOMIA, in *Anatomy*, are the utmoſt gapings and meetings of veſſels.

EPISTOMIUM, Επιστομιον from επι, *upon*, and στομα, *mouth*, in *Hydraulics*, a plug, or inſtrument, by the application whereof the orifice of a veſſel may be opened and ſhut again at pleaſure.

EPISTROPHE, Επιστροφη, in *Rhetoric*, a figure wherein that which is ſuppoſed of one thing is ſtrongly affirmed of another, and the repetition of the ſame word occurs at the end of each member or ſentence.

Since concord was loſt, friendſhip was loſt, fidelity was loſt, liberty was loſt, all was loſt. Auct. ad Herenn. lib. iv. cap. 13. See alſo 2 Cor. xi. 22.

EPISTROPHEUS, in *Anatomy*, from επιστρεφω, *converto, I turn about*, the ſame with *cardo*.

EPISTYLE, Επιστυλιον, from επι, *upon*, and στυλος, *column*, in the *Ancient Architecture*, a term uſed by the Greeks for what we call *architrave*, viz. a maſſive ſtone, or a piece of wood, laid immediately over the capital of a column.

The *epiſtyle* is the firſt or loweſt member of the ENTABLATURE.

EPITAPH, Επιταφιον, from επι, *upon*, and ταφος, *ſepulchre*, a monumental inſcription, in honour or mem ryof a perſon defunct; or an inſcription engraven or cut on a tomb, to mark the time of a perſon's deceaſe, his name, family, and uſually ſome eloge of his virtues or good qualities.

At Sparta, *epitaphs* were only allowed to people who died in battle. Boxhornius has made a collection of *epitaphs*, not very ample, but exceedingly well choſen. Fa. Labbe has likewiſe given a collection of the like kind in French, intituled, Treſor des Epitaphes. Camden, Weaver, and Toldervy, have done ſomething in the ſame way with our Engliſh *epitaphs*.

In *epitaphs*, the dead perſon is ſometimes introduced by way of proſopopœia, ſpeaking to the living; of which we have a fine inſtance, worthy the Auguſtan age, wherein the dead wife thus beſpeaks her ſurviving huſband.

Immatura perî: ſed tu, felicior, annos
Vive tuos, conjux optimo, vive meos.

The French have a proverb, *Menteur comme une epitaphe*; *He lyes like an epitaph*; in alluſion to the eloges ordinarily contained therein, which are not always over-juſt.

EPITAPH, is alſo applied to certain eloges, either in proſe or in verſe, compoſed without any intent to be engraven on tombs.

In the Anthologies, or collections of epigrams, we have abundance of ſuch *epitaphs*, ſome of them ludicrous and ſatirical, others grave. For a ſpecimen, we ſhall here add a very beautiful one, compoſed by Mr. Cowley, on himſelf, to be put in a little country-houſe, whither he retreated from the court and town to ſpend his laſt days.

Hic, O viator, ſub lare parvulo,
Couleius *hic eſt conditus, hic jacet*
Defunctus humani laboris
Sorte, ſupervacuaque vita;
Non indecora pauperie *nitens,*
Et non inerti nobilis otio,
Vanoque dilectis popello,
Divitiis, animoſus *hoſtis.*

Poſſis ut illum dicere mortuum,
En terra jam nunc quantula *ſufficit?*
Exempta ſit curis, viator,
Terra ſit illa levis, precare.
Hic ſparge flores, *ſparge breves* roſas;
Nam vita gaudet mortua floribus;
Herbiſque odoratis corona
Vatis adhuc cinerem calentem.

The following *epitaphs*, beſides many others, are worth recording. That of Alexander:

Sufficit huic tumulus, cui non ſufficeret orbis.

That of Newton:

Iſaacum Newton
Quem immortalem
Teſtantur tempus, Natura, Cœlum,
Mortalem hoc marmor
Fatetur.

That of Dryden:

Dryden.

Similar to which is that which the Italians have annexed to the Tomb of Taſſo:

Les os du Taſſe.

We may alſo add that of the ingenious and laborious author of this Dictionary, from his tomb in the cloyſters of Weſtminſter Abbey, on the north-ſide, written by himſelf:

Multis pervulgatus,
Paucis notus;
Qui vitam inter lucem et umbram,
Nec eruditus, nec idiota,
Literis deditus tranſegit; ſed ut homo
Qui humani nihil a ſe alienum putat,
Vitâ ſimul et laboribus functus,
Hic requieſcere voluit
EPHRAIM CHAMBERS,
R. S. S.
Obiit 15 Maij, 1740.

In Engliſh thus:

Heard of by many,
Known to few;
Who led a life between fame and obſcurity;
Neither abounding nor deficient in learning;
Devoted to ſtudy; but as a man
Who thinks himſelf bound to all offices of humanity;
Having finiſhed his life and labour together,
Here deſires to reſt.
EPHRAIM CHAMBERS.

EPITASIS, formed of επιτεινω, *intendo, I heighten*, in the *Antient Poetry*, denoted the ſecond part or diviſion of a dramatic poem, wherein the plot or action propoſed and entered upon in the firſt part or protaſis was carried on, heightened, warmed, and worked up, till it arrives at its ſtate or height called the *cataſtaſis*.

This diviſion is laid aſide in the modern drama; in lieu whereof our plays are divided into acts. See ACT.

The *epitaſis* might ordinarily take up about our ſecond or third act.

EPITASIS, in *Medicine*, denotes the increaſe or growth, and heightening of a diſeaſe; or the beginning of a paroxyſm, particularly in a fever.

EPITHALAMIUM, Επιθαλαμιον, formed of επι and θαλαμος, *bride-chamber*, in *Poetry*, a *nuptial ſong*, or a compoſition, uſually in verſe, on occaſion of a marriage between two perſons of eminence.

The topics it chiefly inſiſts on are the praiſes of matrimony, and of the married couple, with the pomp and order of the marriage ſolemnity: it concludes with prayers to the gods for their proſperity, their happy offspring, &c. This kind of poetry is very ancient: the forty-fourth Pſalm, and the book of CANTICLES have been conſidered as ſpecimens of the *epithalamium*. Steſichorus, who flouriſhed in the forty-ſecond Olympiad, has been uſually eſteemed the inventor of the *epithalamium*, among the Greeks, though it is known that Heſiod compoſed the *epithalamium* of Thetis and Peleus, a work now loſt; but a fragment of which is preſerved by an ancient ſcholiaſt. Catullus exceeded all antiquity in his *epithalamiums*, and the cavalier Marino all the moderns.

Among the Greeks, the *epithalamium* was ſung by young men and maids at the door of the bed-chamber of the married pair in the evening and morning. The former ſort were called επιθαλαμια κοιμητικα, and the latter εγερτικα.

EPITHEM, EPITHEMA, from επι, *upon*, and τιθημι, *pono, I put*, in *Pharmacy*, a kind of fomentation or remedy, of a ſpirituous or aromatic kind, applied externally to the regions of the heart, liver, &c. to ſtrengthen and comfort the ſame, or to correct ſome intemperature thereof. See FOMENTATION.

There are principally three kinds of theſe external applications,

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cations, the liquid, the ſolid, and the ſoft or pultice kind.

The liquid *epithems* are ſometimes conſiderably thick; but when they are intended to penetrate deep, they are much better if very thin and fluid; and as the part to which the *epithem* is immediately applied is not what it is always intended to act upon, but ſomething lying deep within, the *epithems* intended for this purpoſe ſhould conſiſt of the moſt penetrating ingredients; for which reaſon aſtringents and inſpiſſating remedies can be of no uſe in this form, ſince they cannot be abſorbed ſo deep, and indeed prevent their own ingreſs by bracing up the mouths of the pores. Hot wine alone is ſometimes uſed as an *epithem*; and frequently ſuch medicines as are not to be ſafely taken inwardly, ſuch as highly rectified ſpirits, preparations of lead, henbane, mandrake, and other poiſonous plants, and the like. But we are carefully to remember in regard to theſe, that the pores are capable of abſorbing them, and ought therefore to know the effect they are capable of producing when thus abſorbed in the body. As to the vehicles of liquid *epithems*, they are various, ſuch as linen or woollen cloths, ſilk, ſtupes, toaſted bread, crumb of untoaſted bread: the dry *epithems* or bags, and ſometimes the hot liquor, is tied up in a bladder, and that only applied to the part. When a great quantity of the liquor is to be uſed, flannel ſtupes do beſt; but when the heat is to be long retained, and only the finer particles of the liquor admitted, then the bladder preſerves and retains beyond all other means.

Epithems are in ſome caſes to be applied hot, and in others cold; when the intention is powerfully to reſolve, penetrate, and attract, then thoſe of the hot kind are greatly to be preferred; but heat is injurious to parts conſtricted by intenſe cold; and thoſe that are cold, or at leaſt tepid, are to be uſed. Spirituous and volatile liquors are alſo eaſily diſſipated by heat, and all ſuch ought therefore to be applied either cold, or barely tepid.

The dry *epithems* are medicated powders, uſually ſewed up in a cloth, and applied to different parts of the body; for this purpoſe the powders muſt be coarſe, ſince otherwiſe their particles would fall through the cloth; and ſometimes the liquid *epithems* are added to the dry, to reduce the whole to a conſiſtence, ſuch as may be ſpread upon cloth.

The ancients uſed chaff of wood to mix with their powders in the *epithems* of the coarſer kind, and cotton in thoſe which were finer. Among the dry *epithems* is alſo to be accounted the uſe of a bag of hot ſand: this is of ſingular ſervice where heat is to be retained a long time; and ſometimes the liquid *epithems* are added to this, its heat being of power to throw them much farther in than they otherwiſe would reach. The bags in which any of theſe dry *epithems* are put, muſt not be filled hard, but only the matter muſt be lightly put in, that that they may remain pliant and ſpungy. Some make the bags for dry *epithems* of ſilk, and ſome of woollen cloth; but linen, which has been much worn, is greatly preferable on all occaſions. The figure of the bag is to be accommodated to the part it is to be applied to, and the intention it is to anſwer. For the head, it is commonly made in the form of a hood; for the forehead, ſquare; for the heart, pyramidal; for the ſtomach, in form of a ſhield; for the liver, in form of a creſcent; and for the ſpleen, in ſhape of an ox's tongue. When the bags are ſmall, it is ſufficient to ſew up the end when the matter is put in; but when they are large, they muſt be ſewed acroſs in ſeveral places in the manner of quilting, to keep the matter equally diſtributed. When they are thus prepared, they are to be applied either alone, being firſt warmed, or moiſtened with any proper liquor. Pigeons applied to the feet are alſo a ſort of *epithem*.

EPITHEM, *volatile*, *epithema volatile*, a form of medicine preſcribed in the late London Pharmacopœia, and ordered to be made of equal weights of common turpentine and ſpirit of ſal armoniac. The turpentine is to be kept continually ſtirring in a mortar, and the ſpirit gradually dropt in till the whole is reduced to a white maſs.

The ſpirit of ſal armoniac uſed in this mixture muſt not be that made in the common way, with the addition of quick-lime, but with the alkali ſalt. Pemberton's Lond. Diſp. p. 377.

EPITHESIS, in *Surgery*, a word uſed by ſome writers to expreſs the reducing or rectification of crooked limbs, by means of proper inſtruments.

EPITHET, Επιθετον, a noun adjective, expreſſing ſome quality of a ſubſtantive to which it is joined.

The word is formed of επι, *upon*, and θεσις, *poſitio*, *putting*. As a fruitful vine, a ſtately pile, an echoing vault, &c.

Epithets are of great uſe and conveniency among poets and orators, who ſupply in *epithets* what they want in other requiſites. Card. Perron even blames Homer on the head of *epithets*, obſerving, that he frequently hooks in *epithets* without any ſenſe or ſignificancy at all, to help out his meaſures; and that he equips every hero with an *epithet*, not according to the exigence of the caſe, but the meaſure of the verſe.

EPITHET, is alſo uſed for a ſurname, or a perſon's ſecond appellation.

Epithets were anciently beſtowed very frankly, either on account of excellencies or defects of the body or mind; kings themſelves were not exempted from them. Hence thoſe *epithets* ſo frequent in hiſtory, as Edward Long-ſhanks, Richard Cœur de Leon, Edmund Iron-ſide, Richard Crook-back, John Lack-land, &c.

Nor have the French uſed their kings any better; witneſs their Charles the Simple, Louis the Lazy, *faineant* (Ludovicus *nihil faciens*) Pepin the Short, Louis the Stammerer, *le begue*.

EPITHRICADIA, in *Antiquity*, a feſtival in honour of Apollo.

EPITHYME. See DODDER, and EPITHEOS.

EPITOME, an *abridgment*, or a reduction of the principal matters of a larger book into a little compaſs. See ABRIDGMENT.

The word is Greek, επιτομη, formed of επιτεμνειν, *reſecare*, *to retrench*, *abridge*, or *cut off*.

The *Epitome* of Baronius's Annals is done by De Sponde (Spondanus). Bernier has given an *Epitome* of the philoſophy of Gaſſendus.

It is a popular objection againſt the *epitomizing* of authors, that it frequently occaſions the loſs of the originals. Thus the loſs of the hiſtorian Trogus Pompeius is attributed to his epitomizer Juſtin, and the loſs of a great part of Livy to Luc. Florus.

EPITRITES, from επι and τριτος, *third*, in *Proſody*, a foot conſiſting of four ſyllables, three long, and one ſhort.

Grammarians reckon four ſpecies of *epitrites*; the firſt, conſiſting of an iambus and ſpondee, as sălūtāntēs; the ſecond, of a trochee and ſpondee, as cōncĭtātĭ; the third, of a ſpondee and an iambus, as cōmmūnĭcāns; and the fourth, of a ſpondee and trochee, as īncāntārĕ.

EPITRITES, among the Greek *Muſicians*, denoted a ratio, called alſo the *ſeſquitertial ratio*, the ſame with that of 3 to 4. See FOURTH.

EPITROCHASMUS, in *Rhetoric*, a figure wherein we ſlightly paſs over ſeveral things of great moment, by only mentioning them in general. Such is the ſaying of Cæſar, *Veni*, *vidi*, *vici*.

EPITROPE, in *Rhetoric*. See CONCESSION.

EPITROPUS, a kind of judge, or rather an arbitrator, which the Greek Chriſtians under the dominion of the Turks elect in the ſeveral cities, to terminate the differences that ariſe among them, and avoid carrying them before the Turkiſh magiſtrates. See ARBITRATOR.

There are ſeveral *epitropi* in each city: M. Spon, in his Travels, obſerves, that at Athens there are eight taken out of the ſeveral pariſhes, and called *vecchiardi*, i. e. old men. But Athens is not the only place where there are *epitropi*; they are in all the iſlands of the Archipelago.

Some Latin authors of the ſixth century call *epitropi* thoſe who more anciently were called *villici*, and ſince *vidames*.

In times ſtill earlier, the Greeks uſed the term επιτροπος, in the ſame ſenſe as the Latins did *procurator*, viz. for a commiſſioner or intendant.

Thus the commiſſioners of proviſions in the Perſian army are called by Herodotus and Xenophon *epitropi*. In the New Teſtament, επιτροπος, denotes the ſteward of a houſhold, rendered in the vulgate *procurator*.

EPIZEUXIS, in *Rhetoric*, a figure where the ſame word is repeated in the ſame ſenſe, without any others intervening, and ſuited to expreſs anger, ſurprize, ſorrow, and ſeveral other paſſions: thus *age*, *age*; *adeſte*, *adeſte*; and that of Virgil, *nunc*, *nunc inſurgite remis*, are inſtances of it. See Matthew xxiii. 37.

EPLOYE', in *Heraldry*. An eagle *eployé* is what in Engliſh we more uſually call an *eagle diſplayed*, or *a ſpread eagle*. See DISPLAYED.

EPNEUMATOSIS, from πνευμαοω, *I breathe*, in *Medicine*, the ſame with EXPIRATION.

EPOBOLIA, in *Antiquity*, a fine laid upon thoſe that could not prove the indictment they had brought againſt their adverſaries.

It was ſo called, becauſe they were obliged to pay the ſixth part of the value of the thing they contended for, viz. an obolus out of every drachm. Some of theſe ſums were depoſited in all law-ſuits, a very few excepted, before the trial could proceed. Potter, Archæol. Græc. lib. i. cap. 21. tom. i. p. 117.

EPOCHA, in *Chronology*, a term or fixed point of time, whence the ſucceeding years are numbered or accounted.

The

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The word is ἐποχὴ, q. d. *inhibitio, repreſſio*, formed of ἐπέχειν, *to ſuſtain, ſtop*, becauſe the *epocha* defines or limits a certain ſpace of time.

Different *epochas* obtain in different nations; and no wonder; for there being no aſtronomical conſideration to render one preferable to another, their conſtitution is purely arbitrary. That principally regarded among Chriſtians, is, the *epocha* of the *Nativity* or incarnation of Jeſus Chriſt; that of the Mahometans, the *Hegira*; that of the Jews, &c, the *Creation of the World*; that of the ancient Greeks, the *Olympiads*; that of the Romans, the *Building of the City*; that of the ancient Perſians and Aſſyrians, the *Epocha* of Nabonaſſar, &c.

The doctrine and uſe of *epochas* is of very great extent in chronology.

To reduce the years of one *epocha* to thoſe of another, i. e. to find what year of one correſponds to a given year of another; a period of years has been invented, which, commencing before all the known *epochas*, is, as it were, a common receptacle of them all, called the *Julian period*. To this period all the *epochas* are reduced, i. e. the year of this period whereon each *epocha* commences is determined. All that remains, therefore, is, to add the given year of one *epocha* to the year of the period correſponding with its riſe; and from the ſame to ſubtract the year of the ſame period correſponding to the other *epocha*; the remainder is the year of that other *epocha*.

EPOCHA *of Chriſt*, or *of our Lord*, is the *vulgar epocha* throughout Europe, commencing from the ſuppoſed time of our Saviour's nativity, December 25, or rather according to the uſual account, from his circumciſion, that is, from the firſt of January.

Now, the year of the Julian period wherein Chriſt was born and circumciſed, is uſually computed to be the 4713th; conſequently, the firſt year of the æra of Chriſt correſponds to the year 4714 of the Julian period.

Hence, 1. If to any given year of Chriſt you add 4713, the ſum will be the year of the Julian period correſponding thereto. E. gr. If to the year 1779 be added 4713, the ſum 6492 is that year of the Julian period.

2. On the contrary, ſubtracting 4713 from any given year of the Julian period, the remainder is the current year of Chriſt. E. gr. From the year of the Julian period 6492 ſubtracting 4713, the remainder is the year of Chriſt 1779.

In effect, the *epocha* of our Lord ſerves not only for the computation of the years elapſed ſince the *epocha* commenced, but even of thoſe before it.

Now, to find the year of the Julian period correſponding to a given year before Chriſt, ſubtract the given year from 4713, the remainder is the correſpondent year required. Thus, e. gr. the year before Chriſt 752 is the year 3961 of the Julian period. On the contrary, ſubtracting the year of the Julian period from 4713, the remainder is the year before Chriſt.

The author of the vulgar *epocha*, or way of computing from Chriſt, is an abbot of Rome, one Dionyſius Exiguus, by nation a Scythian, who flouriſhed under Juſtinian about the year 507, or, according to others, 527, though this Dionyſius borrowed the hint from Panodorus, an Egyptian monk. Till his time, the generality of Chriſtians computed their years either from the building of Rome, or according to the order of the emperors and conſuls, and other ways in uſe with the people among whom they lived.

This diverſity occaſioning a great diſtraction between the churches of the Eaſt and Weſt; Dionyſius, to compoſe the ſame, firſt propoſed a new form of the year, with a new general æra, which in a few years time was generally admitted.

Dionyſius began his account from the conception or incarnation, by us popularly called *Lady-day*, or the *Annunciation*; which method obtained in the dominions of Great Britain till the year 1752, before which time the Dionyſian and Engliſh *epocha* was the ſame; but in that year the Gregorian calendar having been admitted by act of parliament, they now reckon from the firſt of January, as they do in the other countries of Europe, except in the court of Rome, where the *epocha* of the incarnation ſtill obtains for the date of their bulls.

It muſt be added, that this *epocha* of Dionyſius is charged with a miſtake: the common opinion is, that it places our Saviour's nativity a year too late; or, that he was born the winter preceding the time preſcribed by Dionyſius for his conception.

But the truth is, the fault lies on Beda, who miſinterpreted Dionyſius, and whoſe interpretation we follow, as has been ſhewn by Petavius from Dionyſius's own epiſtles; for Dionyſius began his cycle from the year 4712, but his *epocha* from the year 4713, wherein the vulgar æra ſuppoſes Chriſt to have been incarnate.

The year, therefore, which, according to the vulgar *epocha*, is the firſt year of Chriſt, according to Dionyſius's æra, is the ſecond; ſo that the year which we call 1779, ſhould, in juſtice, be 1780, though ſome chronologers, inſtead of one year, will have the error two.

Others ſuppoſe that the Dionyſian æra is four years too late; which ſuppoſition is confirmed by conſidering that our Saviour was born before the death of Herod; and according to the teſtimony of Joſephus, lib. xvii. cap. 18. there was an eclipſe of the moon in the time of Herod's laſt illneſs; which eclipſe appears to have happened in the year of the Julian period 4710, March 13, at Jeruſalem. Now, as our Saviour muſt have been born ſome months before Herod's death, ſince in the interval he was carried into Egypt, the lateſt time in which we can fix the true æra of his birth is about the end of the 4709th year of the Julian period. Ferg. Aſtr. p. 269.

To this vulgar æra, as a ſure fixed point, chronologers have been accuſtomed to reduce all the other *epochas*, though there is not one of them but what is controverted; ſo much uncertainty there is in the doctrine of time. We ſhall exhibit them as reduced to the Julian period.

EPOCHA *of the creation, orbis conditi*, according to the computation of the Jews, called alſo the Jewiſh *epocha*, is the year of the Julian period 953, anſwering to the year before Chriſt 3761, and commencing on the ſeventh day of October. Hence, ſubtracting 952 years from any given year of the Julian period, the remainder is the year of the Jewiſh *epocha* correſponding thereto. Thus, e. gr. the year 1779 being the 6492d year of the Julian period, it is the 5540th year of the Jewiſh *epocha*, or ſince the creation of the world.

This *epocha* is ſtill in uſe among the Jews.

The EPOCHA *of the creation*, uſed by the Greek hiſtorians, is the year before the Julian period 787, anſwering to the year before Chriſt 5500.

Hence, to any given year of the Julian period, adding 787, the ſum gives the year of this *epocha*. E. gr. 1779 being the 6492d year of the Julian period, 7279 is that year of this *epocha*, or the year of the world, according to this computation.

The author of this *epocha* is Julius Africanus, who collected it from the hiſtorians: but when it came to be admitted into civil uſe, 8 years were added to it, that ſo every year thereof divided by 15 might exhibit the INDICTION, which the eaſtern emperors uſed in their charters and diplomas.

The *epocha of the creation* uſed by the latter Greeks and Ruſſians is the year 795 before the Julian period, or the year 5508 before Chriſt, commencing from the firſt day of September. Though the Ruſſians having lately admitted the Julian calendar, begin their year from the firſt of January.

Hence, adding 795 to the year of the Julian period, the ſum gives the year of this *epocha*. Thus, e. gr. the Julian period of the year 1779 being 6492, that year of this *epocha*, i. e. the years from the creation on this footing are 7287. Again, from that year 7287 ſubtracting 5508, the remainder is the year of the common æra 1779.

This æra was uſed by the emperors of the Eaſt in their diplomata, &c. and thence alſo called the *civil æra of the Greeks*. In reality, it is the ſame with the *epocha* of the Conſtantinopolitan period; whence ſome call it the *epocha of the period of Conſtantinople*.

The Alexandrian EPOCHA *of the creation* is the year 780, before the Julian period, anſwering to the year before Chriſt 5493, and commencing on the 29th day of Auguſt.

Hence, adding 5493 to the year of Chriſt 1779, the ſum 7272 gives that year of this *epocha*, or years elapſed ſince the creation, according to this computation.

This *epocha* was firſt concerted by Panodorus, a monk of Egypt, to facilitate the computation of Eaſter; whence ſome call it the *Greek eccleſiaſtical epocha*.

The Euſebian EPOCHA *of the creation*, is the year of the Julian period 486, anſwering to the year before Chriſt 4228, and commencing in autumn.

Hence, ſubtracting 486 from the year 6492 of the Julian period, or adding 4228 to the year of Chriſt 1779, the reſult 6006 will be that year of this *epocha*.

This *epocha* is uſed in Euſebius's Chronicon, and the Roman Martyrology.

The EPOCHA *of the creation*, according to Mr. Bedford and Mr. Kennedy, is the year of the Julian period 706, anſwering to the year before Chriſt 4007; but it muſt be allowed, that all the *epochs* of the creation are uncertain. See Strauchius's Brev. Chron. by Sault, p. 152, &c.

EPOCHA *of the Olympiads*, is the year of the Julian period 3938, anſwering to the year 775 before Chriſt, and the year 3232 from the creation, commencing at the full moon next the ſummer ſolſtice, and each Olympiad containing four years.

This *epocha* is very famous in ancient hiſtory; it was uſed

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used principally by the Greeks, and had its origin from the Olymic games, which were celebrated at the beginning of every fifth year.

EPOCHA *of the building of Rome*, or *urbis conditæ*, *U. C.* is the year of the Julian period 3961, according to Varro; or 3962, according to the Fasti Capitolini, answering to the years before Christ 753 or 752, and beginning on the 21st of April. Hence, if the years of this *epocha* be fewer than 754, subtracting them from 754 or 753, you have the year before Christ; and, on the contrary, if they be more than 754, you must subtract 754 to have the year of Christ, and add the year of Christ to 754 to have the year of this *epocha*, or the time since the building of Rome. Thus, e. gr. the year 1779, according to Varro, is the year of Rome 2533.

EPOCHA *of Nabonassar*, is the year of the Julian period 3967, answering to the year before Christ 746, commencing on the 26th day of February.

This æra takes its denomination from its institutor Nabonassar king of Babylon, and is that used by Ptolemy in his Astronomical Observations, by Censorinus, and others.

EPOCHA, *Diocletian*, or EPOCHA *of martyrs*, is the year of the Julian period 4997, answering to the year of Christ 284, called the *æra of martyrs*, from the great number of Christians who suffered martyrdom under the reign of that emperor.

The Abyssinians, among whom it is still used in all ecclesiastical computations, call it the *year of grace*; though they do not reckon their years in a continued series from this *epocha*. But when the Dionysian period of 534 years is expired, they begin their computation afresh from 1, 2, &c.

EPOCHA *of the hegira*, or *Mahometan* EPOCHA, is the year of the Julian period 5335, answering to the year of Christ 622. It commences on the 16th of July, the day of Mahomet's flight from Mecca to Medina.

This *epocha* is used by the Turks and Arabs, and even all who profess the Mahometan faith. It was first introduced by Omar, the third emperor of the Turks. The astronomers Alfraganus, Albategnius, Alphonsus, and Ulugh Beigh, refer Mahomet's flight to the 15th of July; but all the people who use the *epocha* agree to fix it on the 16th. See HEGIRA.

EPOCHA *of the Seleucidæ*, which is used by the Macedonians, is the year of the Julian period 4402, answering to the year before Christ 311. See SELUCIDÆ.

EPOCHA, *Persian*, or *Yezdegerdic*, is the year of the Julian period 5344, answering to the year of Christ 631, and commencing on the 16th of June.

This *epocha* is taken from the death of Yezdegerdis, the last king of Persia, slain in battle by the Saracens.

EPOCHA, *Gelalæan*, called also *Royal Epocha*, and *Epocha of the Sultans*, began in the year of the Julian period 5792, on the 14th day of March, at the time of the equinox, and was established for the convenience of finding the vernal equinox, at which time the Persians celebrated their great feast, called *Neurur*.

EPOCHA, *Julian*, or EPOCHA *of Julian years*, is the year of the Julian period 4667, answering to the year before Christ 46.

This *epocha* had its origin from the year of the reformation of the calendar under Julius Cæsar, called the *year of confusion*.

EPOCHA, *Gregorian*. See GREGORIAN.

EPOCHA, *Spanish*, is the year of the Julian period 4676, answering to the year before Christ 37. See ÆRA.

EPOCHA, *Actiac*, or *Actian*, is the year of the Julian period 4684, answering to the year before Christ 29, commencing on the 29th day of August.

Other memorable *epochas* are that of the Deluge, in the year of the creation 1656; that of the birth of Abraham, in 2008 or 2002; the Israelites exodus, or departure out of Egypt, in 2516 or 2511; the building of the temple of Jerusalem, in 2995; and the destruction of the same in the year of Christ 70; the taking of Constantinople by the Turks, in 1453, &c. See *Sacred* CHRONOLOGY.

A TABLE of the most remarkable *Epochas* or *Æras*, and *Events*.

N. B. The years before Christ are those before the reputed year of his birth, and not reckoned back from the first year of his age, as is generally done in such tables.

	Julian Period	Year of the World.	Years before Christ.
The creation of the world	706	0	4007
The deluge, or Noah's flood	2362	1656	2351
Assyrian monarchy, founded by Nimrod	2537	1831	2176
The birth of Abraham	2714	2008	1999
The destruction of Sodom and Gommorah	2816	2110	1897
Kingdom of Athens founded by Cecrops	3157	2451	1556
Moses receives the Ten Commandments	3222	2516	1491
The entrance of the Israelites into Canaan	3262	2556	1451
The destruction of Troy	3529	2823	1184
The beginning of king David's reign	3650	2944	1063
Solomon's temple founded	3701	2995	1012
The Argonautic expedition	3776	3070	937
Lycurgus formed his excellent laws	3829	3103	884
Arbaces, the first king of the Medes	3838	3132	875
Mandaucus, the second	3865	3159	848
Sosarmus, the third	3915	3209	798
The beginning of the Greek Olympiads	3938	3232	775
Artica, the fourth king of the Medes	3945	3239	768
The Catonian *epocha* of the building of Rome	3961	3255	752
The æra of Nabonassar	3967	3261	746
The destruction of Samaria by Salmaneser	3992	3286	721
The first eclipse of the moon on record	3993	3287	720
Cardicea, the fifth king of the Medes	3996	3290	717
Phraortes, the sixth	4058	3352	655
Cyaxares, the seventh	4080	3374	633
The first Babylonish captivity, by Nebuchadnezzar	4107	3401	606
The long war ended between the Medes and Lydians	4111	3405	602
The second Babylonish captivity, and birth of Cyrus	4114	3408	599
The destruction of Solomon's temple	4125	3419	588
Nebuchadnezzar struck with madness	4144	3438	569
Daniel's vision of the four monarchies	4158	3452	555
Cyrus begins to reign in Babylon	4177	3471	536
Establishment of Roman consuls	4206	3500	507
The battle of Marathon	4223	3517	490
Artaxerxes Longimanus [Ahasuerus] begins to reign	4249	3543	464
The beginning of Daniel's seventy weeks of years	4256	3550	457
The beginning of the Peloponnesian war	4282	3576	431
Beginning of Daniel's weeks, according to Scaliger	4292	3586	421
Alexander's victory at Arbela	4383	3677	330
His death	4390	3684	323
The captivity of 100,000 Jews by Ptolemy	4393	3687	320
The Colossus of Rhodes thrown down by an earthquake	4491	3875	222
Antiochus defeated by Ptolemy Philopater	4496	3790	217
Archimedes murdered at Syracuse	4506	3800	207
Jason butchers the inhabitants of Jerusalem	4543	3837	170
Corinth plundered and burnt by consul Mummius	4567	3861	146
Julius Cæsar invaded Britain	4659	3953	54
He corrected the calendar	4667	3961	46
Was killed in the senate-house	4671	3965	42
Herod made king of Judea	4673	3967	40
Agrippa builds the Pantheon at Rome	4688	3982	25
The true year of Christ's birth	4709	4003	4
The death of Herod	4710	4004	3
The Christian Æra begins here.			Years since Christ.
Dionysian, or vulgar æra of Christ's birth	4713	4007	0
The true year of his crucifixion [Friday April 3d]	4746	4040	33
The destruction of Jerusalem	4783	4077	70
The long wall in Britain, built by Adrian	4833	4127	120
Epocha Diocletian, or of Martyrs	4997	4291	284
The Picts defeated in Britain by Constantius	5019	4313	306
The council of Nice	5038	4332	325
The death of Constantine the Great	5050	4344	337
The Saxons invited into Britain	5158	4452	445
Papal Hierarchy, commenced by Boniface III. who assumed the title of Oecumenical Bishop	5319	4613	606
Arabian Hegira, or flight of Mohammed	5335	4629	622
The death of the false prophet Mohammed	5343	4637	630
The Persian Yesdegerd	5344	4638	631
The art of printing discovered	5153	4447	1440
The Reformation begun by Martin Luther	5230	5524	1517
Reformation of the calendar by Gregory	5295	5589	1582
Oliver Cromwell died	5371	5665	1658
Sir Isaac Newton born, December 25th	6355	5649	1642
Elected fellow of Trinity Coll. Cambr.	6380	5674	1667
Invented the fluxions	6382	5676	1669
Made president of the Royal Society	6416	5710	1703
Knighted by queen Anne	6418	5712	1705
Died March 20th	6440	5734	1727

See Ferguson's Ast. p. 273.

EPOCHETEUSIS, from εποχετευω, *I draw through a canal*, of οχετος, *canal*, a word used by Hippocrates, and others of the old writers in *Medicine*, to express the derivation of the blood, or juices, from one part to another.

EPODE, Επωδη, in *Lyric Poetry*, the third or last part of the ode; the ancient ode, or song, being divided into strophe, antistrophe, and *epode*.

The *epode* was sung by the priests, standing still before the altar,

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altar, after all the turns and returns of the ſtrophe and antiſtrophe.

The *epode* was not confined to any preciſe number, or kind of verſes; as the ſtrophe and antiſtrophe were. But when the ode contained ſeveral *epodes*, ſtrophes, &c. they were all alike.

As the word *epode*, then, properly ſignifies the end of the ſong; and as in odes, what they called the *epode*, finiſhed the ſinging, it became cuſtomary, as M. Dacier ſhews, for any little verſe, which, being put after another, cloſed the period, and finiſhed the ſenſe which had been ſuſpended in the firſt verſe, to be called *epode*, επωδος.

And hence it is, that the ſixth book of Horace's Odes is entitled *Liber Epodωn*, *Book of Epodes*, becauſe the verſes thereof are all alternately long and ſhort; and the ſhort one, generally, though not always, cloſes the ſenſe of the long one. But the ſignification of the word is extended ſtill farther; *epode* being become a general name for all kinds of ſhort verſes, that follow one or more long ones; and in this ſenſe, a pentameter is an *epode*, after an hexameter, which in reſpect thereof is a prode.

EPODOS, from επι and ωδη, *ſong*, in *Medicine*, a word uſed to expreſs the curing of diſeaſes by incantation.

EPOICODOMESIS, from επoικoδομεω, *I build upon*, in *Rhetoric*, is ſometimes uſed for what is otherwiſe called CLIMAX.

EPOMIS, Επωμις, in *Anatomy*, the upper part of the ſhoulder, reaching up to the neck.

The word is Greek, επωμις, which primarily ſignifies a ſhort cloak or mantle made to cover the ſhoulders.

Some authors apply the word *epomis* to the upper part of the os humeri; but the ancient Greek phyſicians only uſe it for the muſcular, or fleſhy part, placed as above mentioned. See DELTOIDES.

EPOMPHALION, from επι, *upon*, and ομφαλος, *navel*, any medicine which purges, on being applied to the navel.

EPOPOEIA, Επoποιια, in *Poetry*, the hiſtory, action, or fable, that makes the ſubject of an epic poem.

The word is derived from the Greek επος, *carmen*, *verſe*; and ποιεω, *facio*, *I make*.

In the common uſe of the word, however, *epopoeia* is the ſame with *epos*, or *epic* poem itſelf: in which ſenſe it is defined a diſcourſe invented with art, or a fable agreeably imitated from ſome important action, and related in verſe, in a probable and ſurpriſing manner; with a view to form the manners, &c. See EPIC *Poem*.

EPOPS, in *Zoology*, a name by which ſome of the ancient writers have called the bird we call the *upupa*, or HOOPOE.

EPOSILINGA, a word uſed, by ſome chemical writers, to expreſs the ſcales which fly off from iron, when hammered at the ſmith's forge.

EPOTIDES, in the *Ancient Ship-Building*, two large thick pieces of wood on each ſide of the prow of a galley, which reſembled two ears, whence they had their name.

The *epotides* were chiefly deſigned to ward off the blows of the roſtra of the enemies veſſels.

EPSOM *ſalt*. What we now meet with, in the ſhops of chemiſts, under this name, is no other than a ſalt made from the bittern, or remaining brine, after the making of common ſalt; but when the world was firſt made acquainted with a purging ſalt, under this name, it was truly what its name expreſſed, being really made from the purging waters of that place. This ſalt is bitter, and of a ſtrongly purging quality, and, when ſuffered to ſhoot freely, and its cryſtals at a due diſtance, it always formed them into rectangular priſms, with four parallelogramic planes; by this, and by divers other properties, it appeared evidently different from all other ſalts known at that time. It was ſuppoſed to partake of the nature of alum, and the waters of the place were called aluminous waters; but Dr. Grew has evidently proved the error of that opinion; others ſuppoſed this ſalt the ſame thing with the ſalt of lime, or the nitre of old walls, but this was equally erroneous. The beſt method of taking it was found to be diſſolving it in a proper quantity of its own water; by this means the water was made to work both more quickly and more effectually; and it proved of great ſervice in diſorders of the ſtomach, as want of appetite, and the like; and in colics, diabetes, the ſcurvy, and rheumatiſm, and many other chronic diſeaſes. Phil. Tranſ. N° 216. p. 76.

Mr. Boulduc has given much the ſame deſcription of the manner of making *Epſom ſalt*, as Mr. Brown had done in Phil. Tranſ. N° 337. § 10. and N° 378. § 11. that it is the ſalt which cryſtalizes, after boiling to a due conſiſtence the bittern, which is the liquor remaining in the ſalt-pans, after the ſea-ſalt is ſeparated. See Mem. Acad. Scienc. 1731.

EPSOM *water*. This is a water eaſily imitated by art; i. e. by only diſſolving half an ounce of *Epſom ſalt* in a quart of pure water, made ſomewhat briſk or quick by a few drops of ſpirit of vitriol and oil of tartar, ſo as to let the alkali prevail. Shaw's Lectures, p. 90.

EPTACTIS, in *Natural Hiſtory*, a name given by Linkius, and ſome other authors, to a ſpecies of ſtar-fiſh, of the *aſtrophyte* kind, whoſe rays, or branches, at their firſt going out from the body, are only ſeven in number; but which very ſoon ſpread into more. See STAR-*fiſh*.

EPULÆ. See ENTERTAINMENTS.

EPULARES, in *Antiquity*, an epithet given to thoſe who were admitted to the ſacred *epulæ* or entertainments, it being unlawful for any to be preſent at them who were not pure and chaſte.

EPULETIC *medicines*, the ſame with *cicatrizantia*. See CICATRISIVE.

EPULIDES, from επι, *upon*, and ουλα, *the gums*, in *Surgery*, certain fleſhy tubercles, or excreſcences of the gums: theſe are of two kinds, ſome being of a mild nature, others painful, malignant, and inclining to be cancerous. Surgeons diſtinguiſh them alſo into the larger and the ſmaller, and the harder and ſofter; they are ſometimes ſupported by a broad, ſometimes by a narrow root. Theſe excreſcences not only deform the mouth, but hurt the ſpeech and maſtication, and are always beſt ſpeedily extirpated.

When they grow to a ſmall root, they are beſt extirpated by ligature, or tying a thread firmly about the root; but when the root is broad, they are beſt eaten off by cauſtics, as the oil of tartar, ſpirit of ſal armoniac, and the like; and when theſe mild ones prove ineffectual, it is beſt not to have recourſe to ſtronger, but to raiſe the tubercle with the hook or pliers, and carefully extirpate it with the knife, not cutting off the gums, ſo as to uncover the roots of the teeth, which would be probably attended with a caries of the bone. The blood ſhould be permitted to flow from theſe for ſome time; but if the hæmorrhage continues too long, the patient muſt waſh his mouth with hot red wine, with alum diſſolved in it, repeating it till it ceaſes; and afterwards tincture of myrrh, and honey of roſes, ſhould be uſed, till the parts are perfectly well; and if the tubercles ſhould ſprout up again, they ſhould be taken down in time by the ſame methods. Heiſter's Surgery, p. 462. See alſo Schelhammer, De Epulide. See GUM-*boils*.

EPULIS, *gums*, in *Anatomy*. See GINGIVA and MOUTH.

EPULO, in *Antiquity*, the name of a miniſter of ſacrifice among the Romans.

The pontifices, not being able to attend all the ſacrifices, performed at Rome, to ſo many gods, as were adored by that people, appointed three miniſters, whom they called *epulones*, becauſe they conferred on them the care and management of the *epula*, feaſts in the ſolemn games and feſtivals.

To them belonged the ordering and ſerving the ſacred banquet, offered on ſuch occaſions to Jupiter, &c. They wore a gown bordered with purple, like the pontifices. Their number was at length augmented from three to ſeven, and afterwards by Cæſar to ten.

Their firſt eſtabliſhment was in the year of Rome 558, under the conſulate of L. Furius Purpureo, and M. Claudius Marcellus.

EPULONES. See EPULO.

EPULOTICS, Επουλωτικα, in *Medicine*, drying, aſtringent remedies, proper to harden, cicatrize, and incarnate wounds, and ulcers.

The word is formed of the Greek επι, *ſuper*; and ουλη, *cicatrix*, *eſchar*; whence the verb επουλω, *cicatricem infero*, *I cicatrize*.

Such are emplaſters of ceruſs, and diapalma; the unguent of pompholyx, &c.

EPULUM, in *Antiquity*, *banquet*; a holy feaſt prepared for the gods.

The ſtatues of the gods were commonly laid upon a bed, and ſerved in the *epula* as if they had been very hungry; to perform which, was the function of the miniſters of ſacrifice, hence called *epulones*.

EQUABLE *motion*, is that whereby the moveable body proceeds with the ſame continued velocity; neither accelerated nor retarded.

EQUABLE *pulſe*. See PULSE.

EQUABLE *ſtyle*. See STYLE.

EQUAL, a term of relation between two or more things of the ſame magnitude, quantity, or quality.

Wolfius defines *equals* to be thoſe things which may be ſubſtituted for each other, without any alteration of their quantity. It is an axiom in geometry, that two things which are *equal* to the ſame third, are alſo *equal* to each other. And again, if, to or from *equals*, you add or ſubtract *equals*, the ſum or remainder will be *equal*.

EQUAL *circles*, in *Geometry*, are thoſe whoſe diameters are *equal*. See CIRCLE.

EQUAL *angles*, are thoſe whoſe containing lines are inclined

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alike to each other; or which are measured by similar arches of their circles.

EQUAL *arches*. See ARCH.

EQUAL *figures*, are those whose areas are equal; whether the figures be similar, or not.

The segments of a sphere, or circle, are of an *equal* concavity, or convexity, when they have the same ratio, or proportion to the diameters of the spheres, or circles, whereof they are parts.

EQUAL *solids*, are those which comprehend, or contain, each as much as the other; or whose solidities, or capacities, are *equal*. See SOLID.

EQUAL *hyperbolas*, are those, all whose ordinates to their indeterminate axes, are *equal* to each other; taken at *equal* distances from their vertices.

EQUAL *hours*. See HOUR.

EQUAL *geometrical ratios*, are those whose least terms are similar, aliquot, or aliquant parts of the greater.

EQUAL *arithmetical ratios*, are those wherein the difference of the two less terms is equal to the difference of the two greater. See RATIO.

EQUAL, in *Optics*. We say, that things seen under *equal* angles, are *equal*. *Equal* parts of the same interval, or magnitude, if unequally distant from the eye, appear unequal. *Equal* objects, and at *equal* distances, only the one placed directly, and the other obliquely, seem unequal; and that placed directly, the bigger.

Masonry by EQUAL *courses*. See MASONRY.

EQUALITY, in *Astronomy*. *Circle of* EQUALITY, or the *equant*. See CIRCLE, and EQUANT.

EQUALITY, *ratio*, or *proportion of*, in *Geometry*, is that between two equal numbers, or quantities.

Proportion of EQUALITY *evenly ranged*, or *ex æquo ordinata*, is that wherein two terms in a rank, or series, are proportional to as many terms in another series, compared to each other in the same order, i. e. the first of one rank to the first of another; the second to the second, &c.

Proportion of EQUALITY *evenly disturbed*, called also *ex æquo perturbata*, is that wherein more than two terms of a rank, are proportional to as many terms of another compared to each other, in a different and interrupted order; viz. the first of one rank to the second of another; the second to the third, &c.

EQUALITY, in *Algebra*, is a comparison of two quantities, that are equal both really, and representatively, i. e. which are so both in effect and letters.

A comparison of two quantities, equal in effect, but unequal in letters, to render them equal, is called an *equation*.

Equality, in *Algebra*, is usually denoted by two parallel lines, as =: thus, $2+2=4$, i. e. 2 plus 2, are equal to 4.

This character was first introduced by Harriot. Des Cartes, and some after him, in lieu thereof, use ∝: thus, $2+2 \propto 4$; so $z-y \propto b+c$, signifies that z minus y, is equal to b plus c.

From an equation we arrive at an *equality*, by changing an unknown letter into another, whereby the two members of the equation, i. e. the two quantities compared together, and connected by the sign of *equality*, are rendered equal.

Thus, in the equation $a\,a\,x=b\,c\,d$; supposing $x=\frac{b\,c\,d}{a\,a}$, we change x into $\frac{b\,c\,d}{a\,a}$, and by this substitution arrive at the *equality* $b\,c\,d=b\,c\,d$.

In the solution of a numerical problem, which is to be rendered rational, if there be only one power to be equalled to a square, or other higher power, it is called *simple equality*.

When there are two powers to be equalled, each to a square, it is called *double equality*, &c.

Diophantus hath given us a method for *double equalities*, and F. de Billy, another for *triple equalities*, in his Diophantus Redivivus.

EQUALITY, *union of*. See UNION.

EQUALITY, in *Law*. The law delights in *equality*; so that when a charge is laid upon one, and divers ought to bear it, he shall have relief against the rest. 2 Rep. 25.

EQUANIMITY, in *Ethics*, denotes an even, uniform temper of mind, amidst all the varieties and revolutions of time and chance. This virtue, together with prudence, forms the character which Horace gives of Aristippus:

Omnis Aristippum decuit color & status & res.

EQUANT, or ÆQUANT, in *Astronomy*, a circle, formerly imagined by astronomers, in the plane of the deferent, or eccentric; for regulating and adjusting certain motions of the planets, and reducing them more easily to a calculus. See APOGEE, CIRCLE, DEFERENT, and EXCENTRIC.

EQUATED *anomaly*. See ANOMALY.

EQUATED *bodies*. On Gunter's SECTOR there are sometimes placed two lines, answering to one another, and called the *lines of equated bodies*: they lie between the lines of solids and superficies, and are noted with the letters D, I, C, S, O, T, for dodecahedron, icosihedron, cube, sphere, octahedron, and tetrahedron.

The use of these lines are, 1. When the diameter of the sphere is given, to find the sides of the five regular bodies, severally equal to that sphere. 2. From the side of any of the bodies being given, to find the diameter of the sphere, and the sides of the other bodies, which shall be equal severally to the first body given.

If the sphere be first given, take its diameter, and apply it over in the sector in the points S, S: if any of the bodies be first given, apply the side of it over in its proper points; so the parallels taken from between the points of the other bodies, shall be the sides of those bodies, equal severally to the first body given.

EQUATION, or ÆQUATION, in *Algebra*, an expression of the same quantity, in two different, that is, dissimilar, but equal terms or denominations.

As, when we say, $2\times3=4+2$; that is, twice three is equal to four and two.

Stifelius defines *equation* to be the ratio of equality between two quantities differently denominated; as when we say 3 shill. = 36 pence. Or 50 shill. = 2*l.* 10*s.* = 600 pence, = 2400 farth. Or, $b=d+e$. Or, $12=\frac{a+b}{5}$, &c.

Hence, the reduction of two heterogeneous, or dissimilar quantities to the same value, i. e. to an equality, is called the *bringing them to an equation*. See EQUALITY.

The character, or sign of an *equation*, is = or ∝.

The resolving of problems, by means of *equations*, is the business of algebra.

EQUATION, *terms of an*, are the several quantities, or parts, of which an *equation* is composed, connected together by the signs + and −. Thus, in the *equation* $b+c=d$; the terms are b, c, and d. And the tenor or import of the *equation* is, that some quantity, represented by d, is equal to two others represented by b and c.

EQUATION, *root of an*, is the value of the unknown quantity in the *equation*. E. gr. if $a^2+b^2=x^2$, the root will be $\sqrt{a^2+b^2}$. See ROOT *of an equation*.

Equations are divided, with regard to the powers of the unknown quantities, into *simple*, *quadratic*, *cubic*, &c.

EQUATION, *simple*, is that wherein the unknown quantity is only of one dimension, or in the first power. As, $x=a+b$.

EQUATION, *quadratic*, is that wherein the unknown quantity is of two dimensions, or in the second power. As, $x^2=a^2+b^2$.

Quadratic equations are of two kinds; *simple* or *pure*, and *adfected*.

Simple, or *pure quadratics*, are those where the square of the unknown root is equal to the absolute number given: as in $aa=36$; $ee=146$; $yy=133225$.

The resolution of these is easy; it being apparent that nothing more is required than to extract the square root out of the number or known quantity.

Thus the value of a in the first *equation* is equal to 6; in the second $e=12$, and a little more, as being a surd root; and in the third example $y=365$.

Adfected quadratics, are those which between the highest power of the unknown number, and the absolute number given, have some intermediate power of the unknown number: as, $xx+2ax=100$.

All *equations* of this rank are in one or other of the following forms; viz. $xx+ax=R$. $xx-ax=R$. $ax-xx=R$.

There are several methods of extracting the roots of *adfected quadratics*; the most convenient is that of Harriot.

Suppose $x^2+ax=+b^2$; here x being assumed as a part of the root; a, the known quantity of the second term, will be double the other part, and therefore half of a is the other part—The square thereof will be completed, by adding one fourth of aa; which done, the root of the square may be extracted thus:

$$x^2+ax=b^2$$
add. $\frac{1}{4}aa=\frac{1}{4}aa$
$$x^2 . ax . \tfrac{1}{4}a^2=b^2 . \tfrac{1}{4}a^2$$
$$x^2 . \tfrac{1}{2}a=\sqrt{b^2 . \tfrac{1}{4}a^2}$$
$$x=.\tfrac{1}{2}a . \sqrt{b^2 . \tfrac{1}{4}a^2}$$

In lieu of the characters + and −, we here use points, to avoid the necessity of distinguishing several cases.

EQUATION, *cubic*, is that wherein the unknown quantity is of three dimensions: as, $x^3=a^3-b^3$, &c.

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The second terms of a cubic *equation* being taken away, they may be all reduced to this form, $x^3+ax+b=0$. Where

$x=\sqrt[3]{-\frac{1}{2}b+\sqrt{\frac{1}{4}bb+\frac{1}{27}a^3}}+\sqrt[3]{-\frac{1}{2}b-\sqrt{\frac{1}{4}bb+\frac{1}{27}a^3}}$.

This rule is commonly aſcribed to Cardan, and from him has been called *Cardan's rule*; but it is ſaid by ſome, that Tartalea was the inventor, and, by others, Scipio Ferreus, to whom, it is ſaid, Cardan himſelf aſcribes the invention. Lagni, Elem. d'Arithmet. & d'Algebr. p. 479. Wolf. Elem. Matheſ. tom. i. p. 336. edit. 2. and Saunderſon's Algebra, p. 702.

When in a cubic *equation*, $x^3-ax\pm b=0$, a is negative, the expreſſion $\sqrt{\frac{1}{4}bb+\frac{1}{27}a^3}$, will be transformed into $\sqrt{\frac{1}{4}bb-\frac{1}{27}a^3}$, which becomes impoſſible, or imaginary, when $\frac{1}{27}a^3$ is greater than $\frac{1}{4}bb$; for $\sqrt{\frac{1}{4}bb-\frac{1}{27}a^3}$ will then be the ſquare root of a negative quantity, which is impoſſible. And yet, in this caſe, the root x may be a real quantity; but algebraiſts have not yeen able to find a real expreſſion of its value. This caſe is called the *irreducible*, *irreductible*, or impracticable caſe. See IRREDUCIBLE.

The irreducible caſe may be ſolved by the triſection of an arc, for which the reader may conſult Saunderſon's Algebra, p. 713. This method requires a table of ſines; and if ſuch be not at hand, we may have recourſe to Dr. Halley's univerſal method of extracting the roots of *equations*, in the Philoſophical Tranſactions, or in Lowthorp's Abridgment, vol. i. cap. 1. § 20. Vid. infra.

There are ſeveral other methods of extracting the roots of cubic *equations*, extant in books of algebra.

Mr. Cotes obſerves, in his Logometria, p. 29. that the ſolution of all cubic *equations* depends either upon the triſection of a ratio, or of an angle. See this method explained and demonſtrated in Saunderſon's Algebra, p. 718.

EQUATION, *biquadratic*, is that whoſe unknown quantity is of four dimenſions; as $x^4=a^4+b^4$. See BIQUADRATIC.

Des Cartes gave a method of reducing biquadratic *equations* to cubic. This method is explained in moſt treatiſes of algebra, ſince his time; and very clearly by the marquis de l'Hôpital in his Conic Sections, art. 356. See alſo Maclaurin's Algebra, p. 228, ſeq.

Hence a biquadratic *equation* being propoſed, it may be ſolved, by reducing it firſt to a cubic *equation*; and then finding the roots of this new *equation*, by the triſection of an angle, or of a ratio. Theſe roots, ſo found, having a given relation to the roots of the propoſed biquadratic, will alſo be given.

EQUATIONS *of higher degrees*. If the unknown quantity in an *equation* is of five dimenſions, it is called a *ſurſolid*, &c. We have no univerſal rule to expreſs, algebraically, the roots of *equations*, higher than biquadratic; but ſuch *equations* may be ſolved univerſally in numbers, by Dr. Halley's method of approximation.

This method proceeds by aſſuming the root deſired, nearly true to one or two places; which may be done by a geometrical conſtruction, or by a few trials; and then correcting the aſſumption, by comparing the difference between the true root and the aſſumed, by means of a new *equation*, whoſe root is that difference, and which he ſhews how to form from the *equation* propoſed, by ſubſtitution of the value of the root ſought, partly in known, and partly in unknown terms.

Dr. Brook Taylor found that this method was capable of a greater degree of generality, and that it was applicable, not only to *equations* of the common form, that is, to ſuch as conſiſt of terms, wherein the powers of the root are poſitive and integral, without any radical ſign, but alſo to all expreſſions in general, wherein any thing is propoſed as given, which by any known method might be computed; if, *vice verſa*, the root were conſidered as given. Such are all radical expreſſions of binomials, trinomials, or of any other nominal, which may be computed by the root given, at leaſt, by logarithms, whatever be the index of the power of the nominal; as likewiſe expreſſions of logarithms, of arches by the ſines or tangents, of arcs of curves by the abſciſſæ, or any other fluents, or roots of fluxional *equations*. See Phil. Tranſ. N° 352. Jones's Abridg. vol. iv. cap. 1. § 17.

The method of finding the roots of *equations* by approximation, extends to all kinds of *equations*; and though it be not accurately, yet it is practically true; as it gives the value ſought to a very great degree of exactneſs, nay to any aſſignable degree, if any one will take the pains of computation.

The method of Sir Iſaac Newton, and of Mr. Raphſon, is, in effect, the ſame as that mentioned under the head APPROXIMATION. See farther in Newt. Meth. of Flux. and Mr. Colſon's Comment. p. 186. But Dr. Halley's method is more expeditious in practice. See Phil. Tranſ. N° 210. or Lowthorp's Abridg. vol. i. cap. 1. § 20. The principles of theſe methods may alſo be found in Mr. Maclaurin's Algebra, part ii. cap. 9. or in Mr. Simpſon's Algebra, p. 147, ſeq. who gives ſeveral formulæ for approximating to the roots of *equations*. This gentleman has alſo another method for this purpoſe, which we ſhall mention farther on.

Mr. Daniel Bernouilli, in the Acta Petropolitana, tom. iii. p. 92, ſeq. has given a new and ingenious method of approximating to the roots of *equations*, without any previous trials. The method is deduced from the nature of recurring ſeries. The book wherein it is publiſhed being in few people's hands, we ſhall here give a full account of this method.

Let the propoſed *equation* be put into this form:

$$1=ax+bxx+cx^3+ex^4+, \text{ \&c.}$$

Then form a ſeries, beginning with as many arbitrary terms as the *equation* has dimenſions, but with this condition, that if A, B, C, D, E, &c. denote the terms following each other in direct order, then muſt $E=aD+bC+cB+eA+$, &c. and let there be two proximate terms, M and N, in this ſeries ſufficiently continued; then will the antecedent M, divided by the conſequent N, be nearly equal to the required root.

For inſtance, let $1=-2x+5xx-4x^3+x^4$. Form a ſeries, beginning with four arbitrary numbers, 1 . 1 . 1 . 1 (as the propoſed *equation* is of four dimenſions) and let a new term always be formed from the double of the laſt preceding taken negatively, more the quintuple of the penultimate, leſs the quadruple of the antepenultimate, more the penantepenultimate. This ſeries will be 1 . 1 . 1 . 1 . 0 . 2 . −7 . 25 . −93 . 341 . −1254, &c. and the approximated root of the *equation* propoſed will be nearly $=-\frac{341}{1254}$.

Again, let $1=x+2xx+3x^3+4x^4+5x^5$. Form a ſeries, beginning with five arbitrary terms, 1 . 1 . 1 . 1 . 1 . 15 . 29 . 71 . 183 . 477 . 1239 . 3171, &c. Here $\frac{1239}{3171}$, or $\frac{50}{131}$, will be nearly equal to one of the roots of the *equation*.

The root here found is the leaſt of the roots, without attending to the ſigns; that is, the root ſo determined is that which is leaſt diſtant from nothing.

To find the greateſt root of a propoſed *equation*, let it be diſpoſed in the following manner:

$$x^m=ax^{m-1}+bx^{m-2}+cx^{m-3}\ldots\ldots+d.$$

Then form a ſeries, beginning with as many arbitrary terms as there are dimenſions in the *equation*, ſo that if A, B, C, D, E, &c. denote ſo many contiguous terms directly following each other in the ſeries, E muſt be every where $=aD+bC+cB+dA$, &c. Laſtly, let there be two proximate terms, M and N, in this ſeries ſufficiently continued, then will the conſequent term N, divided by the antecedent M, be nearly equal to the required root.

For inſtance, let us take one of the foregoing *equations*, the root of which was found to be $-\frac{341}{1254}$; and let the *equation* be thus diſpoſed:

$$x^4=4x^3-5xx+2x-1.$$

Then form this ſeries,

1 . 1 . 1 . 1 . 0 . −4 . −15 . −41 . −97 . −209.

And $\frac{209}{97}$ will be nearly equal to the greateſt root of the propoſed *equation*.

In the application of the rule for finding the leaſt root, the author obſerves, that ſome difficulties may ariſe in two caſes. Firſt, when the leaſt root of the *equation* may be taken either affirmatively, or negatively. Secondly, when the leaſt root is imaginary, as if the *equation* had theſe roots, $+\sqrt{-4}$, $-\sqrt{-4}$, and 5; of which the laſt is to be conſidered as greateſt, that is, according to his definition, as fartheſt diſtant from nothing.

In the firſt caſe, the alternate terms only are to be conſidered; and if they tend towards a conſtant ratio, while the contiguous terms deviate, it will argue an equality between the affirmative and negative root. And, in this caſe, a term in the ſeries muſt be divided by the alternate term following; and the ſquare root of the quotient will be the root of the *equation*. For inſtance, if we had, $1=-y+4yy+4y^3$; then forming a ſeries according to the firſt rule, we ſhall have 1 . 1 . 0 . 8 . −4 . 36 . −20 . 148 . −84 . 596 . −340 . 2388, &c.

And the tenth term 596, divided by the alternate term following, or the twelfth, 2388, gives $\frac{596}{2388}$, or $\frac{149}{597}$, nearly equal to the ſquare of the required root, which will therefore be, nearly, $\pm\sqrt{\frac{149}{597}}$. This example ſhews that the rule approximates ſufficiently faſt; for the number found $\frac{596}{2388}$ differs from the truth only by $\frac{1}{2388}$, the true root being $\pm\frac{1}{2}$. The inconvenience, here mentioned, might alſo be remedied, by taking $x=y\pm a$; and then finding the root of the transformed *equation* by the firſt rule.

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In the second case, when the least root is imaginary or impossible, it is to be considered whether the root will be affirmative or negative; if the former, put $x=y+a$, if the latter, $x=y-a$. And then the value of y may always be found by the rule; provided that a be assumed greater than x. But though we shall never be disappointed by taking any greater number for a; yet it is to be observed, that the less $a-x$ is, the more easily and quickly will the series tend to the required root. Some circumspection is therefore requisite.

For instance, let $1=\frac{x+xx-x^3}{2}$.

If we form a series without any previous examination, such as $1.1.1.\frac{1}{2}.\frac{1}{4}.-\frac{1}{8}.-\frac{3}{16}.-\frac{9}{32}.-\frac{11}{64}.-\frac{17}{128}$, &c. we shall never find any root, as the terms of the series do not tend to any constant ratio. But supposing $x=y-2$ (for it is visible that the negative root cannot be great) we shall have

$$1=\frac{15y-7yy+y^3}{8}$$

or to avoid fractions, suppose, $y=8z$, that is, $x=8z-2$. Then we have

$$1=15z-56zz+64z^3.$$

From this *equation* the following series arises:

1 . 1 . 1 . 23 . 353 . 4071 . 42769 . 436151 . &c.

Hence $z=\frac{42769}{436151}$; and $x=-\frac{530150}{436151}$.

For a second example, take this *equation*:

$1=\frac{-x-xx+x^3}{2}$; from whence this series arises,

$1.1.1.-\frac{1}{2}.\frac{1}{4}.\frac{5}{8}.\frac{-11}{16}.\frac{5}{32}.\frac{37}{64}.\frac{-91}{128}$, &c.

Which gives no root; but taking $x=y+3$ (as it appears that x must be affirmative) this *equation* will arise, $1=\frac{-20y-8yy-y^3}{13}$, or rather taking $y=13z$, that is, $x=13z+3$, we shall have $1=-20z-104zz-169z^3$.

This last *equation* gives the following series:

0 . 0 . 1 . −20 . 296 . −4009 . 52776 . −688608.

Whence $z=-\frac{52776}{688608}$; and $z=\frac{1379736}{688608}=2{,}0036$ nearly; x being exactly $=2$.

As to the case before mentioned, of the equality of two roots, it is also to be observed, that a like rule may be applied, where more than two roots are equal, providing they be real. But in case some of these equal roots should be impossible, and the rest real; as if $x^4-1=0$, where $x=1$, $x=-1$, $x=\sqrt{1}$, and $x=-\sqrt{-1}$, all which roots, by our author's definition, are to be considered as equal, or equally distant from nothing: we may obviate this inconvenience, by supposing $x=y\pm a$; which is therefore an universal remedy.

This will lead us to a method of extracting the roots of powers. For instance, if we wanted the cube root of 2.

Then $x^3=2$ or $1=\ast\ast-\frac{1}{2}x^3$

The series, formed according to this *equation*,

$1.1.1.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{4}.\frac{1}{4}.\frac{1}{4}.\frac{1}{8}.\frac{1}{8}.\frac{1}{8}$, &c.

only shews, that $x^3=2$. But taking $x=y+1$, the proposed *equation* will be transformed into the following, $1=3y+3yy+y^3$. From whence this series may be derived,

1 . 1 . 1 . 7 . 25 . 97 . 373 . 1435 . 5521 .

Therefore $y=\frac{1435}{5521}$; and $x=\frac{6956}{5521}=1.2597$ nearly.

Again, let it be required to extract the biquadrate root of 20; then $x^4=20$, and supposing $x=y+2$, we shall have $1=8y+6yy+2y^3+\frac{1}{4}y^4$; from whence this series is obtained

0 . 0 . 0 . 1 . 8 . 70 . 610 . 5316 . $\frac{1}{4}$. 46332.

This gives $y=\frac{21265}{185348}\left(=\frac{5316\frac{1}{4}}{46332}\right)$ and $x=2\frac{21265}{185328}$.

Which root approaches very near to the truth; so that it is much to be doubted whether the same could be obtained so quickly, and so accurately, by any other method.

Suppose again, that the square root of 26 were required. Then $xx=26$. Let $x=y+5$. And $1=10y+yy$. Hence we have the series

0 . 1 . 10 . 101 . 1020 . 10301 . 104030.

Therefore $y=\frac{10301}{104030}$; and $x=\sqrt{26}=5\frac{10301}{104030}=5.09901951360$, differing only by unit from 5.09901951359, found by the common method.

In the case where the greatest root of the *equation* is required, the like observations may be made, as when we seek the least root, viz. that we may obviate all inconveniencies by supposing $x=y\pm a$. Both methods often take place without any preparation; sometimes only one, and sometimes neither; but this rarely. Both will succeed by a proper substitution of $x=y\pm a$, providing the *equation* have equal roots. To avoid fractions in both cases, suppose, first, the general *equation* $a=bx+cxx+dx^3+$, &c. where a, b, c, d, &c. are integers; to which form all *equations* may be reduced. Then we avoid fractions by supposing $x=ay$. In the second method, we have the general *equation* $ax^m=bx^{m-1}+cx^{m-2}\ldots\ldots+d$, where we may put $x=\frac{y}{a}$; but this substitution may often be well omitted.

It is to be observed, that this method may be sometimes usefully extended to literal *equations*. Thus in the general cubic *equation*, $1=ax+bxx+cx^3$, form the series $0.0.0.1.a.aa+b.a^3+2ab+c.a^4+3aab+2ac+bb.a^5+4a^3b+3aac+3abb+2bc$, &c. then will the proximate value of $x=\frac{a^4+3aab+2ac+bb}{a^5+4a^3b+3aac+3abb+2bc}$.

The learned author of these methods afterwards applied them to the resolution of infinite *equations*; for which we must refer the reader to the Acta Petropol. tom. v. p. 63. 82.

The ingenious Mr. Simpson gives us the following method for the solution of *equations* in numbers, when only one *equation* is given, and one quantity (x) to be determined.

Take the fluxion of the given *equation*, supposing x to be the variable quantity; and having divided the whole by $\dot{x}$, let the quotient be represented by A. Estimate the value of x pretty near the truth, substituting the same in the *equation*, as also the value of A, and let the error, or resulting number, in the former, be divided by this numerical value of A, and the quotient be subtracted from the said former value of x; and from thence will arise a new value of that quantity, much nearer the truth than the former, wherewith proceeding as before, another new value may be had, &c. till we arrive to any degree of accuracy desired.

For instance, suppose $300x-x^3-1000=0$. To find x, take the fluxion of the given *equation*, and expunging $\dot{x}$, we have, $300-3xx=A$. It appearing, by inspection, that $300x-x^3$, when $x=3$, will be less, and when $x=4$, will be greater than 1000, estimate x at 3.5, and substitute it instead thereof both in the *equation*, and in the value of A. The error in the former $=7.125$, and the value of the latter $=263.25$; wherefore taking $\frac{7.125}{263.25}=0.027$ from 3.5, there remains 3.473 for a new value of x. With this proceeding as before, the next error, and the next value of A will be 0.00962518 and 263.815 respectively. Hence the third value of $x=3.47296351$; which is true to 7 or 8 places.

The proposed *equation* need not always be delivered from radicals, though this be sometimes convenient, yet it is also sometimes insupportably tedious. Thus, if we had the *equation* $\sqrt{1-x}+\sqrt{1-2xx}+\sqrt{1-3x^3}-2=0$; the clearing it from surds would be very tedious; but Mr. Simpson's method gives the root without any previous reduction.

The like is to be observed, when two *equations* are given, and as many unknown quantities (x and y) are to be determined. For all which we refer to the author himself, in his Essays, printed 1740, p. 82, seq.

The old method of Vieta, for solving adfected *equations*, was extremely tedious. It was formed by analogy, from the common method of extracting the roots of pure powers. See Vietæ Oper. Math. ap. Elzev. p. 173. or Wallis's Algebra, Oughtred's Clavis, De Lagny Elemens d'Arithm. & d'Algebr. p. 515, &c.

Equations are considered two ways: either as the ultimate conclusions we arrive at in the solution of problems; or as means, by the help whereof, we arrive at those final solutions.

An *equation* of the first kind consists only of one unknown quantity, which is intermixed with other known quantities. Those of the latter kind consist of several unknown quantities, which are to be compared, and connected together, till out of them all arise a new *equation*, wherein there is but one unknown quantity mixed with the known. To obtain the value of which unknown quantity, the *equation* is generally turned, and transformed various ways, till it be brought as low, and rendered as simple, as possible.

The doctrine and practice of *equations*, that is, the solution of questions by *equations*, consists of several steps, or parts; viz. 1. The denominating of the several quanti-

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ties, or expreſſing them in proper ſigns, or ſymbols. 2. The bringing the quantities thus denoted to an *equation*. 3. The reducing that *equation* to its loweſt and ſimpleſt terms. To which, 4. May be added the conſtructing of the *equation*, or repreſenting it in geometrical lines.

With regard to the firſt; a queſtion, or problem, being propoſed, we conceive the thing ſought, or required, as already done; and accordingly note or expreſs it by one of the laſt letters of the alphabet, *x*, *y*, or *z*; noting the other known quantities by the firſt letters of the alphabet, *a*, *b*, *c*, *d*, &c.

The queſtion being thus ſtated in ſpecies, it is conſidered whether, or no, it be ſubject to any reſtrictions, i. e. whether it be determinate, or no; which is found by theſe rules.

1. If the quantities ſought be more than the number of *equations* given, or contained in the queſtion, it is indeterminate, and capable of innumerable ſolutions. The *equations* are found, if they be not expreſly contained in the problem itſelf, by the theorems of the equality of quantities.

2. If the *equations* given, or contained in the problem, be juſt equal in number to the unknown quantities, the queſtion is determinate, or admits but of a limited number of anſwers.

3. If the unknown quantities be fewer than the given *equations*, the queſtion is yet more limited; and ſometimes it diſcovers itſelf impoſſible, by ſome contradiction between the *equations*. See REDUCTION *of equations*.

Now, *to bring a queſtion to an* EQUATION, that is, to bring the ſeveral mediate *equations* to one final one, the principal thing to be attended to, is to expreſs all the conditions thereof by ſo many *equations*. In order to which, it is to be conſidered, whether the propoſitions, or ſentences, wherein it is expreſſed, be all of them fit to be noted in algebraic terms; as our conceptions uſe to be in Latin, or Greek characters. And if ſo, as is generally the caſe in queſtions about numbers, or abſtract quantities, then let names be given both to known and unknown quantities, as far as occaſion requires; and thus the drift of the queſtion will be couched, as we may call it, in the *algebraical language*; and the conditions, thus tranſlated to algebraic terms, will give as many *equations* as are neceſſary to ſolve it. To illuſtrate this by an inſtance: ſuppoſe it required to find three numbers, in continual proportion, whoſe ſum is 20, and the ſum of their ſquares 140; putting *x*, y, z, for the names of the three numbers ſought, the queſtion will be tranſlated out of the verbal to the ſymbolical expreſſion, thus:

The queſtion in words.	*In ſymbols.*
Required three numbers, on theſe conditions;	*x*, y, z?
That they be continually proportional.	$x : y :: y : z$, or $xz = yy$
That the ſum be 20.	$x + y + z = 20$.
And the ſum of their ſquares 140.	$xx + yy + zz = 140$.

Thus is the queſtion brought to theſe *equations*, viz. $xz = yy$, $x + z + y = 20$, and $xx + yy + zz = 140$, by the help whereof, *x*, y, and z, are to be found by the rules already laid down.

The ſolutions of queſtions are, for the moſt part, ſo much the more expedite and artificial, by how much the unknown quantities, you have at firſt, are the fewer. Thus, in the queſtion propoſed, putting *x* for the firſt number, and y for the ſecond, $\frac{yy}{x}$ will be the third continual proportional; which being put for the third number, bring the queſtion into *equations*, as follows:

The queſtion in words.	*Symbolically.*
There are ſought three numbers in continual proportion.	$x, y, \frac{yy}{x}$?
Whoſe ſum is 20.	$x + y + \frac{yy}{x} = 20$.
And the ſum of their ſquares 140.	$xx + yy + \frac{y^4}{xx} = 140$.

You have therefore the *equations* $x + y + \frac{yy}{x} = 20$, and $xx + yy + \frac{y^4}{xx} = 140$, by the reduction whereof, *x*, and y, are to be determined.

Take another example: a merchant increaſes his eſtate annually by one third part, abating 100*l.* which he ſpends yearly in his family; and after three years he finds his eſtate doubled. *Query*, What is he worth? To reſolve this, it muſt be obſerved, that there are (or lie hid) ſeveral propoſitions, which are all thus found out, and laid down.

In words.	*Algebraically.*
A merchant has an eſtate —	*x*
Out of which the firſt year he ſpends 100*l.*	$x - 100$
And augments the reſt by one third —	$x - 100 + \frac{x-100}{3}$, or $\frac{4x-400}{3}$
And the ſecond year he ſpends 100*l.*	$\frac{4x-400}{3} - 100$, or $\frac{4x-700}{3}$
And augments the reſt by one third	$\frac{4x-700}{3} + \frac{4x-700}{9}$, or $\frac{16x-2800}{9}$
And ſo the third year he ſpends 100*l.*	$\frac{16x-2800}{9} - 100$, or $\frac{16x-3700}{9}$
And by the reſt gains likewiſe one third.	$\frac{16x-3700}{9} + \frac{16x-3700}{27}$, or $\frac{64x-14800}{27}$
And he becomes at length twice as rich as at firſt.	$\frac{64x-14800}{27} = 2x$

Therefore the queſtion is brought to this *equation*, $\frac{64x-14800}{27} = 2x$; by the reduction whereof you will find the value of *x*.

Viz. Multiply it into 27, and you have $64x - 14800 = 54x$; ſubtract $54x$, and there remains $10x - 14800 = 0$, or $10x = 14800$; and dividing by 10, you have $x = 1480$. So that the value of his eſtate at firſt was 1480*l.*

It appears then, that to the ſolution of queſtions about numbers, or the relations of abſtract quantities, there is ſcarce any thing more required, but to tranſlate them out of the common into the algebraic language, i. e. into characters, proper to expreſs our ideas of the relations of quantities. Indeed, it may ſometimes happen, that the language wherein the queſtion is ſtated, may ſeem unfit to be rendered into the algebraical; though by making a few alterations therein, and attending to the ſenſe, rather than the ſound of the words, the tranſlation becomes eaſy enough. The difficulty here reſults merely from the difference of idioms, which is as obſervable between moſt languages as between the common and ſymbolical. However, to render the ſolution of ſuch problems a little more eaſy and familiar, we ſhall add an example or two of them.

1. *Given the ſum of two numbers a, and the difference of the ſquares* b; *to find the numbers themſelves.* Suppoſe the leſſer, *x*; the other will be $a - x$; and their ſquares xx and $aa - 2ax + xx$; whoſe difference, $aa - 2ax$ is called b. Conſequently, $aa - 2ax = b$. Whence, by reduction, $aa - b = 2ax$; or $\frac{aa-b}{2a} \left(= \frac{1}{2}a - \frac{b}{2a} \right) = x$.

E. gr. Suppoſe the ſum of the numbers, or *a*, to be 8, and the difference of their ſquares, or b, 16; then will $\frac{1}{2}a - \frac{b}{2a} (= 4 - 1) = 3 = x$. And $a - x = 5$. Therefore the numbers are 3 and 5.

2. *To find three quantities* x, y, *and* z, *the ſum of each pair whereof is given.* Suppoſe the ſum of the pair *x* and y be *a*; that of *x* and z, b; and that of y and z, c. To determine the three numbers required, *x*, y, and z, we have three *equations* $x + y = a$; $x + z = b$; and $y + z = c$. Now, to exterminate two of the unknown quantities, e. gr. y and *x*, take away *x*, both from the firſt and ſecond *equations*, and we ſhall have $y = a - x$, and $z = b - x$. Which values being ſubſtituted for y and z in the third *equation*, there will ariſe $a - x + b - x = c$; and by reduction $x = \frac{a+b-c}{2}$. Having found *x*, the former *equations*, $y = a - x$, and $z = b - x$, will give y and z.

Thus, e. gr. if the ſum of the pair *x* and y be 9; of *x* and z, 10; and of y and z, 13; then, in the value of *x*, y, and z, write 9 for *a*, 10 for b, and 13 for c; and you will have $a + b - c = 6$; and conſequently $x \left(= \frac{a+b-c}{2} \right) = 3$, $y (= a - x) = 6$, and $z (= b - x) = 7$.

3. *To divide a given quantity into any number of parts, ſo as that the greater parts ſhall exceed the leaſt by any given differences.* Suppoſe *a* to be a quantity which is to be divided into four ſuch parts, the firſt and ſmalleſt whereof is *x*; the exceſs of the ſecond part above this, b, of the third, c, and the fourth d; then will $x + b$ be the ſecond part, $x + c$ the third, and $x + d$ the fourth; the aggregate of all which $4x + b + c + d$ is equal to the whole line *a*. Now, taking away from each, $b + c + d$, and there remains $4x = a - b - c - d$, or $x = \frac{a-b-c-d}{4}$.

Suppoſe, e. gr. a line of 20 feet to be divided into 4 parts, in ſuch manner, as that the exceſs of the ſecond above the firſt may be 2 feet, of the third 3 feet, and of the fourth 7 feet. Then the four parts will be $x \left(= \frac{a-b-c-d}{4}, \text{ or } \frac{20-2-3-7}{4} \right) = 2$, $x + b = 4$, $x + c = 5$,

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$e=5$, and $x+d=9$. And after the same manner, may a quantity be divided into a greater number of parts on the like conditions.

4. *A person disposed to distribute a little money among some beggars, wants eight pence of three pence for each of them: he therefore gives them two pence a-piece, and has three pence left: the number of beggars is required.* Let the number of beggars be called x; and the person wants 8 pence of giving them all $3x$ pence. Consequently he has $3x-8$; out of which he gives $2x$ pence; and the remaining pence $+3x-8-2x=3$. That is, $x-8=3$, or $x=11$.

5. *The power or strength of one agent being given, to determine how many such agents will produce a given effect* a, *in a given time* b. Suppose the power of the agent such, as that it may produce the effect c, in the time d; then, as the time d is to the time b, so is the effect c, which the agent can produce in the time d, to the effect it can produce in the time b, which accordingly will be $\frac{bc}{d}$. Then, as the effect of one agent $\frac{bc}{d}$ is to the joint effect of them all, a; so is that one agent, to all the agents. Consequently the number of agents will be $\frac{ad}{bc}$.

Thus, e. gr. if a clerk, or writer, in 8 days time transcribe 15 sheets; how many such clerks are required to transcribe 405 sheets in 9 days? *Ans.* 24. For if 8 be substituted for d, 15 for c, 405 for a, and 9 for b, the number $\frac{ad}{cd}$ will become $\frac{405\times 8}{9\times 15}$, that is $\frac{3240}{135}$, or 24.

6, *The powers of several agents being given; to determine the time* x, *wherein they will jointly perform a given effect.* Suppose the powers of the agents, A, B, C, such as that in the times e, f, g, they would produce the effects a, b, c, respectively; and these, in the time x, would produce effects $\frac{ax}{e}, \frac{bx}{f}, \frac{cx}{g}$. Consequently $\frac{ax}{e}+\frac{bx}{f}+\frac{cx}{g}=d$, and by reduction $x=\frac{d}{\frac{a}{e}+\frac{b}{f}+\frac{c}{g}}$.

Suppose, e. gr. that three workmen could finish a certain work in such and such times, viz. A once in three weeks, B thrice in eight weeks, and C five times in twelve weeks; and it is required in what time they will finish it together? Here, the powers of the agents A, B, C, are such as in the times 3, 8, and 12, respectively produce effects 1, 3, 5; and it is inquired in what time they will produce the effect together. For a, b, c, d, e, f, g, write 1, 3, 5, 1, 3, 8, 12; and there will come out $x=\frac{1}{\frac{1}{3}+\frac{3}{8}}+1\frac{1}{2}$ or $\frac{8}{9}$ of a week, that is, 6 days, $5\frac{1}{3}$ of an hour, the time they will finish it in together.

7. *Given the specific gravities of a mixture, and of the several ingredients thereof; to find the proportion of the ingredients therein.* Suppose e the specific gravity of the mixture A+B; a that of A, and b that of B; since the absolute gravity, or weight, is compounded of the bulk of the body, and its specific gravity; a A will be the weight of A; b B, that of B; and e A+e B the weight of the aggregate A+B. Consequently, a A+b B=e A+e B; and therefore a A−e A = e B−b B, or $e-b : a-e :: A : B$.

Thus, e. gr. suppose the specific gravity of gold to be as 19, that of silver as $10\frac{1}{2}$, and that of king Hiero's crown, composed of gold and silver, as 17; then will $A:B :: e-b : a-e :: 17-10\frac{1}{2} : 19-17 :: 7-\frac{1}{2} : 2 :: 20 : 6 :: 10 : 3$ :: the bulk of gold in the crown, to the bulk of silver: or $190 : 31$ ($:: 19\times 10 : 10\frac{1}{2}\times 3 :: a\times\overline{e-b} : b\times\overline{a-e}$) :: the weight of the gold in the crown, to the weight of the silver, and $221 : 31$ :: the weight of the crown to the weight of silver. See ALLIGATION.

Dr. Halley's method for the solution of *equations* is thus: Let the root z of any *equation* be taken equal to $a\pm e$; where a is supposed to be taken near to the true value. Then from the quantity $a\pm e$ let all the powers of z found in the proposed *equation*, be formed; and to these let their respective coefficients be prefixed. Let the power to be resolved be subducted from the sum of the parts of the first column where e is not found; and let the difference be $\pm b$. Then take the sum of all the coefficients of e in the second column, which call s; and having added all the coefficients of ee, the sum of which is called t; the root sought z, will, in a rational form, $=a\pm\frac{sb}{ss\pm tb}$; and, in an irrational form, $=a\mp\frac{\frac{1}{2}s\mp\sqrt{\frac{1}{4}ss+bt}}{t}$.

For instance, let it be supposed to find a root of the *equation* $z^4-\underset{d}{3}z z+\underset{c}{75}z=10000$, where 10000 is the resolvend.

For a first supposition let $a=10$; we shall therefore have the *equation*

$$\begin{aligned}
&z^4=a^4\pm 4a^3e+6a^2ee\pm 4ae^3+e^4\\
&-dzz=-da^2\pm 2dae-dee\\
&+cz=+ca\pm ce\\
&=10000\pm 4000e+600e^2\pm 40e^3+e^4\\
&-300\pm 60e-3e^2\\
&+750\pm 75e\\
&-10000\\
&\overline{+450\mp\underset{s}{4015}e+\underset{t}{597}ee\mp\underset{u}{40}e^3+e^4=0.}
\end{aligned}$$

The signs + and −, with respect to e and e^3, are left doubtful, till it be known whether e be affirmative or negative; in which there is some difficulty, as in *equations* having several roots, the *homogenea comparationis*, as they are called, are often increased by diminishing a, and, on the contrary, diminished by increasing a. But the sign of e is determined by the sign of the quantity b; for the resolvend being subtracted from the *homogeneum* formed from a; the sign of se, and therefore of the parts prevailing in its composition, will always be contrary to the sign of the difference b. Hence it will appear whether e be affirmative or negative, or whether a has been assumed greater or less than the true root. But e is always equal to $\frac{\frac{1}{2}s-\sqrt{\frac{1}{4}ss-bt}}{t}$, as often as b and t have the same sign; but when they are connected with different signs, e becomes $=\frac{\sqrt{\frac{1}{4}ss+bt}-\frac{1}{2}s}{t}$. After that e has been found to be negative, e, e^3, e^5, &c. must be made negative in the affirmative members of the *equation*, and affirmative in the negative members; that is, they must be writ with a contrary sign; but if e be affirmative, then must e, e^3, e^5, &c. be affirmative in the affirmative members, and negative in the negative.

In the proposed example we have 10450 instead of the resolvend 10000, or $b=+450$; from whence it appears that a was taken greater than the true root, and consequently that e is negative. Hence the *equation* becomes $10450-4015e+597ee=4e^3+e^4=10000$; that is, $450-4015e+597ee=0$. Therefore, $450=4015e-597ee$, or $b=se-tee$; the root of which is $e=\frac{\frac{1}{2}s-\sqrt{\frac{1}{4}ss-bt}}{t}$, or $\frac{s}{2t}-\sqrt{\frac{ss}{4tt}-\frac{b}{t}}$, that is, in the present case, $e=\frac{2007\frac{1}{2}-\sqrt{37614062\frac{1}{4}}}{597}$, from whence the approximated root is found to be $=9.886$. Now this root being taken for a second supposition, and the operation being repeated, we shall have $a+e=z=9.8862603936495$, which is very exact, scarcely exceeding the truth by above 2 the last figure.

This is sufficient to give a notion of Dr. Halley's method: those who desire more examples, and farther instructions, may consult the Phil. Trans. N° 210. or Lowthorp's Abridg. vol. i. p. 85, seq.

EQUATION, *differential.* See DIFFERENTIAL.

EQUATIONS, *to bring geometrical problems to.* Geometrical questions, or those relating to continued quantities, are sometimes also brought to *equations*, after the same manner as arithmetical ones. So that the first rule to be here prescribed is, to observe every thing directed for the solution of numerical problems.

Suppose, e. gr. it were required to cut a right line, as AB (*Tab. Algebra, fig.* 6.) in mean and extreme proportion in C; that is, so as that BE, the square of the greater part, shall be equal to the rectangle BD, contained under the whole and the lesser part.

Here supposing $AB=a$, and $CB=x$; then will $AC=a-x$; and $xx=a\times\overline{a-x}$. An *equation* which, by reduction, gives $x=-\frac{1}{2}a+\sqrt{\frac{1}{4}aa}$.

But it is very rare that geometrical problems are thus brought to *equation*; as being generally found to depend on various complex positions, and relations of lines; so that here some farther artifice, and certain special rules, will be required, to bring them to algebraic terms. Indeed, it is very difficult to prescribe any thing precise in such cases; every man's own genius should be the rule of his procedure.

Something, however, shall be said in the general, for the sake of such as are not at all versed in such operations, and that principally from Sir Isaac Newton.

Observe then, 2. That problems concerning lines related to each other in any definite manner, may be variously stated, by supposing such or such quæsita, or things sought, to be required from such or such data; yet still, with whatever data and quæsita the question is proposed, its solution will arise after the very same manner, without the least alteration of any circumstance, except in the imaginary species of lines, or in the names whereby the data are distinguished from the quæsita.

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Suppoſe, e. gr. the queſtion were about an iſoceles triangle, BCD (*fig.* 7.) inſcribed in a circle, whoſe ſides BC, BD, and baſe CD, were to be compared with the diameter of the circle AB. Here the queſtion may be either propoſed, of inveſtigating the diameter from the given ſides and baſe, or inveſtigating the baſe from the ſides and diameter given. Or, laſtly, of finding the ſides from the baſe and diameter given; and propoſe it under which form you will, it will be brought to an *equation*, by the ſame algebraic ſeries.

Thus, if the diameter be ſought, put AB=x, CD=a, and BC, or BD=b. Then, drawing AC, as the triangles ABC and CBE are ſimilar; AB : BC :: BC : BE, or x : b :: b : BE. Wherefore $BE = \frac{bb}{x}$, and $CE = \frac{1}{2}CD$, or $\frac{1}{2}a$. And becauſe the angle CEB is a right angle, $CE^2 + BE^2 = BC^2$, that is, $\frac{1}{4}aa + \frac{b^4}{xx} = bb$. Which *equation* being reduced, gives the diameter required, x. Again, if the baſe be ſought, put AB=c, CD=x, and BC, or BD=b. Then drawing AC, as the triangles ABC and CBE are ſimilar; AB : BC :: BC : BE, or c : b :: b : BE. Wherefore $BE = \frac{bb}{c}$. And $CE = \frac{1}{2}CD$, or $\frac{1}{2}x$. And ſince the angle CEB is right, $CE^2 + BE^2 = BC^2$, that is, $\frac{1}{4}xx + \frac{b^4}{cc} = bb$; an *equation* which, reduced, gives the baſis ſought, x.

Laſtly, if the ſide BC, or BD, were ſought, put AB =c; CD=a, and BC, or BD=x. Then drawing AC, the triangles ABC, and CBE, being ſimilar, we have AB : BC :: BC : BE; or c : x :: x : BE. Wherefore, $BE = \frac{xx}{c}$. And $CE = \frac{1}{2}CD$, or $\frac{1}{2}a$; and the angle CEB being right, $CE^2 + BE^2 = BC^2$. That is, $\frac{1}{4}aa + \frac{x^4}{cc} = xx$. An *equation* which, by reduction, gives x required.

Thus is the calculus for arriving at the *equation*, as well as the *equation* itſelf, the ſame in all the caſes; except that the ſame lines are deſigned by different letters, according as they are data, or quæſita. Indeed, as the data or quæſita differ, there ariſes a difference in the reduction of the *equation* found; but there is no difference in the *equation* itſelf. So that we need make no difference between given and ſought quantities; but are at liberty to ſtate the queſtion with ſuch data and quæſita, as we think moſt favourable to the ſolution of the queſtion.

3. A problem then being propoſed, compare the quantities it includes; and, without making any difference between data and quæſita, conſider what dependences they have on each other, that you may learn which of them will, by compoſition, give the reſt; in the doing of which, it is not neceſſary you ſhould at firſt contrive how ſome may be deduced out of others, by an algebraic calculus: it ſuffices you remark in the general, that it may be deduced by ſome direct connexion. Thus, e. gr. if the queſtion be about the diameter of a circle, AD (*fig.* 8.) and three lines AB, BC, CD, inſcribed in a ſemicircle; whereof, the reſt being given, BC is required: it is evident, at firſt ſight, that the diameter AD determines the ſemicircle; as alſo, that the lines AB and CD, by inſcription, determine the points B and C, and conſequently BC required, and that by a direct connexion. Yet does not it appear how BC is deduced from the ſame data, by any analytical calculus.

4. Having conſidered the ſeveral ways wherein the terms of the queſtion may be explained and decompounded, chooſe ſome of the ſynthetic methods; aſſuming ſome lines, as given, from which there is the moſt eaſy acceſs, or progreſſion to the reſt, and to which the regreſſion is the moſt difficult. For, though the calculus may be carried on diverſe ways, yet muſt it begin with theſe lines; and the queſtion is more readily ſolved, by ſuppoſing it to be of theſe data, and ſome quæſitum readily flowing from them, than by conſidering the queſtion as it is actually propoſed.

Thus, in the example already given, if from the reſt of the quantities given, it were required to find AD; perceiving that this cannot be done ſynthetically; yet that if it were ſo done, I could proceed in my reaſoning on it in a direct connexion from one thing to others, I aſſume AD as given, and begin to compute as if it was really given, and ſome of the other quantities, viz. ſome of the given ones, as AB, BC, or CD, were ſought; and thus, by carrying on the computation, from the quantities aſſumed to the others, as the relations of the lines to one another direct, there will always be obtained an *equation* between two values of ſome one quantity; whether one of thoſe values be a letter ſet down as a repreſentation, or name, at the beginning of the work,

for that quantity; and the other, a value of it found out by computation; or whether both be found by computation made different ways.

5. Having thus compared the terms of the queſtion in general, there is ſome farther thought and addreſs required, to find the particular connexions, or relations of the lines, fit for computation. For thoſe quantities which, to a perſon who does not ſo thoroughly conſider them, may ſeem immediately, and by a very near relation, connected together, when we come to expreſs that relation algebraically, are often found to require a longer circuit, and ſhall even oblige you to begin your ſchemes anew, and carry on your computation ſtep by ſtep, as may appear by finding BC, from AD, AB, and CD. For you are only to proceed by ſuch propoſitions, or enunciations, as can be fitly repreſented in algebraic terms, whereof there are ſeveral ariſing from Euclid, ax. 19. prop. 4. book vi. and prop. 47. lib. i. Elem.

To facilitate this diſcovery, of the relations of the lines in the figure, there are ſeveral things that contribute; as firſt, the addition and ſubtraction of lines; ſince from the values of the parts you may find the value of the whole; or from the value of the whole, and one of the parts, you may obtain the value of the other part. Secondly, by the proportionality of lines; ſince, as above ſuppoſed, the rectangle of the mean terms, divided by either of the extremes, gives the value of the other; or, which is the ſame thing, if the values of all four of the proportionals be firſt had, we make an equality (or *equation*) between the rectangles of the extremes and means. But the proportionality of lines is beſt found out by the ſimilarity of triangles; which, as it is known by the equality of their angles, the analyſt ought in particular to be converſant in. In order to which, it will be neceſſary that he be maſter of Euclid, prop. 5. 13. 15. 29. and 32. lib. i. and of prop. 4, 5, 6, 7, 8. lib. vi. and of the 20, 21, 22. 27. and 31. lib. iii. To which may be added the 3d prop. lib. vi. or the 35th and 36th prop. lib. iii. Thirdly, the calculus is promoted by the addition or ſubtraction of ſquares; viz. in right-angled triangles we add the ſquares of the leſſer ſides, to obtain the ſquare of the greater; or from the ſquare of the greater ſide we ſubtract the ſquare of one of the leſſer, to obtain the ſquare of the other. On which few foundations, if we add to them prop. 1. of the ſixth Elem. when the buſineſs relates to ſuperficies, and alſo ſome propoſitions taken out of the eleventh and twelfth books of Euclid, when ſolids come in queſtion, the whole analytic art, as to right-lined geometry, depends. Indeed, all the difficulties of problems may be reduced to the ſole compoſition of lines out of parts, and the ſimilarity of triangles; ſo that there is no occaſion to make uſe of other theorems, becauſe they may all be reſolved into theſe two, and conſequently into the ſolutions that may be drawn from them.

6. To accommodate theſe theorems to the ſolutions of problems, the ſchemes are oft times to be farther conſtructed, by producing out ſome of the lines, till they cut ſome others, or become of an aſſigned length; or by drawing lines parallel or perpendicular, from ſome remarkable point; or by conjoining ſome remarkable points; as alſo, ſometimes, by conſtructing them after other methods, according as the ſtate of the problems and the theorems, which are made uſe of to ſolve it, ſhall require.

As for example: if two lines that do not meet each other, make given angles with a certain third line, we may produce them ſo, that when they concur, or meet, they ſhall form a triangle, whoſe angles, and conſequently the ratio of their ſides, ſhall be given; or if any angle be given, or be equal to any one, we often complete it into a triangle given in ſpecie, or ſimilar to ſome other, and that by producing ſome of the lines in the ſcheme, or by drawing a line ſubtending an angle. If the triangle be an oblique angled one, we often reſolve it into two right-angled ones, by letting fall a perpendicular. If the buſineſs concern multilateral or many-ſided figures, we reſolve them into triangles, by drawing diagonal lines, and ſo in others; always aiming at this end, viz. that the ſcheme may be reſolved either into given, or ſimilar, or right-angled triangles.

Thus, in the example propoſed, draw the diagonal BD, that the trapezium ABCD may be reſolved into two triangles, ABD, a right-angled one, and BDC an oblique angled one (*fig.* 8.); then reſolve the oblique angled one into two right-angled triangles, by letting fall a perpendicular from any of its angles, B, C, or D, upon the oppoſite ſide; as from B upon CD produced to E, that BE may meet it perpendicularly. But ſince the angles BAD and BCD, make in the mean while two right ones (by 21. prop. 3. Eucl.), as well as BCE and BCD, the angles BAD and BCE are perceived to be equal; conſequently the triangles BCE and DAB to be

ſimilar.

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similar. And so the computation (by assuming AD, AB, and BC, as if CD were sought) may be thus carried on; viz. AD and AB (because of the right-angled triangle ABD) give you BD. AD, AB, BD, and BC (because of the similar triangles ABD and CEB) give BE and CE. BD and BE (because of the right angled triangle BED) give ED; and ED—EC, gives CD; whence there will be obtained an *equation* between the value of CD so found out, and the algebraic letter that denotes it. We may also (and for the greatest part it is better so to do, than to follow the work too far in one continued series) begin the computation from different principles, or at least promote it by diverse methods, to one and the same conclusion, that at length there may be obtained two values of any of the same quantity, which may be made equal to one another. Thus AD, AB, and BC, give BD, BE, and CE, as before; then CD+CE gives ED; and lastly, DB, and ED (because of the right-angled triangle BED) give BE.

7. Having concerted your method of procedure, and drawn your scheme, give names to the quantities that enter the computation (that is, from which assumed, the values of others are to be derived, till you come to an *equation*) choosing such as involve all the conditions of the problem, and seem best accommodated to the business, and which may render the conclusion (as far as you can guess) more simple, but yet not more than what shall be sufficient for your purpose; wherefore do not give new names to quantities which may be nominated from names already given. Thus, of a whole line given, and its parts, of the three sides of a right-angled triangle, and of three or four proportionals, some one of the least considerable we leave without a name; because its value may be derived from the names of the rest. As in the example already brought, if I make $AD=x$, and $AB=a$, I denote BD by no letter, because it is the third side of a right-angled triangle ABD, and consequently its value is $\sqrt{xx-aa}$. Then if I say $BC=b$, since the triangles DAB and BCE are similar, and thence the lines AD : AB :: BC : CE, to three whereof, viz. to AD, AB, and BC, there are already names given; for that reason I leave the fourth CE without a name, and in its room I make use of $\frac{ab}{x}$, discovered from the foregoing proportionality. And so if DC be called c, I give no name to DE, because from its parts DC and CE, or c and $\frac{ab}{x}$, its value $c+\frac{ab}{x}$ comes out.

8. By this time the problem is almost reduced to an *equation*. For after the aforesaid letters are set down from the species of the principal lines, there remains nothing else to be done, but that out of those species the values of other lines be made out, according to a pre-conceived method, till after some foreseen way they come to an *equation*. And there is nothing wanting in this case, except that by means of the right-angled triangles BCE and BDE, I can bring out a double value of BE, viz. $BC^2-CE^2\left(\text{or } bb-\frac{aabb}{xx}\right)=BE^2$; as also $BD^2-DE^2\left(\text{or } xx-aa-cc-\frac{2abc}{x}-\frac{aabb}{xx}\right)=BE^2$. And hence (expunging on both sides $\frac{aabb}{xx}$) you shall have the *equation* $bb=xx-aa-cc-\frac{2abc}{x}$; which being reduced, becomes $x^3=+aax+bbx+2abc+ccx$.

9. For the geometry of curve lines: we denote them either in describing them by the local motion of right lines, or by using *equations* indefinitely expressing the relation of right lines disposed in order, according to some certain law, and ending at the curve lines. See CONIC *Sections*.

The ancients did the same by the sections of solids; but they effected it less commodiously. The computations which regard curves, described after the first manner, are performed as above directed: thus, suppose AKC (*fig.* 9) a curve line, described by K, the vertical point of the right angle $AK\varphi$, whereof one leg, AK, freely slides through the point A given in position, while the other $K\varphi$ of a determinate length is carried along the right line AD, also given in position; and it is required to find the point C, in which any right line CD, given also in position, shall cut this curve: draw the right lines AC, CF, which may represent the right angle in the position sought, and CB perpendicular to AF, and the relation of the lines (without any difference or regard of what is given or sought, or any respect had to the curve) being considered, you perceive the dependency of the

others upon CF, and any of these four, viz. BC, BF, AF, and AC, to be synthetical; two whereof you assume as $CF=a$, and $CB=x$; and beginning the computation from thence, you presently obtain $BF=\sqrt{aa-xx}$, and $AB=\frac{xx}{\sqrt{aa-xx}}$, because of the right angle CBF; and that the lines BF . BC :: BC . AB are continual proportionals. Moreover, from the given position of CD, AD is given, which therefore call b; there is also given the ratio of BC to BD, which suppose as d to e, and you have $BD=\frac{ex}{d}$, and $AB=b-\frac{ex}{d}$.

Therefore $b-\frac{ex}{d}=\frac{xx}{\sqrt{aa-xx}}$, an *equation*, which (by squaring its parts, and multiplying by $aa-xx$) will be reduced to this form.

$$x^4=\frac{2bdex^3+a^2e^2x^2-b^2d^2x^2-2aabdex+aabbdd}{dd+ee}.$$

Whence, lastly, from the given quantities, a, b, d, and e, x may be found; and at that interval, or distance, x or BC, a right line drawn parallel to AD will cut CD in the point sought, which is C.

If, instead of geometrical descriptions, we use *equations* to denote the curve lines by, the computations will thereby become as much shorter and easier, as the gaining of those *equations* can make them. Thus, suppose the intersection C of the given ellipsis ACE, (*fig.* 10.) with the right line CD given in position, sought; to denote the ellipsis, take some known *equation* proper to it, as $rx-\frac{r}{q}xx=yy$, where x is indefinitely put for any part of the axis Ab, or AB, and y for the perpendicular bc, or BC, terminated at the curve; and r and q are given for the given species of the ellipsis. Since therefore CD is given in position, AD will also be given, which call a; and BD will be $a-x$; also the angle ADC will be given, and thence the ratio of BD to BC, which call r to e; and BC (y) will be $=ea-ex$, whose square $eeaa-2eeax+eexx$, will be equal to $rx-\frac{r}{q}xx$. And thence by reduction there will arise $xx=\frac{2aeex+rx-aaee}{ee+\frac{r}{q}}$, or $x=\frac{aee+\frac{1}{2}r\pm e\sqrt{ar+\frac{rr}{4ee}-\frac{aar}{q}}}{ee+\frac{r}{q}}$. Add, that tho' a curve be denominated by a geometrical description, or by a section of a solid, yet thence an *equation* may be obtained, which shall define the nature of the curve, and consequently all the difficulties of problems proposed about it, may be reduced hither. Thus, in the former example, if AB be called x, and BC, y, the third proportional BF will be $\frac{yy}{x}$, whose square, together with the square of BC, is equal to CF^2; that is, $\frac{y^4}{xx}+yy=aa$; or $y^4+xxyy=aaxx$. And this is an *equation*, by which every point C, of the curve AKC, agreeing or corresponding to any length of the base (and consequently the curve itself), is defined; and from whence consequently you may obtain the solutions of problems proposed concerning this curve.

After the same manner almost, when a curve is not given in specie, but proposed to be determined, you may feign an *equation* at pleasure, that may contain its general nature; and assume this to denote it, as if it was given; that from its assumption you may some way arrive at *equations*, by which the assumptions may be determined.

What remains of the doctrine and practice of *equations*, relates to their reduction to the lowest and simplest terms, the better to come at the value of the unknown quantity in the *equation*, and their geometrical construction. See REDUCTION *of equations*.

EQUATIONS, *extraction of the roots of.* See EXTRACTION *of roots of equations.*

EQUATIONS, *construction of.* See CONSTRUCTION *of equations*, and CURVE.

EQUATIONS, *conversion of.* See CONVERSION.

EQUATIONS, *adfected, eminential, exponential,* and *transcendental.* See the adjectives.

EQUATION *of payments*, in *Arithmetic*, is the method of reducing several debts payable at different times, and bearing no interest till after the term of payment to a single debt or payment, to be discharged at once, without loss either to debtor or creditor, allowing simple interest; or, it is the method of finding the equated term at which

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these several debts should be paid in one sum. Cocker, Hatton, Kersey, Sir Samuel Moreland, and Ward, have given rules for this purpose, which Mr. Malcolm has examined and found to be erroneous; and though the error resulting from any of the rules which they have proposed is not very considerable, the following process furnishes one more accurate:

Let the debt first payable be called d	The last payable debt D
The distance of the term of payment t	The distance of the term T
The distance of the equated time x	
The rate of interest, or 1 year's interest of 1*l.* r	
The distance of the time t and x is $x-t$	for x lies between them.
The distance of the time T and x is $T-x$	

Then the interest of d for the time $x-t$ is $drx-drt$, or $drx-drt$, dr being one year's interest of d; and $\frac{DTr-Drx}{1+Tr-rx}$ is the discount of D for the time $T-x$, because $Tr-rx$ is the interest of 1*l.* for that time, which is consequently the discount of $1+Tr-rx$ for the same time; consequently, from the nature of the question we shall have $drx-drt=\frac{DTr-Drx}{1+Tr-rx}$; which, being reduced, gives $T+t+\frac{D+d}{dr}\times x-x^2=\frac{DT+dt}{dr}+Tt$. Then make $T+t+\frac{D+d}{dr}=a$, and $\frac{DT+dt}{dr}+Tt=s$, and $ax-x^2=s$; and, resolving this quadratic equation, $x=\frac{a}{2}\pm\sqrt{\frac{a^2}{4}-s}$.

E. gr. Suppose 100*l.* payable one year hence, and 105*l.* payable three years hence; what is the equated time, allowing simple interest at 5 *per cent. per annum*?

Here $d=100$, $t=1$, $\left.\begin{matrix}D=105\\T=3\end{matrix}\right\}$ $r=.05$.

Then $D+d=205$, $dr=5$, and $\frac{D+d}{dr}=\frac{205}{5}=41$.

And $T+t+\frac{D+d}{dr}$, or $a=4+41=45$.

And s or $\frac{DT+dt}{dr}+Tt=\frac{315+100}{5}+3=83+3=86$.

Consequently,

$x=\frac{45}{2}\pm\sqrt{\frac{2025}{4}-86}=\frac{45}{2}\pm\sqrt{506.25-86}=22.5\pm\sqrt{420.25}=22.5\pm20.5=43$ or 2: but 43 cannot be the true answer by the conditions of the question, since it is greater than the distance of the last term in the question; and therefore 2 is the answer required.

If there are more debts than two, you must first find an equated time for the two that are first payable; then consider their sum as a debt payable at that equated time, and find another equated time for that debt and the next of the given debts, &c. See Malcolm's Arithm. book vi. § 5. or p. 616—621.

EQUATION *of time*, in *Astronomy*, denotes the difference between mean and apparent time, or the reduction of the apparent unequal time, or motion of the sun or a planet, to equable and mean time, or motion.

Time is only measured by motion; and as time in itself flows ever equably, to measure it, such a motion must be used as is equable, or which always proceeds at the same rate.

The motion of the sun is commonly used for this purpose, as it is the most easy to be observed; yet it wants the great qualification of a chronometer, which is equability. In effect, the astronomers find, that the sun's apparent motion is no ways equal; that he now and then slackens his pace, and afterwards quickens it again; and consequently equal time cannot be measured thereby. See SUN.

Hence the time which the sun's motion shews, called the *apparent time*, becomes different from the true and equable time, shewn by a well-regulated clock, wherein all the celestial motions are to be estimated and accounted; so that the time shewn by such a clock and a true sun-dial is never the same, but on the 15th of April, the 16th of June, the 31st of August, and the 24th of December. See the annexed table.

This inequality of time is thus accounted for: the natural or solar day is measured not properly by one entire revolution of the equinoctial, or 24 equinoctial hours, but by the time which passes while the plane of a meridian, passing through the center of the sun, does, by the earth's conversion round its axis, return again to the sun's center, which is the time between one midday and the next.

Now, had the earth no other motion but that round its axis; all the days would be precisely equal to each other, and to the time of the revolution of the equinoctial; but the case is otherwise; for while the earth is turning round its axis, it is likewise proceeding forward in its orbit. So that when a meridian has completed a whole revolution from the sun's center, its plane has not yet arrived at the sun's center again, as will appear from the figure.

Let the sun be S (*Tab. Astron. fig.* 50.); and let A B be a portion of the ecliptic; let the line M D represent any meridian, whose plane produced, passes through the sun when the earth is in A. Let the earth proceed in its orbit; and in making one revolution round its axis, let it arrive at B; then will the meridian M D be in the position m d parallel to the former M D; and consequently this has not yet passed through the sun, nor have the inhabitants under that meridian yet had their midday: but the meridian d m must still proceed with its angular motion, and describe the angle d B f before its plane can pass through the sun.

Hence, it appears that the solar days are all longer than the time of one revolution of the earth round its axis.

However, were the planes of all the meridians perpendicular to the plane of the earth's orbit, and did the earth proceed with an equal motion in its orbit, the angle d B f would be equal to the angle B S A, and the arches d f and A B would be similar; consequently, the times would be always equal, the arch A B, and the angle d B f, of the same quantity, all the solar days equal to each other, and the apparent and real time agree.

But as it is, neither of those is the case; for the earth does not proceed in its orbit with an equable motion; but in its aphelion describes a less arch, and in its perihelion a greater, in the same time; besides, the planes of the meridians are not perpendicular to the ecliptic, but to the equator; consequently, the time of the angular motion d B f, which is to be added to the entire revolution in order to make a whole day, is not always of exactly the same quantity.

The same will be found, if setting aside the consideration of the real motion of the earth, we consider the apparent motion of the sun in lieu thereof, as being what we measure time by. On this principle we observe, that the day not only includes the time of one revolution of the globe on its axis, but it is increased by so much as answers to that part of the sun's motion performed in that time: for when that part of the equinoctial, which, with the sun, was at the meridian yesterday at noon, is come thither again to-day, it is not yet noon, the sun not being now at the place where he yesterday was, but gone forward near a degree, more or less; and this additament above the 24 equinoctial hours is upon a double account unequal.

1. In that the sun, because of his apogee and perigee, does not at all times of the year dispatch an equal arch of the ecliptic in one day, but greater arches near the perigæum, which, in the present century, is on the 30th of December; and lesser nearer the apogæum, which is on the 30th of June.

2. In that though the sun should always move equably in the ecliptic, yet equal arches of the ecliptic do not, in all parts of the zodiac, answer to equal arches of the equator, by which we are to estimate time, because some parts thereof, as the two solstitial points, lie nearer to a parallel position to the equinoctial than others, e. gr. those about the equinoctial points where the ecliptic and equinoctial intersect. Whereupon an arch of the ecliptic near the solstitial points answers to a greater arch of the equinoctial than an arch equal to it near the equinoctial points.

The apparent motion of the sun to the east then being unequal, the natural and apparent days are no ways proper to be applied to measure the celestial motions, which have no dependence on that of the sun.

And hence astronomers have been obliged to invent other days for the use of their calculations; those others are equal, and are a mean between the shortest and longest of the unequal ones.

These are had by considering the number of hours in the whole revolution of the sun in the ecliptic, and dividing the whole time into as many equal parts as there are hours, 24 of which constitute the day; and the reduction of the days constitutes the *equation* of natural days.

Consequently, computing these motions according to equal time, it is necessary to turn that time back again into apparent time, that they may correspond to observation: on the contrary, any phenomenon being observed, the apparent time thereof must be converted into equal time, to have it correspond with the times marked in the astronomical tables. As we do not know of any body in nature that moves equably, yet such a motion being alone proper to measure equal days and hours; it has been thought fit

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fit to imagine ſome body, e. gr. a ſtar moving in the equator eaſtward, and never quickening or ſlackening its pace, but going through the equator in preciſely the ſame time as the ſun finiſhes his period in the ecliptic.

The motion of ſuch a ſtar will repreſent equal time, and its diurnal motion of the equator will be 59′ 8″, the ſame as the mean or equated motion of the ſun in the ecliptic; conſequently, the mean or equable day is determined by the arrival of the ſtar at the meridian, and is equal to the time wherein the whole circumference of the equator or 360° paſs the meridian, and 59′ 8″ more: which addition of 59′ 8″ remaining always the ſame, theſe mean or equated days will be conſtantly equal.

Since then the ſun goes unequally eaſtwards with reſpect to the equator, it will ſometimes arrive at the meridian ſooner than this imaginary ſtar, and ſometimes later: the difference is the difference between true and apparent time; which difference is known by having the place of the imaginary ſtar in the equator, and the point of the equator which comes to the meridian with the ſun; for the arch intercepted between them being converted into time, ſhews the difference between equal and apparent time, which, as before, is called the *equation of time*.

The *equation of time*, then, may be defined: the time that flows while the arch of the equator intercepted between the point determining the right aſcenſion of the ſun, and the place of the imaginary ſtar, paſſes the meridian; or as Tycho, and after him Street, ſtate it, it is the difference between the ſun's true longitude and his right aſcenſion.

To EQUATE *ſolar days*, that is, *to convert apparent into mean time, and mean into apparent time.* 1. If the ſun's right aſcenſion be equal to his mean motion, the imaginary and true ſun will paſs the meridian at the ſame time; conſequently, the true coincides with the apparent time.

2. If the right aſcenſion be greater than the mean motion, ſubtract the latter from the former; and turning the difference into ſolar time, either ſubtract it from the apparent time to find the mean time; or add it to the mean time to find the apparent.

3. Laſtly, if the right aſcenſion be leſs than the mean motion, ſubtract the former from the latter; and turning the difference into ſolar time, either add it to the apparent time to find the mean time, or ſubtract it from the mean time to find the apparent.

This method of *equation* obtains, if the calculus be progreſſive; if it be retrogade, that is, if the time be reckoned backwards, the operation muſt be juſt the reverſe.

Or, find the mean and true anomalies for any propoſed day; their difference will be the EQUATION *of the center*. The true anomaly gives the ſun's longitude, with which, and the obliquity of the ecliptic, compute the right aſcenſion; then add or ſubtract the difference between the longitude and right aſcenſion to or from the *equation* of the center, and the ſum or difference converted into time, gives the *equation* ſought.

This doctrine of the inequality and *equation* of natural days is not only of uſe in aſtronomical obſervations, but alſo in the adjuſting and directing of clocks, watches, and other time-keepers: hence we ſee why a pendulum or other movement, which meaſures apparent equal time, does not keep pace with the ſun, which meaſures apparent time, but is ſometimes before, and ſometimes later than the ſame. Whence ſuch automata and ſun-dials are neceſſarily found almoſt perpetually at variance.

The variations of the two kinds of time are exhibited in the following tables for every day throughout the year. Mr. Flamſteed was the firſt who fully demonſtrated and cleared this inequality of natural days; though others, and even Ptolemy, had a partial notion of it.

The uſe of the tables is obvious; a clock or watch that is to be kept to true or equal time, muſt be ſo many minutes and ſeconds faſter or ſlower than a ſun-dial, as is aſſigned in the tables for the reſpective day; or if you would have it go by the ſun-dial, it goes well if it gains or loſes each day the number of minutes and ſeconds in the tables. See CLOCK.

TABLES of the EQUATION of natural Days, for regulating Clocks and Watches by the Sun.

TABLE I. for Biſſextile or Leap-Year.

Days	Jan. M.	Jan. S.	Feb. M.	Feb. S.	March M.	March S.	April M.	April S.	May M.	May S.	June M.	June S.	July M.	July S.	Auguſt M.	Auguſt S.	Sept. M.	Sept. S.	Oct. M.	Oct. S.	Nov. M.	Nov. S.	Dec. M.	Dec. S.
1	4	0	14	3	12	31	3	44	3	13	2	34	3	25	5	50	0	28	10	35	16	14	10	18
2	4	28	14	10	12	19	3	25	3	20	2	24	3	36	5	46	0	47	10	54	16	14	9	55
3	4	56	14	17	12	5	3	7	3	27	2	15	3	47	5	41	1	6	11	12	16	13	9	31
4	5	24	14	23	11	51	2	49	3	33	2	5	3	58	5	35	1	28	11	30	16	12	9	6
5	5	51	14	27	11	37	2	31	3	39	1	55	4	8	5	29	1	45	11	48	16	9	8	40
6	6	17	14	32	11	23	2	13	3	43	1	44	4	18	5	23	2	5	12	5	16	6	8	14
7	6	43	14	35	11	8	1	56	3	48	1	33	4	28	5	16	2	25	12	21	16	2	7	48
8	7	9	14	37	10	52	1	39	3	52	1	22	4	37	5	8	2	46	12	38	15	57	7	21
9	7	34	14	39	10	36	1	22	3	55	1	10	4	46	5	0	3	6	12	53	15	51	6	54
10	7	58	14	40	10	20	1	5	3	57	0	58	4	54	4	51	3	27	13	9	15	45	6	26
11	8	22	14	40	10	4	0	49	3	59	0	46	5	2	4	42	3	47	13	23	15	37	5	58
12	8	46	14	39	9	47	0	33	4	1	0	34	5	10	4	32	4	8	13	38	15	29	5	29
13	9	8	14	38	9	30	0	18	4	1	0	21	5	17	4	22	4	29	13	52	15	19	5	0
14	9	31	14	36	9	13	0	2	4	1	0	9	5	24	4	11	4	49	14	5	15	9	4	31
15	9	52	14	33	8	56	0	* 13	4	1	0	* 4	5	30	3	59	5	10	14	17	14	58	4	2
16	10	13	14	30	8	38	0	27	4	0	0	17	5	36	3	47	5	31	14	29	14	47	3	32
17	10	33	14	26	8	20	0	41	3	58	0	30	5	41	3	35	5	52	14	41	14	34	3	3
18	10	53	14	21	8	2	0	55	3	56	0	43	5	46	3	22	6	13	14	52	14	21	2	33
19	11	11	14	15	7	44	1	8	3	54	0	56	5	50	3	8	6	34	15	2	14	7	2	3
20	11	29	14	9	7	26	1	21	3	50	1	9	5	54	2	54	6	55	15	12	13	52	1	33
21	11	47	14	2	7	8	1	34	3	47	1	22	5	57	2	39	7	16	15	21	13	36	1	3
22	12	3	13	54	6	49	1	46	3	42	1	35	5	59	2	24	7	36	15	29	13	20	0	33
23	12	19	13	46	6	31	1	57	3	38	1	48	6	1	2	9	7	57	15	37	13	2	0	3
24	12	34	13	37	6	12	2	9	3	32	2	1	6	2	1	53	8	18	15	44	12	44	0	* 27
25	12	48	13	28	5	54	2	19	3	26	2	13	6	3	1	37	8	38	15	51	12	25	0	57
26	13	1	13	18	5	35	2	29	3	20	2	26	6	3	1	20	8	58	15	56	12	6	1	26
27	13	14	13	7	5	16	2	39	3	14	2	38	6	2	1	3	9	18	16	1	11	46	1	56
28	13	25	12	56	4	58	2	48	3	6	2	50	6	1	0	45	9	38	16	5	11	25	2	25
29	13	36	12	44	4	39	2	57	2	59	3	2	5	59	0	28	9	57	16	9	11	46	2	54
30	13	46			4	20	3	5	2	51	3	14	5	57	0	9	10	16	16	11	10	41	3	23
31	13	55			4	2			2	42			5	54	0	* 9			16	13			3	52

Clock too faſt / Clock too ſlow

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TABLE II. for the First Year after Leap-Year.

Days	Jan. M.	Jan. S.	Feb. M.	Feb. S.	March M.	March S.	April M.	April S.	May M.	May S.	June M.	June S.	July M.	July S.	August M.	August S.	Sept. M.	Sept. S.	Oct. M.	Oct. S.	Nov. M.	Nov. S.	Dec. M.	Dec. S.
1	4	28	14	8	12	34	3	47	3	12	2	37	3	21	5	50	0	23	10	30	16	13	10	22
2	4	48	14	15	12	21	3	29	3	20	2	28	3	33	5	47	0	42	10	49	16	13	9	59
3	5	16	14	21	12	8	3	Clock too fast 11	3	26	2	18	3	44	5	42	1	Clock too slow 1	11	7	16	12	9	35
4	5	43	14	26	11	54	2	53	3	32	2	8	3	55	5	37	1	20	11	25	16	11	9	10
5	6	10	14	30	11	40	2	35	3	38	1	57	4	6	5	31	1	40	11	42	16	9	8	45
6	6	36	14	34	11	26	2	18	3	43	1	47	4	16	5	25	1	59	11	59	16	6	8	19
7	7	2	14	37	11	11	2	0	3	47	1	36	4	26	5	18	2	Clock too slow	12	16	16	2	7	53
8	7	28	14	39	10	56	1	Clock too fast 43	3	50	1	Clock too slow 24	4	35	5	11	2	0	12	32	15	57	7	20
9	7	53	14	40	10	41	1	27	3	54	1	13	4	44	5	3	3	0	12	48	15	51	6	59
10	8	17	14	41	10	25	1	10	3	56	1	1	4	53	4	54	3	21	13	4	15	45	6	31
11	8	Clock too fast 41	14	Clock too fast 41	10	9	0	54	3	58	0	49	5	1	4	45	3	41	13	19	15	38	6	3
12	9	4	14	39	9	52	0	38	4	0	0	Clock too slow 36	5	9	4	Clock too fast 36	4	3	13	33	15	30	5	35
13	9	26	14	38	9	Clock too fast 35	0	22	4	Clock too slow 1	0	24	5	Clock too fast 16	4	Clock too fast 25	4	23	13	Clock too fast 47	15	Clock too fast 21	5	Clock too fast 7
14	9	48	14	35	9	18	0	7	4	1	0	12	5	23	4	14	4	44	14	Clock too fast 1	15	11	5	38
15	10	9	14	32	9	1	0	* 8	4	Clock too slow 1	0	* 1	5	29	4	2	5	5	14	14	15	1	4	9
16	10	29	14	27	8	Clock too fast 43	0	23	4	0	0	13	5	Clock too fast 35	3	Clock too fast 50	5	26	14	Clock too slow 26	14	Clock too slow 50	3	Clock too slow 39
17	10	45	14	22	8	25	0	37	3	Clock too slow 59	0	26	5	40	3	37	5	47	14	38	14	37	3	10
18	11	7	14	17	8	7	0	Clock too fast 51	3	57	0	Clock too slow 39	5	44	3	24	6	8	14	49	14	24	2	40
19	11	25	14	11	7	49	1	5	3	55	0	Clock too fast 52	5	48	3	11	6	29	15	0	14	10	2	10
20	11	43	14	4	7	31	1	18	3	52	1	5	5	52	2	57	6	50	15	6	13	56	1	40
21	11	59	13	56	7	12	1	Clock too fast 31	3	48	1	17	5	55	2	42	7	11	15	19	13	40	1	10
22	12	15	13	48	6	54	1	43	3	44	1	Clock too fast 31	5	57	2	27	7	32	15	28	13	24	0	40
23	12	30	13	39	6	35	1	55	3	40	1	43	5	59	2	12	7	53	15	36	13	7	0	Clock too fast 10
24	12	44	13	29	6	16	2	7	3	35	1	56	6	1	1	56	8	13	15	43	12	49	0	* 20
25	12	57	13	19	5	58	2	18	3	29	2	9	6	1	1	40	8	33	15	49	12	30	0	50
26	13	11	13	9	5	39	2	28	3	23	2	21	6	1	1	23	8	53	15	55	12	11	1	Clock too slow 20
27	13	25	12	58	5	20	2	38	3	17	2	39	6	1	1	6	9	13	16	0	11	50	1	Clock too slow 49
28	13	32	12	46	5	1	2	47	3	10	2	46	6	0	0	49	9	33	16	4	11	29	2	19
29	13	42			4	43	2	56	3	2	2	58	5	59	0	31	9	52	16	7	11	8	2	Clock too fast 48
30	13	52			4	24	3	5	2	54	3	19	5	56	0	14	10	11	16	10	10	45	3	18
31	14	0			4	6			2	46			5	54	0	* 4			16	12			3	Clock too fast 47

TABLE III. for the Second Year after Leap-Year.

Days	Jan. M.	Jan. S.	Feb. M.	Feb. S.	March M.	March S.	April M.	April S.	May M.	May S.	June M.	June S.	July M.	July S.	Aug. M.	Aug. S.	Sept. M.	Sept. S.	Octob. M.	Octob. S.	Nov. M.	Nov. S.	Dec. M.	Dec. S.
1	4	15	14	8	12	38	3	53	3	10	2	38	3	19	5	52	0	18	10	25	16	12	10	28
2	4	43	14	15	12	25	3	34	3	17	2	29	3	31	5	48	0	37	10	44	16	13	10	5
3	5	11	14	21	12	12	3	16	3	24	2	20	3	42	5	43	0	Clock too slow 56	11	3	16	13	9	41
4	5	38	14	26	11	59	2	58	3	30	2	10	3	53	5	38	1	16	11	21	16	12	9	17
5	6	5	14	31	11	45	2	Clock too fast 40	3	36	2	0	4	3	5	33	1	35	11	38	16	10	8	52
6	6	32	14	34	11	30	2	23	3	41	1	49	4	13	5	26	1	55	11	56	16	7	8	26
7	6	58	14	37	11	16	2	53	3	45	1	Clock too slow 38	4	23	5	19	2	Clock too slow 15	12	13	16	4	8	0
8	7	23	14	39	11	1	1	48	3	50	1	27	4	32	5	12	2	36	12	29	15	59	7	34
9	7	48	14	41	10	45	1	Clock too fast 31	3	53	1	16	4	41	5	4	2	56	12	46	15	54	7	7
10	8	14	14	Clock too fast 41	10	29	1	14	3	56	1	Clock too slow 5	4	50	4	55	3	17	13	1	15	Clock too fast 48	6	Clock too fast 39
11	8	Clock too fast 36	14	41	10	Clock too fast 13	0	57	3	58	0	53	4	58	4	46	3	37	13	Clock too fast 16	15	41	6	11
12	8	59	14	40	9	56	0	41	4	0	0	Clock too slow 41	5	Clock too fast 6	4	36	3	58	13	31	15	33	5	Clock too fast 43
13	9	21	14	38	9	39	0	25	4	Clock too slow 1	0	29	5	13	4	Clock too fast 26	4	19	13	45	15	24	5	15
14	9	43	14	Clock too fast 35	9	22	0	9	4	2	0	16	5	20	4	15	4	40	13	59	15	Clock too slow 15	4	Clock too fast 46
15	10	4	14	32	9	5	0	* 6	4	2	0	4	5	26	4	4	5	1	14	Clock too slow 12	15	4	4	16
16	10	24	14	28	8	47	0	21	4	Clock too slow 2	0	* 9	5	Clock too fast 32	3	Clock too fast 52	5	22	14	24	14	53	3	47
17	10	44	14	23	8	29	0	Clock too fast 35	4	1	0	22	5	37	3	40	5	43	14	36	14	40	3	17
18	11	2	14	18	8	11	0	42	3	59	0	35	5	43	3	27	6	4	14	47	14	27	2	47
19	11	21	14	12	7	53	1	3	3	56	0	Clock too fast 48	5	47	3	14	6	24	14	58	14	14	2	17
20	11	38	14	5	7	35	1	Clock too slow 16	3	53	1	1	5	50	3	0	6	45	15	7	13	59	1	47
21	11	55	13	58	7	16	1	29	3	50	1	14	5	54	2	46	7	6	15	17	13	43	1	17
22	12	11	13	50	6	58	1	41	3	46	1	Clock too fast 27	5	57	2	31	7	26	15	25	13	27	0	47
23	12	26	13	41	6	39	1	53	3	41	1	40	5	59	2	16	7	47	15	33	13	10	0	17
24	12	41	13	32	6	21	2	4	3	36	1	53	6	0	2	0	8	8	15	40	12	52	0	* 13
25	12	54	13	22	6	2	2	15	3	31	2	6	6	1	1	44	8	28	15	47	12	34	0	44
26	13	7	13	12	5	43	2	26	3	25	2	18	6	2	1	28	8	48	15	53	12	15	1	Clock too fast 13
27	13	19	13	1	5	25	2	35	3	18	2	31	6	2	1	11	9	8	15	58	11	55	1	43
28	13	31	12	50	5	6	2	45	3	11	2	43	6	1	0	54	9	27	16	2	11	34	2	12
29	13	41			4	48	2	54	3	8	2	56	6	0	0	37	9	47	16	6	11	13	2	42
30	13	51			4	29	3	2	2	55	3	7	5	58	0	19	10	6	16	9	10	51	3	11
31	13	60			4	11			2	47			5	55		* 1			16	11			3	Clock too fast 39

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TABLE IV. for the Third Year after Leap-Year.

Days	Jan. M.	Jan. S.	Feb. M.	Feb. S.	March M.	March S.	April M.	April S.	May M.	May S.	June M.	June S.	July M.	July S.	Aug. M.	Aug. S.	Sept. M.	Sept. S.	Octob. M.	Octob. S.	Nov. M.	Nov. S.	Dec. M.	Dec. S.
1	4	8	14	5	12	40	3	57	3	8	2	40	3	16	5	52	0	14	10	22	16	14	10	35
2	4	36	14	12	12	28	3	38	3	15	2	31	3	28	5	49	0	33	10	41	16	14	10	12
3	5	3	14	18	12	15	3	20	3	22	2	22	3	39	5	44	0	52	10	59	16	14	9	48
4	5	31	14	24	12	1	3	2	3	29	2	12	3	50	5	39	1	11	11	17	16	13	9	24
5	5	57	14	28	11	47	2	44	3	35	2	2	4	0	5	34	1	31	11	35	16	11	8	59
6	6	24	14	32	11	33	2	26	3	40	1	52	4	11	5	28	1	51	11	52	16	8	8	33
7	6	50	14	35	11	18	2	9	3	45	1	41	4	21	5	31	2	11	12	9	16	5	8	7
8	7	15	14	38	11	3	1	51	3	49	1	30	4	30	5	18	2	31	12	26	16	1	7	40
9	7	40	14	39	10	48	1	34	3	52	1	18	4	39	5	6	2	51	12	42	15	55	7	13
10	8	5	14	40	10	32	1	17	3	55	1	7	4	48	4	58	3	11	12	57	15	49	6	46
11	8	29	14	40	10	15	1	1	3	58	0	55	4	57	4	49	3	32	13	12	15	42	6	18
12	8	52	14	39	9	59	0	45	3	59	0	43	5	5	4	39	3	53	13	27	15	35	5	50
13	9	15	14	38	9	43	0	29	4	1	0	30	5	12	4	29	4	13	13	41	15	26	5	21
14	9	37	14	36	9	26	0	14	4	1	0	18	5	19	4	19	4	34	13	55	15	17	4	52
15	9	58	14	33	9	9	0	1	4	1	0	5	5	26	4	8	4	55	14	8	15	6	4	23
16	10	19	14	29	8	51	9	16	4	0	0	8	5	32	3	56	5	16	14	20	14	55	3	54
17	10	39	14	25	8	34	0	31	3	59	0	21	5	38	3	44	5	37	14	32	14	43	3	25
18	10	58	14	20	8	16	0	45	3	57	0	34	5	43	3	31	5	58	14	44	14	31	2	55
19	11	17	14	14	7	58	0	58	3	55	0	47	5	47	3	18	6	19	14	55	14	17	2	25
20	11	37	14	7	7	40	1	12	3	52	1	0	5	51	3	4	6	40	15	0	14	3	1	55
21	11	52	14	0	7	22	1	24	3	49	1	13	5	55	2	50	7	1	15	15	13	48	1	25
22	12	8	13	52	7	3	1	37	3	46	1	26	5	57	2	37	7	22	15	24	13	32	0	55
23	12	23	13	44	6	45	1	49	3	41	1	38	6	0	2	26	7	42	15	32	13	15	0	25
24	12	38	13	35	6	26	2	0	3	36	1	51	6	1	2	4	8	3	15	39	12	58	0	5
25	12	52	13	25	6	7	2	12	3	31	2	4	6	2	1	48	8	23	15	46	12	40	0	35
26	13	5	13	15	5	49	2	22	3	25	2	16	6	2	1	32	8	44	15	52	12	21	1	4
27	13	17	13	4	5	30	2	32	3	19	2	29	6	2	1	15	9	4	15	58	12	1	1	34
28	13	28	12	52	5	11	2	42	3	12	2	41	6	1	0	58	9	24	16	3	11	41	2	4
29	13	38			4	52	2	51	3	5	2	53	6	0	0	40	9	43	16	7	11	20	2	33
30	13	48			4	34	3		2	57	3	5	5	58	0	22	10	3	16	10	10	58	3	2
31	13	57			4	15			2	49			5	55	0	4			16	12			3	31

Clock too fast / Clock too slow

N. B. No tables of this kind can be perpetual, becauſe the preceſſion of the equinox, and the variation of the ſun's apogee, produce a change in the inequality of his motion at the end of every year; but this change is ſo ſmall, that the ſame tables will ſerve without any ſenſible error for many years.

See tables of *equation of time* computed for every year, in the Nautical Almanac, by a method propoſed and illuſtrated by Mr. Maſkelyne, the aſtronomer royal, viz. by taking the difference of the ſun's true right aſcenſion and his mean longitude, corrected by the *equation* of the equinoxes in right aſcenſion, and turning it into time at the rate of 1′ of time to 15′ of right aſcenſion. Phil. Tranſ. vol. liv. art. 56. p. 336.

EQUATION, *abſolute*. See ABSOLUTE.

EQUATION *of the center*, called alſo *proſthaphæreſis*, and *total proſthaphæreſis*, is the difference between the true and mean place of a planet, or the angle made by the lines of the true and mean place; or which amounts to the ſame, between the mean and equated ANOMALY.

The greateſt *equation of the center* may be obtained by finding the ſun's longitude at the times when he is near his mean diſtances, the difference will give the true motion for that interval of time: then find the ſun's mean motion for that interval of time, and half the difference between the true and mean motions will ſhew the greateſt *equation of the center*. E. G.

By obſervations made at the Obſervatory at Greenwich, it appears that

	d.	h.	′	″		ſ	°	′	″
1769, Oct. 1, at	23	49	12		mean time, ſun's long. was	6	9	32	0.6
1770, March 29, at	0	4	50		mean time, ſun's long. was	0	8	50	27.5
The difference of time	178	0	15	38	True difference of long.	5	29	18	27

d. h. ′ ″

The tropical year = 365 5 48 42 = 365,2421527.
The obſerved interval = 178 0 15 38 = 178,01085648.
Then 365,2421527 : 178,01085648 :: 360° : 175,455948 mean motion. Therefore, 175° 27′ 21″ of mean motion anſwers to 179° 18′ 27″ true motion. Their difference = 3° 51′ 6″, and half this difference, viz. 1° 55′ 33″ is the greateſt *equation of the center* according to theſe obſervations.

To find the *equation of the center*, or to ſolve (what is called) *Kepler's* PROBLEM, is a very difficult operation, particularly in orbits, whoſe excentricity bears a conſiderable proportion to the mean difference: how this is to be done has been ſhewn by Newton, Gregory, Keil, Machin, La Caille, and others, by methods little differing from one another, which conſiſt chiefly in finding an intermediate angle, called the *excentric anomaly*; the mean anomaly and the dimenſions of the ſun's orbit being known. The mean anomaly is eaſily found, by determining the exact time of the ſun's paſſage through the aphelion, and uſing the following proportion, viz. as the time of a tropical revolution or ſolar year is to the interval between the aphelion and given time, ſo is 360° to the degrees of the mean anomaly; or, it may be found by taking the ſun's mean motion at the given time out of tables.

To find the excentric anomaly, let ADP (*Tab.* II. *Aſtronomy, fig.* 73.) be the excentric, AEP the earth's orbit, C the center, S the ſun, A the aphelion, P the perihelion, E the true place, D the correſponding place in the excentric, and B the mean place. In orbits of ſmall excentricities the true and mean places E and B approach one another, and the lines CD and SB approach to parallelism or coincidence; and therefore they may be conſidered as parallel, eſpecially in the earth's orbit, where CS is only about $\frac{1}{60}$ of CP: conſequently, ASB = ACD the excentric anomaly.

Then, in the triangle BCS, BC+CS=SA, and BC−CS=SP, and the angle BCS = ſupplement of ACB, are known, and therefore the angle CSB may be found; for, by a well-known trigonometrical theorem, $CS+BC\ (=SA) : BC-CS\ (=SP) :: \text{tang.}\frac{CSB+B}{2}$, or $\frac{1}{2}$ ACB : tang. of $\frac{CSB-B}{2}$, or of an arc, which added to $\frac{1}{2}$ ACB, will give CSB, the excentric anomaly; therefore, it may be found by the following proportion, as the aphelion diſtance is to the perihelion diſtance, ſo is the tangent of half the mean anomaly to the tangent of an arc, which, added to half the mean anomaly, will give the excentric anomaly. Then,

To find the true anomaly from the given excentric anomaly, and the dimenſions of the orbit, let a ſemicircle be deſcribed from E through the other focus s, interſecting AP in s, I, and SE, produced in G and H. Then, by Euclid, lib. iii. prop. 36. SH : SI :: Ss : SG $= \left(\frac{SI\times Ss}{SH} = \frac{\overline{Ss+SI}\times Ss}{SE+Es}, =\right) \frac{2CF\times 2CS}{2CA}$, the chord sI being biſected by the perpendicular from the center DF. Therefore, CF×CS = ($\frac{1}{2}$SG=) $\frac{1}{2}$SE−$\frac{1}{2}$Es; CA (=$\frac{1}{2}$SE+$\frac{1}{2}$Es) being radius; or conſequently, SE = (1+CS×CF, ſince the half difference of two quantities added to their half ſum gives the greater of them, =) 1+CS× coſine, or Σ, ACD. Again, in the triangle SFE, SE : R :: SF : Σ, ASE $= \left(\frac{SF}{SE}=\right) \frac{SC+\Sigma.\,ACD}{1+SC\times\Sigma.\,ACD}$. Then $1+\Sigma.\,ASE : 1-\Sigma.\,ASE :: 1+\frac{SC+\Sigma.\,ACD}{1+SC\times\Sigma.\,ACD} : 1-\frac{SC+\Sigma.\,ACD}{1+SC\times\Sigma.\,ACD}$; or, $\frac{1-\Sigma.\,ASE}{1+\Sigma.\,ASE} = \left(\frac{1+SC\times\Sigma.\,ACD-SC-\Sigma.\,ACD}{1+SC\times\Sigma.\,ACD+SC+\Sigma.\,ACD}\right.$ $= \frac{1-SC+SC\times\Sigma.\,ACD-\Sigma.\,ACD}{1+SC+SC\times\Sigma.\,ACD+\Sigma.\,ACD} = \frac{SP+\overline{CS-1}\times\Sigma.\,ACD}{SA+\overline{CS+1}\times\Sigma.\,ACD} = \frac{SP-\Sigma.\,ACD\times SP}{SA+\Sigma.\,ACD\times SA}=\right)$ $\frac{1-\Sigma.\,ACD\times SP}{1+\Sigma.\,ACD\times SA}$. But it is demonſtrated by trigonometrical

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metrical writers, that radius leſs the coſine of an arc divided by radius more the coſine of an arc is equal to the ſquare of the tangent of half that arc divided by the ſquare of the radius; therefore,

$\frac{1-\Sigma.\,ASE}{1+\Sigma.\,ASE}=T^2,\ \frac{1}{2}ASE$; and $\frac{1-\Sigma.\,ACD}{1+\Sigma.\,ACD}\times\frac{SP}{SA}=T^2,\ \frac{1}{2}ACD\times\frac{SP}{SA}$.

Then, $\frac{SP}{SA}\times T^2,\ \frac{1}{2}ACD=T^2.\ \frac{1}{2}ASE$, or $\frac{SP}{SA}=\frac{T^2.\ \frac{1}{2}ASE}{T^2.\ \frac{1}{2}ACD}$.

Therefore, $\frac{\sqrt{SP}}{\sqrt{SA}}=\frac{T.\ \frac{1}{2}ASE}{T.\ \frac{1}{2}ACD}$; and $\sqrt{SA}:\sqrt{SP}::T\,\frac{1}{2}ACD:T\,\frac{1}{2}ASE$.

Whence we have the following theorem; as the ſquare root of the aphelion diſtance is to the ſquare root of the perihelion diſtance, ſo is the tangent of half the excentric anomaly to the tangent of half the true anomaly.

The difference between the true and mean anomaly, or the angle $CQS=ACB-ASE$, is the *equation of the center*, which muſt be ſubtracted, from the aphelion to the perihelion, or in the firſt ſix ſigns of anomaly, and added, from the perihelion to the aphelion, or in the ſix laſt ſigns of anomaly, and hence called PROSTHAPHÆRESIS.

For the lines CB, SE, C*b*, SE, which coincide in SA, SP, will in every other poſition croſs one another; in Q, while revolving from A to P, and in *q*, while revolving from P to A: in the firſt half revolution, the mean anomaly, or the external angle ACB exceeds the angle ASE, the true anomaly, by the angle CQS; in the latter half, the true anomaly, or external angle PS *a*, exceeds the mean anomaly or the angle PC*b* by the angle S*q*C.

By this problem a table may be eaſily formed: when the *equations of the center* for every degree of the firſt ſix ſigns of mean anomaly are found, theſe will alſo ſerve for the degrees of the laſt ſix ſigns, becauſe equal anomalies are at equal diſtances on both ſides of their apſides: then ſet theſe *equations* orderly to their ſigns and degrees of anomaly; the firſt ſix being reckoned from the top of the table downwards, and ſigned *ſubtract*; the laſt ſix, for which the ſame *equations* ſerve, in a contrary order, being reckoned from the bottom upwards, and marked *add*; and let the difference between every adjacent two *equations*, called *tabular differences*, be ſet in another column: from theſe *equations of the center*, augmented or diminiſhed by the proportional parts of their reſpective tabular differences for any given minutes and ſeconds, may be eaſily deduced *equations of the center* to any given mean anomaly.

TABLE of the EQUATION of the *Sun's Center* to each Sign and Degree of Mean Anomaly.

Deg.	○ Subt.	Diff.	I. Subt.	Diff.	II. Subt.	Diff.	III. Sub.	Diff.	IV. Sub.	Diff.	V. Subt.	Diff.	Deg.
	○ ′ ″	′ ″	○ ′ ″	′ ″	○ ′ ″	′ ″	○ ′ ″	′ ″	○ ′ ″	′ ″	○ ′ ″	′ ″	
0	○ 0 0	1 59	○ 56 47	1 43	1 39 6	1 1	1 55 37	0 2	1 41 12	1 0	○ 58 53	1 46	30
1	1 59	58	58 30	42	40 7	0 59	55 39	1	40 12	0 2	57 7	48	29
2	3 57	59	1 0 12	41	41 6	57	55 38	2	39 10	4	55 19	49	28
3	5 56	58	1 53	40	42 3	56	55 36	5	38 6	6	53 30	50	27
4	7 54	58	3 33	39	42 59	53	55 31	7	37 0	8	51 40	51	26
5	9 52	58	5 12	38	43 52	52	55 24	9	35 52	9	49 49	52	25
6	○ 11 50	1 58	1 6 50	1 37	1 44 44	0 50	1 55 15	0 12	1 34 43	1 11	○ 47 57	1 52	24
7	13 48	58	8 27	35	45 34	48	55 3	13	33 32	13	46 5	54	23
8	15 46	57	10 2	34	46 22	46	54 50	15	32 19	15	44 11	55	22
9	17 43	57	11 36	33	47 8	45	54 35	18	31 4	17	42 16	55	21
10	19 40	57	13 9	32	47 53	42	54 17	20	29 47	18	40 21	56	20
11	21 37	56	14 41	30	48 35	40	53 57	21	28 29	20	38 25	57	19
12	○ 23 33	1 56	1 16 11	1 29	1 49 15	0 39	1 53 36	0 24	1 27 9	1 21	○ 36 28	1 58	18
13	25 29	56	17 40	28	49 54	36	53 12	26	25 48	23	34 30	58	17
14	27 25	55	19 8	26	50 30	35	52 46	28	24 25	25	32 32	59	16
15	29 20	55	20 34	25	51 5	32	52 18	30	23 0	26	30 33	2 0	15
16	31 15	54	21 59	23	51 37	31	51 48	33	21 34	28	28 33	0	14
17	33 9	53	23 22	22	52 8	28	51 15	34	20 6	30	26 33	0	13
18	○ 35 2	1 53	1 24 44	1 21	1 52 36	0 27	1 50 41	0 36	1 18 36	1 31	○ 24 33	2 1	12
19	36 55	52	26 5	19	53 3	24	50 15	39	17 5	32	22 32	2	11
20	38 47	52	27 24	17	53 27	23	49 26	40	15 33	34	20 30	2	10
21	40 39	51	28 41	16	53 50	20	48 46	43	13 59	35	18 28	2	9
22	42 30	50	29 57	14	54 10	18	48 3	44	12 24	37	16 26	2	8
23	44 20	49	31 11	13	54 28	16	47 19	47	10 47	38	14 24	3	7
24	○ 46 9	1 48	1 32 24	1 11	1 54 44	0 14	1 46 32	0 48	1 9 9	1 40	○ 12 21	2 3	6
25	47 57	48	33 35	10	54 58	12	45 44	51	7 29	40	10 18	4	5
26	49 45	47	34 45	8	55 10	10	44 53	52	5 49	42	8 14	3	4
27	51 32	46	35 53	6	55 20	8	44 1	54	4 7	43	6 11	4	3
28	53 18	45	36 59	4	55 28	6	43 7	57	2 24	45	4 7	3	2
29	55 3	1 44	38 3	1 3	55 34	3	42 10	0 58	0 39	46	2 4	4	1
30	○ 56 47		1 39 6		1 55 37		1 41 12		○ 58 53		○ 0 0		0
	XI. Add.	Diff.	X. Add.	Diff.	IX. Add.	Diff.	VIII Ad.	Diff.	VII. Ad.	Diff.	VI. Add	Diff.	

Robertſon's Elem. of Navig. book v. p. 286—290. 295—308.

Mr. Euler has particularly conſidered this ſubject in Mem. de l'Acad. de Berlin. tom. ii. p. 225. ſeq. where he ſolves the following problems:

1. To find the true and mean anomaly correſponding to the planet's mean diſtance from the ſun; that is, when the planet is in the extremity of the conjugate axis of its orbit.
2. The excentricity of a planet being given, to find the excentric anomaly correſponding to the greateſt *equation*.
3. The excentricity being given, to find the mean anomaly correſponding to the greateſt *equation*.
4. From the ſame data to find the true anomaly correſponding to this *equation*.
5. From the ſame data to find the greateſt *equation*.
6. The greateſt equation being given to find the excentricity. Mr. Euler obſerves, that this problem is very difficult, and that it can only be ſolved by approximation and tentatively in the manner he mentions; but, if the excentricity be not great, it may be then found directly from the greateſt *equation*. Thus, if the greateſt *equation* $= m$, and the excentricity $= n$, then,

$$m=2n+\frac{11}{48}n^3+\frac{599}{5120}n^5+,\ \&c.$$

Whence by converſion,

$$n=\frac{1}{2}m-\frac{11}{768}m^3-\frac{587}{2^{10}.\,15}m^5-,\ \&c.$$

Where the greateſt *equation m*, muſt be expreſſed in parts of the radius, which may be done by converting the angle *m*, into ſeconds, and adding 4,6855749 to the logarithm of the reſulting number, from this will be the logarithm of the number *m*.

The mean anomaly to which this greateſt *equation* correſponds will be $x=90^\circ+\frac{5}{8}m-\frac{5}{2^9.\,3}m^3-\frac{1}{2^9.\,5}m^5-,\ \&c.$

Whence, if to 90° we add $\frac{5}{8}$ of the greateſt *equation*, we ſhall ſufficiently approximate to this mean anomaly.

Mr. Euler gives us a table, in which may be found the greateſt *equations*, the excentric and mean anomalies correſponding to theſe greateſt *equations* for every hundredth part of unity, which he ſuppoſes equal to the greateſt excentricity, or when the diſtance of the foci and the tranſverſe axis become infinite. The laſt column of his table alſo gives us the logarithm of that diſtance of the planet from the ſun where its *equation* is greateſt. By the help of this table, any excentricity being given, we may find the greateſt correſponding *equation* by interpolation. But the principal uſe of the table is to determine

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the excentricity when the greateſt *equation* is known; and Mr. Euler thinks the queſtion inſoluble without this help. See the Table, lib. cit. p. 245, ſeq.

The motions of the ſun and moon are affected with various inequalities, whence ariſes the neceſſity of ſo many *equations*.

From theſe inequalities, the moon's place became exceeding difficult to be determined; to remove which difficulty, is the great deſign of Sir Iſaac Newton's New Theory of the moon, wherein we are furniſhed with *equations* for all the inequalities of the mean motion. The principal of theſe are,

EQUATIONS, *annual, of the mean motion of the ſun and moon, and of the apogee and nodes of the moon.*

The annual *equation* of the ſun's center being given, the three other correſponding annual *equations* will be alſo given, and therefore a table of that will ſerve for all. For if the annual *equation* of the ſun's center be taken from thence for any time, and be called P, and let $\frac{1}{10}$ P=Q, Q+$\frac{1}{30}$, Q=R, $\frac{1}{6}$ P=D. D+ $\frac{1}{30}$ D=E, and D−$\frac{1}{60}$D=2F; then ſhall the annual *equation* of the moon's mean motion for that time be R, that of the apogee of the moon will be E, and that of the node F.

Only obſerve, that if the *equation* of the ſun's center be required to be added, then the *equation* of the moon's mean motion muſt be ſubtracted, that of her apogee muſt be added, and that of the node ſubducted; and, on the contrary, if the *equation* of the ſun's center were to be ſubducted, the moon's *equation* muſt be added, the *equation* of her apogee ſubducted, and that of her node added.

There is alſo an *equation of the moon's mean motion*, depending on the ſituation of her apogee in reſpect of the ſun, which is greateſt when the moon's apogee is in an octant with the ſun, and is nothing at all when it is in the quadratures or ſyzygies. This *equation*, when greateſt, and the ſun in perigæo, is 3 min. 56 ſeconds. But if the ſun be in apogæo, it will never be above 3 min. 34 ſeconds. At other diſtances of the ſun from the earth, this *equation*, when greateſt, is reciprocally as the cube of that diſtance. But when the moon's apogee is any where but in the octants, this equation grows leſs, and is moſtly at the ſame diſtance between the earth and ſun, as the ſine of the double diſtance of the moon's apogee from the next quadrature or ſyzygy to the radius. This is to be added to the moon's motion while her apogee paſſes from a quadrature with the ſun to a ſyzygy; but is to be ſubtracted from it, while the apogee moves from the ſyzygy to the quadrature.

There is, moreover, another *equation of the moon's motion*, which depends on the aſpect of the nodes of the moon's orbit with reſpect to the ſun; and this is greateſt when her nodes are in octants to the ſun, and vanquiſhes quite when they come to their quadratures or ſyzygies. This *equation* is proportional to the ſine of the double diſtance of the node from the next ſyzygy or quadrature; and at the greateſt, is but 47 ſeconds. This muſt be added to the moon's mean motion while the nodes are paſſing from the ſyzygies with the ſun to their quadratures with him, but ſubtracted while they paſs from the quadratures to the ſyzygies.

From the ſun's true place take the equated mean motion of the lunar apogee as was above ſhewed, the remainder will be the annual argument of the ſaid apogee; from whence the excentricity of the moon and the ſecond *equation* of her apogee may be compared. See *Theory of the* MOON's *Motions*, &c.

EQUATION, *excentric.* See EXCENTRIC.

EQUATION, *lunar and ſolar*, in *Chronology.* See METEMPTOSIS.

EQUATOR, or ÆQUATOR, in *Aſtronomy* and *Geography*, a great circle of the ſphere, equally diſtant from the two poles of the world, or having the ſame poles with thoſe of the world.

Such is the circle D A (*Tab. Aſtron. fig.* 52.) its poles being P and Q. It is called the *equator*, becauſe when the ſun is in it the days and nights are *equal*; whence alſo it is called the *equinoctial*; and when drawn on maps and planiſpheres, the *equinoctial line*, or ſimply, the *line*.

Every point of the *equator* is a quadrant's diſtance from the poles of the world; whence it follows, that the *equator* divides the ſphere into two hemiſpheres, in one of which is the northern, and in the other the ſouthern pole.

By the paſſages or tranſits of arcs of the *equator* over the meridian, equal or mean time is eſtimated; hence we have frequent occaſion for the converſion of degrees of the *equator* into time; and again, for the re-converſion of parts of time into degrees or parts of the *equator*.

For performance whereof, we ſubjoin the following table; wherein are exhibited the arcs of the *equator*, which paſs the meridian in the ſeveral hours, minutes, &c. of equated or mean time.

Converſion of the Parts of the *Equator* into Time, and *vice verſa*.

Deg. of *Equat.*	Hours.	Min.	Hours.	Deg of *Equat*	Hour. Min.	Deg. of *Equat.*	′
Min.	Min.	Sec.	Min. ′	Min.	Sec.	Min. ′	″
Sec.	Sec.	Third.	Sec ″	Sec. ″	Third	Sec. ″	‴
Third.	Third.	Fourth.	Th. ‴	Th. ‴	Fourth.	Th. ‴	⁗
1	0	4	1	15	1	0	15
2	0	8	2	30	2	0	30
3	0	12	3	45	3	0	45
4	0	16	4	60	4	1	0
5	0	20	5	75	5	1	15
10	0	40	6	90	6	1	30
15	1	0	9	135	10	2	30
30	2	0	12	180	20	5	0
60	4	0	15	225	30	7	30
90	6	0	18	270	40	10	0
180	12	0	21	315	50	12	30
360	24	0	24	360	60	15	0

The conſtruction of this table is very eaſy; for the *equator* being divided into 360 degrees, and revolving always in 24 hours, any point of it moves through 15° in one hour, and in one minute through the 60th part of 15°, or 15′ of a degree, and in one ſecond through 15″ of a degree, &c. and therefore nothing more is neceſſary beſides ſimple addition, in order to have the number of degrees, minutes and ſeconds, which it deſcribes in any given time.

The uſe of the table is obvious; ſuppoſe, e. gr. it were required to turn 19° 13′ 7″ of the *equator* into time: againſt 15 deg. in the firſt column we have 1ʰ 0′ 00″; againſt 4 deg. we have 16′ 0″; againſt 10 minutes, 40″; againſt 3 minutes, 12″ 0″; againſt 5 ſeconds, we have 0′ 20‴; and againſt 2 ſeconds, 8‴; which, added together, give 1ʰ 16′ 52″ 28‴.

Again, ſuppoſe it were required to find how many degrees, minutes, &c. of the *equator* anſwers to 23 hours 25 min. 17 ſec. and 9 thirds. Againſt 21ʰ in the fourth column of the table, you have 315°; and againſt 2 hours, 30; againſt 20′, 5°; againſt 5′, 1° 15′; againſt 10 ſec. 2′ 30″; againſt 5 ſec. 1′ 15″ 0‴; againſt 2 ſec. 30″ 0‴; againſt 6 thirds, 1″ 30‴; and againſt 3 thirds, 45‴; which, added together, gives 351° 19′ 17″ 15‴. See EQUINOCTIAL.

EQUATOR, *elevation* or *altitude of the.* See ELEVATION *of the equator.*

EQUATOREAL, *univerſal*, in *Aſtronomy*, is the name of an excellent inſtrument lately conſtructed by Mr. Ramſden, an ingenious philoſophical inſtrument-maker in London. The principal parts of this *equatoreal* (ſee *Tab.* II. *Aſtronomy, fig.* 74.) are 1. The azimuth or horizontal circle A, which repreſents the horizon of the place, and moves on a long axis B, called the vertical axis. 2. The *equatoreal* or hour-circle C, repreſenting the equator, placed at right angles to the polar axis D, or the axis of the earth, upon which it moves. 3. The ſemicircle of declination E, on which the teleſcope is placed, and moving on the axis of declination, or the axis of motion of the line of collimation F. Theſe circles are meaſured and divided as in the following table:

Meaſures of the ſeveral circles and diviſions on them.	Radius. In. dec.	Limb divided to	Nonius of 30 gives ſeconds.	Divided on limb into parts of inc.	Divided by Nonius into parts of inch.
Azimuth or horizontal circle	5 1	15′	30″	45th	1350th
Equatoreal or hour circle	5 1	15′ / 1′ in time	30″ / 2″	45th	1350th
Vertical ſemicircle for declination or latitude	5 5	15′	30″	42d	1260th

4. The teleſcope, which is an achromatic refractor with a triple object glaſs, whoſe focal diſtance is 17 inches, and aperture 2,45 inches, and furniſhed with 6 different eye-tubes; ſo that its magnifying powers extend from 44 to 168. The teleſcope in this *equatoreal* may be brought parallel to the polar axis, as in the figure, ſo as to point to the pole-ſtar in any part of its diurnal revolution; and thus it has been obſerved near noon, when the ſun has ſhone very bright. 5. The apparatus for correcting the error in altitude occaſioned by refraction, which is applied to the eye-end of the teleſcope, and conſiſts of a ſlide G moving in a groove or dove-tail, and carrying the ſeveral eye-tubes of the teleſcope, on which ſlide there is an index correſponding to 5 ſmall diviſions engraved on the dove-tail; a very ſmall circle, called the refraction circle H, moveable by a finger-ſcrew at the extremity of the eye-end of the teleſcope; which circle is divided into half-minutes, one entire revolution of it being equal to 3′ 18″, and by its motion raiſes the

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the center of the croſs-hairs on a circle of altitude; and likewiſe a quadrant I of 1½ inch radius, with diviſions on each ſide, one expreſſing the degree of altitude of the object viewed, and the other expreſſing the minutes and ſeconds of error occaſioned by refraction, correſponding to that degree of altitude: to this quadrant is joined a ſmall round level K, which is adjuſted partly by the pinion that turns the whole of this apparatus, and partly by the index of the quadrant; for which purpoſe the refraction circle is ſet to the ſame minute, &c. which the index points to on the limb of the quadrant; and if the minute, &c. given by the quadrant exceed the 3′ 18″ contained in one entire revolution of the refraction circle, this muſt be ſet to the exceſs above one or more of its entire revolutions; then the center of the croſs-hairs will appear to be raiſed on a circle of altitude to the additional height which the error of refraction will occaſion at that altitude.

This inſtrument ſtands on three feet L diſtant from each other 14,4 inches; and when all the parts are horizontal is about 29 inches high: the weight of the *equatoreal* and apparatus is only 59 lb. avoirdupoiſe, which are contained in a mahogany caſe weighing 58 lb.

The principal adjuſtment in this inſtrument is that of making the line of collimation to deſcribe a portion of an hour-circle in the heavens; in order to which, the azimuth circle muſt be truly level, the line of collimation or ſome correſponding line repreſented by the ſmall braſs rod M parallel to it, muſt be perpendicular to the axis of its own proper motion; and this laſt axis muſt be perpendicular to the polar axis: on the braſs rod M there is occaſionally placed a hanging level N, the uſe of which will appear in the following adjuſtments:

The azimuth circle may be made level by turning the inſtrument till one of the levels is parallel to an imaginary line joining two of the feet ſcrews; then adjuſt that level with theſe two feet ſcrews; turn the circle half round, i. e. 180°; and if the bubble be not then right, correct half the error by the ſcrew belonging to the level, and the other half error by the two foot ſcrews; repeat this till the bubble comes right; then turn the circle 90° from the two former poſitions, and ſet the bubble right, if it be wrong, by the foot ſcrew at the end of the level; when this is done, adjuſt the other level by its own ſcrew, and the azimuth circle will be truly level. The hanging level muſt then be fixed to the braſs rod by two hooks of equal length, and made truly parallel to it: for this purpoſe make the polar axis perpendicular or nearly perpendicular to the horizon; then adjuſt the level by the pinion of the declination ſemicircle; reverſe the level, and if it be wrong, correct half the error by a ſmall ſteel ſcrew that lies under one end of the level, and the other half error by the pinion of the declination ſemicircle; repeat this till the bubble be right in both poſitions. In order to make the braſs rod on which the level is ſuſpended at right angles to the axis of motion of the teleſcope or line of collimation, make the polar axis horizontal, or nearly ſo; ſet the declination ſemicircle to 0°, turn the hour-circle till the bubble comes right; then turn the declination-circle to 90°; adjuſt the bubble by raiſing or depreſſing the polar axis, (firſt by hand till it be nearly right, afterwards tighten with an ivory key the ſocket which runs on the arch with the polar axis, and then apply the ſame ivory key to the adjuſting ſcrew at the end of the ſaid arch till the bubble comes quite right); then turn the declination-circle to the oppoſite 90°; if the level be not then right, correct half the error by the aforeſaid adjuſting ſcrew at the end of the arch, and the other half error by the two ſcrews which raiſe or depreſs the end of the braſs rod. The polar axis remaining nearly horizontal as before, and the declination-ſemicircle at 0°, adjuſt the bubble by the hour-circle; then turn the declination-ſemicircle to 90°, and adjuſt the bubble by raiſing or depreſſing the polar axis; then turn the hour-circle 12 hours; and if the bubble be wrong, correct half the error by the polar axis, and the other half error by the two pair of capſtan ſcrews at the feet of the two ſupports on one ſide of the axis of motion of the teleſcope; and thus this axis will be at right angles to the polar axis. The next adjuſtment is to make the center of croſs hairs remain on the ſame object, while you turn the eye-tube quite round by the pinion of the refraction apparatus: for this adjuſtment, ſet the index on the ſlide to the firſt diviſion on the dove-tail; and ſet the diviſion marked 18″ on the refraction-circle to its index; then look through the teleſcope, and with the pinion turn the eye-tube quite round; and if the center of the hairs does not remain on the ſame ſpot during that revolution, it muſt be corrected by the four ſmall ſcrews, two and two at a time, which you will find upon unſcrewing the neareſt end of the eye-tube that contains the firſt eye-glaſs) repeat this correction till the center of the hairs remains on the ſpot you are looking at during an entire revolution. In order to make the line of collimation parallel to the braſs rod on which the level hangs, ſet the polar axis horizontal, and the declination circle to 90°, adjuſt the level by the polar axis; look through the teleſcope on ſome diſtant horizontal object, covered by the center of the croſs hairs; then invert the teleſcope, which is done by turning the hour-circle half round; and if the center of the croſs hairs does not cover the ſame object as before, correct half the error by the uppermoſt and lowermoſt of the four ſmall ſcrews at the eye-end of the large tube of the teleſcope; this correction will give a ſecond object now covered by the center of the hairs, which muſt be adopted inſtead of the firſt object; then invert the teleſcope as before; and if the ſecond object be not covered by the center of the hairs, correct half the error by the ſame two ſcrews which were uſed before: this correction will give a third object, now covered by the center of the hairs, which muſt be adopted inſtead of the ſecond object; repeat this operation till no error remains; then ſet the hour-circle exactly to 12 hours, (the declination-circle remaining at 90° as before); and if the center of the croſs hairs does not cover the laſt object fixed on, ſet it to that object by the two remaining ſmall ſcrews at the eye-end of the large tube, and then the line of collimation will be parallel to the braſs rod. For rectifying the Nonius of the declination and *equatoreal* circles, lower the teleſcope as many degrees, minutes, and ſeconds, below 0° or Æ on the declination-ſemicircle as are equal to the complement of the latitude; then elevate the polar axis till the bubble be horizontal, and thus the *equatoreal* circle will be elevated to the co-latitude of the place; ſet this circle to 6 hours; adjuſt the level by the pinion of the declination-circle; then turn the *equatoreal* circle exactly 12 hours from the laſt poſition; and if the level be not right, correct one half of the error by the *equatoreal* circle, and the other half by the declination-circle; then turn the *equatoreal* circle back again exactly 12 hours from the laſt poſition; and if the level be ſtill wrong, repeat the correction as before till it be right, when turned to either poſition; that being done, ſet the Nonius of the *equatoreal* circle exactly to 6 hours, and the Nonius of the declination-circle exactly to 0°.

The principal uſes of this *equatoreal* are,

1. To find your meridian by one obſervation only: for this purpoſe, elevate the *equatoreal* circle to the co-latitude of the place, and ſet the declination-ſemicircle to the ſun's declination for the day and hour of the day required; then move the azimuth and hour-circles both at the ſame time, either in the ſame or contrary direction, till you bring the center of the croſs hairs in the teleſcope exactly to cover the center of the ſun; when that is done, the index of the hour-circle will give the apparent or ſolar time at the inſtant of obſervation; and thus the time is gained, though the ſun be at a diſtance from the meridian; then turn the hour-circle till the index points preciſely at 12 o'clock, and lower the teleſcope to the horizon, in order to obſerve ſome point there in the center of your glaſs, and that point is your meridian mark found by one obſervation only; the beſt time for this operation is three hours before or three hours after 12 at noon.

2. To point the teleſcope on a ſtar, though not on the meridian, in full day-light. Having elevated the *equatoreal* circle to the co-latitude of the place, and ſet the declination-ſemicircle to the ſtar's declination, move the index of the hour-circle till it ſhall point to the preciſe time at which the ſtar is then diſtant from the meridian, found in tables of the right aſcenſion of the ſtars, and the ſtar will then appear in the glaſs. Beſides theſe uſes peculiar to this inſtrument, it is alſo applicable to all the purpoſes to which the principal aſtronomical inſtruments, viz. a tranſit, a quadrant, and an equal altitude inſtrument, are applied. See the deſcription and drawing of an *equatoreal* teleſcope, or portable obſervatory, invented by Mr. Short, in the Phil. Tranſ. N° 493. or vol. xlvi. p. 242, &c. And another by Mr. Nairne, vol. lxi. part i. art. 14. p. 107.

EQUERY, or ECURY, a grand ſtable or lodge for horſes, furniſhed with all the conveniencies thereof; as ſtalls, manger, rack, &c.

The word is formed from the French, *eſcurie*, which ſignifies the ſame thing. Some again derive *eſcurie* from the Latin, *ſcuria*, which not only denotes a place for beaſts to be put up in, but alſo a grange or barn. But a more probable derivation is from *equile*, *a ſtable for horſes*, of *equus*, *horſe*.

Some hold that the word *ſtable*, in propriety, relates only to bullocks, cows, ſheep, hogs, &c. and *equery*, to horſes, mules, &c.

A *ſimple equery* is that provided for one row of horſes; a *double equery* that provided for two, with a paſ-

ſage

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ſage in the middle, or two paſſages; the horſes being placed head to head, as in the little *equery* at Verſailles.

Under *equery* are ſometimes alſo comprehended the lodgings and apartments of the *equeries*, grooms, pages, &c.

EQUERY, *eſcuyer*, is alſo an officer who has the care and management of the horſes of a king or prince.

EQUERIES, or EQUERRIES, popularly called QUERRIES, are particularly uſed among us for officers of the king's ſtables, under the maſter of the horſe, ſeven in number, who, when his majeſty goes abroad, ride in the leading-coach, are in waiting one at a time monthly, and have a table with the gentlemen-uſhers during the time, and a ſalary of 300 *l.* a year each.

They uſed to ride on horſeback by the coach-ſide when the king travelled; but that being more expenſive to them than neceſſary to the ſovereign, it has been diſcontinued.

EQUERIES *of the crown ſtable* have that appellation, as being employed in managing and breaking the ſaddle-horſes, and preparing them for the king's riding.

Theſe are two in number; the firſt having an annual ſalary of 256*l.* and the ſecond 200*l.* whereof one is, or always ſhould be, in cloſe waiting at court; and when his majeſty rides, holds the ſtirrup, while the maſter of the horſe, or one of the *equeries* in his abſence, aſſiſts in mounting him; and when his majeſty rides, they uſually attend him.

EQUES *auratus*, is uſed to ſignify a knight bachelor, called *auratus*, q. d. *gilt*, becauſe anciently none but knights might gild or beautify their armour, or other habiliments of war, with gold.

In law, this term is not uſed, but inſtead of it *miles*, and ſometimes *chevalier*.

EQUESTRIA, among the Romans, a place in the theatre where the equites or knights ſat.

EQUESTRIS, EQUESTRIAN, a term chiefly uſed in the phraſe, *equeſtrian ſtatue*, which ſignifies a ſtatue repreſenting a perſon mounted on horſeback.

The word is formed of the Latin, *eques*, *knight*, *horſeman*, of *equus*, *horſe*.

The *Fortuna equeſtris*, in ancient Rome, was a ſtatue of the goddeſs on horſeback. We ſometimes alſo ſay, *Equeſtrian* COLUMN.

EQUESTRIAN *cohort*, in *Antiquity*. See COHORS *equitata*.

EQUESTRIAN *games*, *ludi equeſtres*, among the Romans, horſe-races, of which there were five kinds, the *prodromus*, or *plain horſe-race*, the *chariot race*, the *decurſory race*, about funeral piles, the *ludi ſevirales*, and the *ludi neptunales*.

EQUESTRIAN *order*, among the Romans, ſignified the order of knights or *equites*.

EQUIANGULAR, or ÆQUIANGULAR, in *Geometry*, is applied to figures whoſe angles are all equal. See ANGLE.

A ſquare is an *equiangular* figure. See SQUARE. All equilateral triangles are alſo *equiangular*.

EQUICRURAL, or ÆQUICRURAL *triangle*, is what we more uſually call an ISOSCELES *triangle*.

EQUICULUS, EQUULEUS, or EQUUS *minor*, a conſtellation of the northern hemiſphere. See EQUULEUS.

EQUIDIFFERENT, or ÆQUIDIFFERENT, in *Arithmetic*. If in a ſeries of three quantities there be the ſame difference between the firſt and ſecond as between the ſecond and third, they are ſaid to be *continually equidifferent*; but, if in a ſeries of four quantities, there be the ſame difference between the firſt and ſecond as between the third and fourth, they are ſaid to be *diſcretely equidifferent*.

Thus, 3, 6, 7, and 10, are diſcretely *equidifferent*, and 3, 6, and 9, continually *equidifferent*.

EQUIDISTANT, or ÆQUIDISTANT, in *Geometry*, a term of relation between two things which are every where at an equal or the ſame diſtance from each other. See DISTANCE.

Thus, parallel lines are ſaid to be *equidiſtant*, as they neither approach nor recede.

EQUILATERAL, or ÆQUILATERAL, of *æquus*, *equal*, and *latus*, *ſide*, is applied to any thing whoſe ſides are all equal.

Thus, an *equilateral* triangle is that whoſe ſides are all of equal length. In an *equilateral* triangle all the angles are likewiſe equal.

All regular polygons and regular bodies are *equilateral*. See POLYGON, REGULAR, &c.

EQUILATERAL *hyperbola*, is that wherein the conjugate axes, as A B and D E are equal. *Tab. Conics*, *fig.* 20.

Hence, as the parameter is a third propoſtional to the conjugate axes, it is alſo equal thereto; conſequently, if in the equation $y^2 = bx \pm \frac{bx^2}{a}$, we make $b = a$: the equation $y^2 = ax + x^2$, defines the nature of an *equilateral hyperbola*. See HYPERBOLA.

EQUILIBRIUM, or ÆQUILIBRIUM, in *Mechanics*, a term implying an exact equality of momentum or force between two bodies compared with each other; and this takes place when their directions are equally oppoſite, and their maſſes are reciprocally proportional to the velocities with which they tend to move. See FORCE.

A balance is in *equilibrio* when the two ends are ſo exactly poiſed that neither of them aſcends or deſcends, but both retain their parallel poſition to the horizon. From this circumſtance the word is originally taken, as being a compound of *æquus*, *equal*, and *libra*, *balance*; whence we frequently uſe the word *balance* in lieu thereof.

The *equilibrium* of fluids make a conſiderable part of the doctrine of hydroſtatics. See FLUID.

EQUILIBRIUM, is alſo uſed figuratively on other occaſions.

A painter muſt take care to obſerve the *equilibrium* of his figures, i. e. diſpoſe them well on their center of gravity, that they may not ſeem ill-ſupported, or ready to tumble. Thus, e. gr. if one arm be moved forward, the other muſt be proportionably backward to poiſe the figure.

In a picture there ſhould always be an *equilibrium* between one part and another; that is, the objects are to be diſtributed ſo as to balance and contraſt each other; and not too many, e. gr. be crouded on one ſide, and the other be left bare.

EQUIMULTIPLE, in *Arithmetic* and *Geometry*, is applied to ſimple magnitudes when multiplied equally, i. e. by equal quantities or multipliers.

Thus, taking A as many times as B, or multiplying them equally, there will ſtill remain the ſame ratio between the magnitudes thus multiplied as between the primitive magnitudes before multiplication.

Now, thoſe magnitudes thus equally multiplied are called *equimultiples* of the original ones A and B; whence we ſay, that *equimultiples* have the ſame ratio as the ſimple quantities. In arithmetic, we generally uſe the term *equimultiples* for numbers which contain equally or an equal number of times their *ſubmultiples*.

Thus 12 and 6 are *equimultiples* of their *ſubmultiples* 4 and 2, inaſmuch as each of them contains its *ſubmultiple* three times.

EQUINA *ſella*. See the article SELLA.

EQUINOCTIAL, or ÆQUINOCTIAL, in *Aſtronomy*, a great and immoveable circle of the ſphere, under which the equator moves in its diurnal motion.

The *equinoctial* or *equinoctial line*, is ordinarily confounded with the equator; but there is a difference, the equator being moveable, and the *equinoctial* immoveable; and the equator being drawn about the convex ſurface of the ſphere, but the *equinoctial* on the concave ſurface of the magnus orbis.

The *equinoctial* is conceived by ſuppoſing a ſemidiameter of the ſphere produced through a point of the equator, and there, by the rotation of the ſphere about its axis, deſcribing a circle on the immoveable ſurface of the primum mobile.

Whenever the ſun, in his progreſs through the ecliptic, comes to this circle, it makes equal days and nights all around the globe; as then riſing due eaſt and ſetting due weſt, which he never does at any other time of the year. And hence the denomination from *æquus* and *nox*, *night*, *quia æquat diem nocti*.

The *equinoctial*, then, is the circle which the ſun deſcribes, or appears to deſcribe, at the time of the equinoxes; that is, when the length of the day is every-where equal to that of night, which happens twice a year. See EQUINOX.

EQUINOCTIAL, in *Geography*. See EQUATOR.

The ſhadows of thoſe who live under this circle are caſt to the ſouthward of them for one half of the year, and to the northward of them during the other half; and twice in a year, viz. at the equinoxes, the ſun at noon caſts no ſhadow, being in their zenith.

From this circle is the declination or latitude of places accounted in the degrees of the meridian.

EQUINOCTIAL *points*, are the two points wherein the equator and ecliptic interſect each other: the one being in the firſt point of Aries, is called the *vernal point*, or *equinox*; and the other in the firſt point of Libra, the *autumnal point*, or *equinox*.

EQUINOCTIAL *colure*, is that paſſing through the *equinoctial* points. See COLURE.

EQUINOCTIAL *dial*, is that whoſe plane lies parallel to the *equinoctial*. See DIAL.

EQUINOCTIAL *hours*, *line*, *orient*. See the ſubſtantives.

EQUINOX, or ÆQUINOX, in *Aſtronomy*, the time when the ſun enters one of the EQUINOCTIAL *points*.

The *equinoxes* happen when the ſun is in the *equinoctial* circle; when of conſequence the days are equal to the nights throughout the world, which is the caſe twice a year, viz. about the 20th of March and the 23d of September, the firſt of which is the *vernal*, and the ſecond the *autumnal equinox*.

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As the ſun's motion is unequal, that is, ſometimes ſwifter and ſometimes ſlower (from the cauſes already explained under the article EQUATION) it comes to paſs, that there are about eight days more from the vernal to the autumnal *equinox* than from the autumnal to the vernal, the ſun ſpending ſo much more time in travelling through the northern than the ſouthern ſigns.

According to the obſervations of M. Caſſini, the ſun is $186^d\ 14^h\ 53'$ in the northern ſigns, and only $178^d\ 14^h\ 56'$ in the ſouthern. The difference of which is $7^d\ 23^h\ 57'$.

The ſun, continually advancing forwards in the ecliptic and gaining a degree every day, makes no ſtay in the equinoctial points, but the moment he arrives in them he alſo leaves them.

Of courſe, therefore, though the day the ſun enters the equinoctial point is called the *equinox*, as being reputed equal to the night; yet it is not preciſely ſo, unleſs the ſun enter the equator at mid-day: for if the ſun riſing, ſhould enter the vernal *equinox* at ſetting, he will have departed from it, and have got northwards about 12'; conſequently, that day will be ſomewhat longer than 12 hours, and the night proportionably ſhorter.

The time of the *equinoxes*, i. e. the moment in which the ſun enters the equator, is found by obſervation, the latitude of the place of the obſervation being given.

Thus, in the equinoctial day, or near it, take the juſt meridian altitude of the ſun; if this be equal to the altitude of the equator, or the complement of the latitude, the ſun is that very moment in the equator: if it be not equal, the difference is the ſun's declination. The next day obſerve the meridian altitude as before, and find his declination; if the declination be of different kinds, viz. the one north and the other ſouth, the *equinox* has happened in the interval of time between them; otherwiſe, the ſun has not entered the equinoctial, or had paſſed it at firſt. From theſe obſervations a trigonometrical calculus gives the time of the *equinox*.

Thus, let DG (*Tab.* II. *Aſt. fig.* 75.) repreſent the equator, AC the ecliptic, E the equinoctial point; the points A, B, C, the places of the ſun at the times of obſervation; the arcs AD, BF, CG, the correſponding declinations; in the right-angled ſpherical triangles CEG, BEF, the obliquity of the ecliptic, and the declinations are known; whence may eaſily be found EC, EB; then BC, the ſum or difference of EC, EB is the ecliptic arc deſcribed in 24 hours: then ſay as BC : BE :: 24 hours for BC : time for BE; and this time ſhews the diſtance of the *equinox* from the time of the middle obſervation.

It is found by obſervation, that the equinoctial points, and all the other points of the ecliptic, are continually moving backward, or in antecedentia, that is, weſtward. This retrograde motion of the equinoctial points, is that famous and difficult phænomenon called the *preceſſion of the equinoxes*. See PRECESSION *of the equinoxes*.

EQUINUS *barbatus*, a kind of comet. See HIPPEUS.

EQUINUS *ellipticus* and *quadrangularis*. See HIPPEUS.

EQUINUS *venter*. See VENTER *equi*.

EQUIPAGE, in the *Military Art*, denotes all ſorts of utenſils, artillery, &c. neceſſary for commencing and proſecuting with eaſe and ſucceſs any military operations. Camp and field *equipage* conſiſts of tents, kitchen furniture, ſaddle-horſes, baggage, waggons, bat-horſes, &c.

EQUIPAGE, in *Navigation*. See CREW and FITTING-OUT.

To EQUIP, in *Naval language*, a term borrowed from the French marine, and frequently applied to the buſineſs of fitting a ſhip for ſea, or arming her for war. See FITTING-OUT.

EQUIPOLLENCE, in *Logic*, is when there is an equivalence between any two or more terms or propoſitions; i. e. when they ſignify one and the ſame thing, though they expreſs it differently. Such propoſitions, &c. are ſaid to be *equipollent*.

EQUIPPE'D, in *Heraldry*, expreſſes a cavalier equipped, i. e. armed at all points.

EQUIRIA, in *Antiquity*, a feſtival inſtituted by Romulus, and celebrated on the 27th of February, in honour of Mars, at which there were horſe-races.

EQUISELIS, in *Natural Hiſtory*, the name of a large fly, of the ſize of a hornet, but having only two wings and no ſting: it otherwiſe much reſembles the common hornet in ſhape. This fly is found only in Macedonia. We have alſo in England flies which nearly reſemble the hornet, waſp, and bee, but in their wanting ſtings and having only two wings.

EQUISELIS, in *Ichthyology*, a name uſed by ſome authors for the Hippuris, a ſea-fiſh, caught on the Spaniſh ſhores, and ſuppoſed by many to be the ſame with the DORADA, or CORYPHÆNA with the forked tail of Artedi. See HIPPURIS.

EQUISETUM, in *Botany*. See HORSE-*tail*.

EQUITATA *cohors*, in *Antiquity*. See COHORS *equitata*.

EQUITY, ÆQUITAS, denotes juſtice or right, mitigated and tempered by the conſideration of particular circumſtances; or a correction and abatement of the ſeverity of ſome law; or a temperament, which, without being unjuſt, abates the rigour of ſome juſt law.

This is what the Greeks call επιεικεια. The utmoſt ſeverity of a good law is frequently contrary to juſtice; it ſhould always have *equity* for its rule and guide. *Summum jus, ſæpe ſumma injuria.*

The foundation of *equity* is not that there is any miſtake in the law, but that the law was laid down univerſally, becauſe all circumſtances could not be conſidered or taken in under one law.

For an inſtance, ſuppoſe it an expreſs law, that the city being now beſet with an enemy, the gates be all ſhut; and ſuppoſe it fall out that the enemy is then in purſuit after ſome of the citizens by whom it is defended, ſo that it would be highly prejudicial thereto not to open for them the gates; *equity* here decrees the gates to be opened, contrary to the expreſs word of the law.

Equity is of two kinds, and thoſe of contrary effects; the one abridges, and takes from the letter of the law; and the other enlarges, and adds thereto.

The firſt is defined the correction of a law, made generally in that part wherein it fails; as ſuppoſe a ſtatute made, "That whoſoever does ſuch a thing ſhall be a "felon, or ſuffer death:" yet if a mad-man, or an infant, who hath no diſcretion, do the ſame, he ſhall neither be a felon nor ſuffer death.

The other is defined an extenſion of the words of the law to caſes which are not expreſſed, which yet come under the ſame reaſon; ſo that when one thing is enacted, all other things which are of the like degree are ſo too.

Thus, the ſtatute which ordains, that in action of debt againſt executors, he who appears by diſtreſs ſhall anſwer, extends by *equity* to adminiſtrators; and ſuch of them as ſhall appear firſt by diſtreſs, ſhall anſwer by the *equity* of the ſaid act, *quia ſunt in æquali genere.*

EQUITY is alſo uſed for the virtue of juſtice. See JUSTICE.

EQUITY, in our *Laws*, &c. is alſo frequently uſed for the court of chancery, where controverſies are ſuppoſed to be determined according to the exact rules of *equity* and conſcience, by mitigating the rigour of the common law.

Æquitas ſequitur legem, is an old maxim in law; but, from the great increaſe of ſuits in chancery, ſome have thought fit to give it this conſtruction, that in all caſes after a man has been at law, he muſt go to *equity*.

EQUITY *of redemption*, on mortgages, is that right which a mortgager has of redeeming his eſtate upon payment of the money borrowed. If where money is due on a mortgage, the mortgagee is deſirous to bar the *equity of redemption*, he may oblige the mortgagor either to pay the money, or be foreclоſed of his *equity*; which is done by proceedings in the court of chancery. But the chancery cannot ſhorten the time of payment of the mortgage money, where it is limited by expreſs covenant, though it may lengthen it; and then upon non-payment, the practice is to foreclоſe the *equity of redemption* of the mortgagor. 2 Vent. 364.

To foreclоſe the *equity*, a bill in chancery is exhibited, to which an anſwer is put in, and a decree being obtained, a maſter in chancery is to certify what is due for principal, intereſt, and coſts, which are to be prefixed by the decree, whereupon the premiſes are to be re-conveyed to the mortgagor; or in default of payment, the mortgagor is ordered to be foreclоſed from all *equity of redemption*, and to convey the premiſes abſolutely to the mortgagee. Law of Securities, p. 129. 133.

By ſtat. 7 Geo. II. cap. 20. after payment or tender by the mortgagor of principal, intereſt, and coſts, the mortgagee can maintain no ejectment, but may be compelled to re-aſſign his ſecurities.

EQUITY, in *Mythology*, ſometimes confounded with Juſtice, a goddeſs among the Greeks and Romans, repreſented with a ſword in one hand and a balance in the other.

EQUIVALENT, is underſtood of ſomething that is equal in value, force, or effect, to another.

Equivalence is of various kinds, in propoſitions, in terms, and in things.

EQUIVALENT *propoſitions*. See EQUIPOLLENCE.

EQUIVALENT *terms* are where ſeveral words that differ in ſound have yet one and the ſame ſignification; as *every body was there*, and *nobody was abſent*, *nihil non*, and *omne*.

EQUIVALENT *things*, are either *moral*, *phyſical*, or *ſtatical*. *Moral*, as when we ſay that the commanding or adviſing a murder is a guilt *equivalent* to that of the murderer.

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Phyſical, as when a man who has the ſtrength of two men is ſaid to be *equivalent* to two men. *Statical*, whereby a leſs weight becomes of equal force with a greater, by having its diſtance from the center increaſed.

EQUIVOCAL, EQUIVOCUM, denotes a word or expreſſion that is dubious and ambiguous, or that may have ſeveral ſenſes, one true and another falſe.

Equivocal terms anſwer to what are otherwiſe called *homonyma*, or *homonymous terms*.

Such is the word *emperor*, which is both the name of a dignity, the proper name of a perſon, and the name of a plant. So alſo the Latin *gallus*, which ſtands indifferently for a *cock* and a *Frenchman*.

In theſe caſes, one word denotes two or more different ideas, or different ſorts of objects; whence that common definition of *equivocals* in the ſchools, *quorum nomen eſt commune, ratio vero eſſentiæ ſecundum illud nomen diverſa*. Philoſophers diſtinguiſh *equivocals* into *active* and *paſſive*; or *æquivoca æquivocantia*, and *æquivocata*.

Æquivoca æquivocantia, or thoſe that denominate and ſignify things, are words common to ſeveral things in a very different ſignification, i. e. to ſeveral things which have a ſimilar eſſence correſpondent to the ſimilar denomination. E. gr. The word *taurus*, which ſtands for a ſign, a mountain, and an animal; and in one ſignifies a lowing animal; in another, a heap of ſtones and earth; and in the third, a conſtellation or ſyſtem of ſtars.

Æquivoca æquivocata, or thoſe that are called or denominated, are the things ſignified by ambiguous names, e. gr. a ſign, a mountain, and an animal: which laſt ſpecies of *equivocals* alone Ariſtotle ſeems to have had in view in his definition, which agrees to theſe, and theſe only.

EQUIVOCAL *action* and *cauſe*. See ACTION and CAUSE.

EQUIVOCAL *generation*, is a method whereby animals and plants are ſuppoſed to be produced, not by the uſual way of coition between male and female, but by ſome ſuppoſed plaſtic power or virtue in the ſun, &c.

Thus, inſects, maggots, flies, ſpiders, frogs, &c. have uſually been ſuppoſed to be produced by the heat of the ſun warming, agitating, and impregnating the duſt, earth, mud, and putrified parts of animals.

This method of generation, which we alſo call *ſpontaneous*, was commonly aſſerted and believed among the ancient philoſophers; but the moderns, from more and better obſervations, unanimouſly reject it, and hold that all animals, nay, and vegetables too, are univocally produced; that is, from parent animals, and vegetables of the ſame ſpecies and denomination.

It were a thing, one would imagine, ſufficient to diſcredit the Ariſtotelian, or rather the Egyptian doctrine of *equivocal generation*, to find flies, frogs, lice, &ce. to be male and female, and accordingly to ingender, lay eggs, &c.

The doctrine of *equivocal generation* we call an *Egyptian doctrine*, as having in all probability had its riſe in Egypt, to ſolve the hypotheſis of the original production of men, and other animals, out of the earth, by the help of the ſun's heat.

To prove which, the Egyptians, as Diodorus Siculus obſerves, produce this obſervation, that about Thebes, when the earth is moiſtened by the Nile, and afterwards impregnated by the intenſe heat of the ſolar rays, an innumerable ſwarm of mice do come forth; whence he infers, that all kinds of animals might equally have ariſen out of the earth at the beginning of things; and from theſe biſhop Stillingfleet takes the other writers and adherents to the doctrine of *equivocal generation*, Mela, Pliny, Ovid, &c. to have borrowed the hypotheſis without enquiring into its truth. Derham's Phy. Theol. lib. iv. cap. 15.

EQUIVOCATION, ÆQUIVOCATIO, the uſing a term or expreſſion that has a double ſignification.

Equivocations are expedients to ſave telling the truth, and yet without telling a falſity. The fathers are great patrons of *equivocations* and mental reſervations, holding, that the uſe of ſuch ſhifts and ambiguities is in many caſes allowable.

St. Auguſtine, particularly, is reproached with endeavouring to vindicate Iſaac for ſaving his wife from a crime by an *equivocation*; *tacuit aliquid veri, & non dixit aliquid falſi*. To advance a dubious propoſition, knowing it will be underſtood in a ſenſe different from that you give it in your mind, is an *equivocation*, and a breach of good faith and ſincerity.

In moral theology, it is ſtrictly underſtood of a term or phraſe with two different ſignifications, the common and obvious, the other more unuſual and remote; the latter of which being underſtood by the ſpeaker, but the former by the hearers, they conceive ſomething different from one another.

Of this we have an inſtance in St. John, chap. xi. where our Saviour is repreſented as ſaying, *Lazarus ſleepeth*; for the diſciples who took the word *ſleeping* in the uſual ſignification, concluded that Lazarus, whom, they had been told, was ſick, began to take reſt, and would ſoon recover; but Jeſus, uſing the word in a leſs direct and uſual ſignification, meant that Lazarus was dead.

When the *equivoque* conſiſts of ſeveral words, it is properly called an *amphibology*; of which we have an inſtance in St. John, chap. ii. *Deſtroy this temple*, ſays Jeſus, ſpeaking to the Jews, *and I will raiſe it again in three days*.

The lawfulneſs of the uſe of *equivocations* has been greatly diſputed among the modern caſuiſts; many grave authors deny that it is allowable to uſe them on any occaſion whatever. Their reaſon is, that an *equivoque* is to all intents and purpoſes the ſame thing with a lye.

EQUULEUS, or ECULEUS, in *Antiquity*, a kind of rack, or engine of torture, uſed for extorting the truth; at firſt chiefly on ſlaves, but afterwards turned againſt the Chriſtians.

The patient's arms and legs being faſtened on the *equuleus* with cords, he was hoiſted aloft, and extended in ſuch manner that all his bones were diſlocated. In this ſtate, red-hot plates were applied to his body; and he was alſo goaded in the ſides with an iron-forked inſtrument, called *ungula*.

The *equuleus* was of wood, and had holes at certain diſtances, with a ſcrew, by which the criminal was ſtretched to the third, ſometimes to the fourth or the fifth hole: at intervals, the ſcrew was ſlackened again, by which he had ſome reſpite; but then he was tormented with queſtions.

The *equuleus* in more ancient times was conſtructed in the form of a horſe; the criminal was laid on his back, and his arms were turned under the breaſt of the *equuleus*, his hands were bound, and his feet ſtretched out towards his tail. A rope faſtened to the feet, was made to paſs over a ſmaller pulley between the hind-legs of the *equuleus*, and made to coil over another larger pulley fixed under the belly by means of a handle, which the executioner turned round till all the bones, &c. were diſlocated. See a learned diſſertation on the form and uſe of this inſtrument, by Dr. Ward, in the Phil. Tranſ. vol. viii. part iv. p. 32, &c.

Hieronymus Magius, when a priſoner among the Turks, wrote an expreſs treatiſe De Equuleo; and another of Bells, merely as it is ſaid from his memory, without any aſſiſtance of books. Sigonius had another treatiſe on the ſame ſubject.

EQUULEUS, EQUICULUS, and EQUUS *minor*, *equi ſectio*, the *Horſe's Head*, in *Aſtronomy*, a conſtellation of the northern hemiſphere, whoſe ſtars in Ptolemy's Catalogue are 4, in Tycho's 4, in Hevelius's 6, and in Mr. Flamſteed's 10. The longitudes, latitudes, magnitudes, &c. are as follow:

Names and ſituations of the ſtars.	Bayer's Cha.	Signs.	Longit.			Latitude North.			Magnitude
			°	′	″	°	′	″	
		♒	14	12	57	20	32	56	5
			15	59	37	23	2	36	6
			16	2	30	21	16	1	6
			16	25	37	21	38	31	6
Preced. of two in the mouth.	γ		19	6	24	25	13	12	4
5.			19	7	7	25	6	52	6
Subſeq. of the ſame.	δ		20	7	50	24	47	57	4
Preced. of two in the head.	α		18	47	48	20	9	9	4
			20	51	5	21	42	53	6
Subſeq. in the ſame.	β	♒	21	7	2	21	3	6	4

EQUULEUS, in *Arts* and *Manufactures*. See HORSE.

EQUUS, in *Zoology*. See HORSE.

EQUUS *marinus*, in *Zoology*, a name given by ſome to an animal very different from the hippopotamus, or river-horſe, and more uſually known by the name of the MORSE.

ERA, in *Chronology*. See ÆRA.

ERANDGAAS, in *Zoology*, the name of a fowl, of the gooſe kind, deſcribed by ſome authors. It is ſaid to be ſomewhat ſmaller than the common wild-gooſe: its head grey, and its neck adorned with a red-ring: its breaſt, wings, and neck, are grey, and its feet red. Mr. Ray much ſuſpects the account of this bird. Ray's Ornithol. p. 308.

ERADICATIVE, in *Medicine*. See RADICAL.

ERANARCHA, a public officer among the ancient Greeks, whoſe buſineſs was to preſide over and direct the alms given, and proviſions made for the poor.

The word is formed of ερανος, *alms*, *contribution*, and αρχη, *command*.

The *eranarcha* was properly the adminiſtrator or ſteward of the poor: when any perſon was reduced to poverty, taken captive, or had a daughter to marry, which he could

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could not effect for want of money, &c. this officer called an assembly of friends and neighbours, and taxed each, according to his means and estate, to contribute towards his relief. This is what we learn from Cornelius Nepos, in his Life of Epaminondas.

ERANTHEMUM, in *Botany*, a name given by some authors to the flos Adonis, or red maithes. See PHEASANT'S *eye*.

ERARIUM. See ÆRARIUM.

ERASED, in *Heraldry*, expresses any thing that seems violently torn off from its proper place. It is used in contradistinction to *couped*, which signifies a thing clean cut off. The family of Card bears ermine, a demy lion rampant *erased*, azure, &c.

ERASTIANS, a religious sect or faction, which arose in England during the time of the civil wars in 1647, thus called from their leader Thomas Erastus, whose distinguishing doctrine it was, that the church had no right to discipline, that is, no regular power to excommunicate, exclude, censure, absolve, decree, or the like.

ERATO, from εραω, *I love*, in *Mythology*, the name of one of the nine Muses who presided over love-poetry. To this Muse some have ascribed the invention of the lyre and lute; and she is represented with a garland of myrtles and roses, holding a lyre in one hand, and a bow in the other, and at her side a Cupid with his torch. There is also a NEREID of the same name.

ERCEUS, of ερκος, *septum*, in *Mythology*, the name by which those who were appointed to guard the walls of a city invoked Jupiter.

EREBENNUS, Ερεβεννὸς, a name given by Galen and some other of the Greek writers, as a distinctive epithet for the black chamæleon thistle, which was esteemed poisonous, and was by this word distinguished from the ægleus or ἀιγληὲς, or white chamæleon, which was an esculent plant, and used by some as an antidote. It has happened, however, that the white chamæleon thistle has been by some called a poison, as well as the black; but this is only owing to a mistake of Pliny, in supposing the effects of birdlime to have been attributed to this plant, because of its yielding a viscous, but safe gum, at its root. It was called by some *ixias chamæleon*. See IXIAS and CHAMÆLEON *thistle*.

EREBUS, Ερεβος, from ערב, *night*, in *Mythology*, a term denoting darkness. According to Hesiod, *Erebus* was the son of Chaos and the night, and the father of the day. This was also the name of part of the *inferi* among the ancients: they had a peculiar expiation for those who were detained in *Erebus*.

Erebus was properly the gloomy region, and distinguished both from Tartarus, the place of torment, and Elysium, the region of bliss: according to the account given of it by Virgil, it forms the third grand division of the invisible world beyond the Styx, and comprehends several particular districts, as the *limbus infantum*, or receptacle for infants; the *limbus* for those who have been put to death without cause; that for those who have destroyed themselves; the fields of mourning, full of dark groves and woods, inhabited by those who died for love; and beyond these, an open champaign country for departed warriors. Æn. lib. vi. p. 427, &c.

ERECT *flowers*, are such as grow upright, without hanging or reclining the head. See FLOWER.

ERECT *leaf*, *erectum folium*, among *Botanists*. See LEAF.

ERECT *vision*. See VISION.

ERECT, *direct*, and *declining*, &c. *dials*, &c. See DIAL.

ERECTION, the act of raising or elevating a thing in a right line.

The *erecting* a perpendicular on a line given, is a popular problem in geometry.

The term *erection* is also used figuratively; as the *erection* of a marquisate into a duchy; bishopricks can only be *erected* by the king.

ERECTION is particularly used in *Medicine*, for the state of the penis when swelled and distended by the action of the muscles, called *erectores*.

There is also an *erection* of the clitoris, which is performed by muscles provided for that purpose. See CLITORIS and ERECTORES.

An alternate state of *erection* and flaccidity in the penis, Dr. Drake observes, is of absolute necessity; the first to the performance of its office, the second for the security of the part.

Without an *erection* it were impossible to emit and lodge the seed where it ought to be; and with a constant one, almost as impossible to secure the part from external injuries. To say nothing of the loss of instigation, which must be a necessary consequence of constant *erection*.

The *erection* of the penis consists in a distension of its corpora cavernosa, by an extraordinary quantity of blood pent up therein.

That the blood is the matter which distends the penis in *erection*, is evident from abundance of experiments; though the most convincing is that of firmly tying the penis of an animal (as has been frequently done to a dog) in coitu, wherein nothing has been found but blood to distend it. Hence, in the bodies of criminals, that hang long after death, the penis becomes *erected*; the blood in that position falling to the inferior parts, and stopping there. By blowing into the blood-vessels of the penis after death, the part becomes *erected*. This was first discovered by Mr. Cowper, upon viewing its veins, after he had distended them with wind; whence it plainly appeared, that the external trunks passed, some under its skin only, and some over the ossa pubis; besides, that a vast number of other veins on the dorsum penis unite and empty themselves into one trunk, called *vena penis*, which passes immediately under a transverse ligament of the ossa pubis, which is compressed by the approximation of the dorsum penis to the ligament of the pubis. This application of the dorsum penis is affected by its musculi directores pulling down the crura of the corpora cavernosa penis, which are tied up at their juncture in the body of the penis to the os pubis by the ligamentum suspensorium. Now, this cannot happen to the cavernous body of the urethra, because there is no bone whose position can give rise to a ligament which can have that effect on its veins; wherefore, the musculi acceleratores embracing the veins of the bulb, do that office, though not so effectually as in the penis itself.

Accordingly the glans is not always perfectly distended with the penis, and it is this part that soonest becomes flaccid on an *erection*.

The blood by such means being precluded from its return, the corpora cavernosa must of necessity become distended, if we consider their structure above mentioned with respect to the veins. The arteries, which before were flaccid, have now their trunks also distended, and do more plentifully import blood into the corpora cavernosa.

But since it is absolutely necessary some part of the detained blood should be still passing off, lest it become grumous, and unfit for a reflux; the venæ præputii communicate with those of the penis itself, whereby part of the blood may be returned from the penis during its *erection*, and give way to a fresh supply from the arteries, and preserve the circulation uninterrupted.

ERECTORES *clitoridis*, in *Anatomy*, a pair of muscles arising from the protuberances of the ischium, and inserted into the spongious body of the clitoris, which they serve to erect in coition. See CLITORIDIS *musculus* and CLITORIS.

ERECTORES *penis*, in *Anatomy*, a pair of muscles, arising fleshy from the protuberances of the ischium below the beginning of the cavernous bodies of the yard, into whose thick membranes they are inserted.

Their use is to pull the yard upwards towards the os pubis, whereby the greatest vein is compressed, and the refluent blood denied its passage under those bones, which makes it swell. See ERECTION.

EREGMOS, from ερεικω, *I break*, a word used by the ancients, to express a bean decorticated and broken into small pieces, in order to be boiled in ptisans. This name was not, however, kept strictly to this sense, but they applied it indifferently to all the leguminous fruits broken in the same manner. Fœsius will have it to signify *bean-meal*, but others are against this; and Galen in some places uses it only to express a bean divided into two parts.

EREMIT. See HERMIT.

ERETHISMOS, from ερεθιζω, *I irritate*, a word used by Galen and Hippocrates to express any thing that irritates. Galen says that Hippocrates means by it also every thing that reduces the habit of body to an infirm state, among which are to be reckoned before all other things, irritating, acrimonious, and pungent humours in the stomach and bowels, particularly in the mouth of the stomach, worms ascending from the intestines into the stomach, nocturnal itchings of the whole skin, or of some part of it, which, by their irritation and prevention of sleep, greatly exhaust strength.

ERETRIA *terra*, *Eretrian earth*, in the *Materia Medica*, the name of a very peculiar kind of alkaline bole, dug in the Negropont, near the ancient *Eretria*, and once in great use as an astringent and a sudorific.

The ancient writers in medicine all mention the *Eretrian* earth, and Dioscorides and Galen describe two kinds of it, a grey and white. The grey is what is properly distinguished by this name, being an earth of a different kind from all the other boles. The white, though the ancients seem not to have observed it, yet was plainly, from their own descriptions, the same with the white bole armenic, though found in a different place. Hill's Hist. of Foss. p. 5.

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The grey or genuine *Eretrian* earth is a fine and pure greyish white earth, moderately heavy, naturally of a smooth surface, of a friable texture, easily crumbling to pieces between the fingers, but not staining the skin in handling; it sticks firmly to the tongue, but melts to a butter-like substance in the mouth; it burns to a perfect snow-white, and effervesces violently with aqua fortis. But what abundantly distinguishes it from all other earths, is, that if a little be wetted, and drawn over a plate of brass or copper, so as to mark a line, the mark will in a little time appear bluish. This is recorded of it so early as in the writings of Dioscorides, and experiment proves it to be true. It seems plainly to be owing to an alkaline quality in the earth; this it plainly manifests by its fermenting so strongly with acids; and it is a well-known that alkalines draw a blue tincture from copper.

The ancients all esteemed it a great medicine, and were particularly careful in their way of preparing it for use, by frequent washing, It is now unknown in the shops; but its highly alkaline quality, in which it is so much superior to all the earths now in use, might make it worth the bringing into use again; and it may still be had in its old place, in almost any quantities.

ERGALIA, of ἐργον, *opus*, a word used by the *Alchemists*, to express that part of their treatises which explains the instruments employed in their operations.

ERGASIMA, a name given by Dioscorides and other of the ancients to a very foul and coarse kind of myrrh.

ERGASTERIUM, a word used by the writers in *Chemistry*, sometimes to express the whole elaboratory, and sometimes that part of a furnace on which the bottom of the retort, copel, or crucible, is to rest in an operation.

ERGASTINÆ, Ἐργασιναι, in *Antiquity*, a select number of virgins employed in weaving Minerva's peplos or robe, which was carried in procession at the Athenian festival, *Panathanæa*. See PEPLOS, and PANATHANÆA.

ERGASTULUM, among the ancients, a house of correction, or work-house, where slaves, by the private authority of their masters, were confined, and kept at hard labour for some offence. It was likewise called *sophronisterium*.

ERGATIA, Ἐργατια, in *Antiquity*, a Laconian festival, in honour of Hercules.

ERGOT, in the *Manege*, is a stub like a piece of soft horn, about the bigness of a chesnut, placed behind and below the pastern joint, and commonly hid under the tuft of the fetlock. To *dis-ergot*, or take it out, is to cleave it to the quick with an incision-knife, in order to pull up a bladder full of water that lies covered with the *ergot*. This operation is scarcely practised at Paris, but in Holland is frequently performed upon all four legs, with intent to prevent watery sores and foul ulcers.

ERGOT, in *Medicine*, the name given by the French to a disease similar to one in England, proceeding from eating vitiated rice. See Phil Trans. vol. lii. part ii, and vol. lv. art. 17. p. 106. See BLIGHT and SMUT.

ERIACH, in *Antiquity*, the name of a recompense assigned by the high BREHON *law* in case of murder, to the friends, or to the child or wife of him that was slain, as a kind of composition between the murderer and his prosecutors.

ERICA, in *Botany*. See HEATH.

ERICA *marina*, *sea-heath*, a name given by many authors to a very beautiful sea-plant of the fucus kind, called by Mr. Ray and some others the FUCUS *ericæ folio*. This differs so much in bigness in different places, that it has been suspected to be of two distinct species; those plants of it which are found about the shore seldom exceeding ten inches in length, and those in deeper water often growing to three foot.

It is composed of a vast number of ramifications; the bottom stalk is woody, and often of the thickness of a man's little finger; yet even in these there is no distinction of nerves or fibres; the large branches are rough and knotty, and send off many other ramifications, the larger of which are round, but the extreme ones flat.

At different spaces over this plant, one observes certain knots or tumours; these are no other than the branch in that part swelled, and the use of the swelling is to contain the capsules which inclose the seed; these, and their arrangement in these swellings, are wholly like those of the common fucus, and there are usually ten or twelve capsules contained in every swelling or bladder of the stalk. They are not arranged with any regularity in the swelling, but are always found nearer the upper than the lower extremity of it. The seeds are round, and a very great number of them are contained in every capsule.

The swellings which contain these capsules are sometimes placed at considerable distances from one another on the stalks of the plant, and sometimes they stand so close as to represent the beads of a necklace. Some branches of the plant also are very full of them, and others scarce have any at all upon them. Sometimes the bladders are found empty on this plant, as they are in the common sea-wrack; but in this case there may always be seen the marks of the places where the capsules have once been, though since perished by some accident. Mr. Reaumur, who gives this description of this plant, never saw its flowers; but there seems no doubt but that they are composed of short filaments, like those of the other plants of this kind; and his not examining the plant at a proper season was probably the reason of his not finding them; for the flowers and seeds of these plants are usually both large enough to be seen by the naked eye; and when the seed is so, in most cases the flower is also. Mem. Acad. Par. 1712.

ERICA, in *Ichthyology*, a name given by Gaza and some others, as the interpretation of the chalcis of Aristotle, that is, as the name of the common HERRING.

ERICERUM, a name given by Aëtius and other authors, to a sort of collyrium, used in weaknesses of the eyes, in which the herb *erica*, or *heath*, was an ingredient.

ERICHTHONIUS, in *Astronomy*, a constellation, the same as AURIGA.

ERIDANUS, in *Astronomy*, a constellation of the southern hemisphere, in form of a river.

The stars in the constellation *Eridanus*, in Ptolemy's Catalogue, are 34; in Tycho's, 19; in the British Catalogue, 84; the longitudes, latitudes, magnitudes, &c. whereof are as follow:

Names and situations of the stars.	Bayer's Cha.	Signs.	Longit. °	′	″	Latitude South. °	′	″	Magnitude.
First from the turn of the river to the breast of Cetus.	τ	♈	27	43	50	32	46	3	4
A second.	τ	♈	28	17	41	35	32	44	4
First in the river before the breast of Cetus.	π	♉	4	24	50	24	33	38	3
		♈	28	40	53	38	43	48	6
		♉	7	23	4	18	42	23	6
5.									
		♈	28	59	23	38	33	16	6
		♉	7	31	58	19	10	50	6
Preced.	ς		6	2	44	23	45	20	6
Middle.	ς		6	26	39	23	54	37	5
Second before the breast of Cetus.	ς		6	52	9	23	57	16	4
10.									
Third of those following turn of river.			0	25	0	39	0	1	3·4
Inform. within the last sinus.			0	11	14	44	45	1	3
Third before the breast of Cetus.	ζ		9	29	25	25	57	22	3
			9	35	13	26	19	46	6
			5	6	36	39	8	28	6
15.									
Fourth behind the turn of the riv.			5	45	3	38	32	17	4
			14	30	20	23	22	27	4·5
Fourth before the breast of Cetus.	ε		13	55	20	27	46	30	3·4
Fifth behind the turn.			9	51	32	39	28	14	4
			12	8	57	35	40	15	5·6
20.									
			16	34	14	24	25	20	6
			17	6	37	24	8	18	5·6
Fifth before the breast of Cetus.	δ		16	30	56	28	46	16	3·4
			19	11	36	20	27	17	5
			19	30	50	19	38	34	6
25.									
Subseq. and more south.	π		16	37	28	31	9	15	4
Sixth behind the turn.			13	4	15	41	53	9	4
More south, but contiguous to this.			13	0	52	42	34	32	6·5
			20	18	16	24	42	25	7·6
			20	16	20	25	0	38	5·6
30.									
			20	33	37	24	59	47	5·6
Subseq. inform. over the river.			21	17	38	22	45	42	4·5
Eighth behind the turn.			14	31	20	43	40	50	5·4
In the second bend of the river.	γ		19	31	34	33	13	35	2
			23	32	24	21	47	28	5
35.									
Ninth beyond the turn.			16	38	37	43	30	44	4
			24	40	24	27	29	56	6
North. of two beyond the first bend.	ο		25	5	51	27	30	0	3·4
Next before the second bend.		♌	25	00	50	30	57	28	5
South. beyond the first bend.			26	07	45	28	13	03	5
Preced. of two beyond the 2d bend.			18	07	00	53	58	54	4·3
40.									
Preced. in the first bend.	ξ		28	59	47	25	01	01	4·3
Subseq. beyond the second bend.			20	06	30	54	33	15	5
		♊	1	15	15	20	11	57	5·6
			1	53	24	21	43	53	5·6
			1	12	3	28	24	50	5
45.									
			1	00	31	29	53	52	4
Subseq. in the first bend.	ν		2	29	15	25	08	39	4
			3	35	35	20	54	06	5·6

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Names and situations of the stars.	Bayer's Cha.	Signs.	Longit. ° ′ ″	Latitude South. ° ′ ″	Magnitude.
North. in the second bend toward the east.	υ	♈	25 08 20	50 56 43	4
Small one contiguous to the subseq. in the first bend.	c	♊	2 59 03	24 20 37	4
50.					
South. in the second bend.	υ	♉	25 32 21	51 51 1	3
		♊	0 56 10	36 1 48	3·4
			0 23 41	41 25 3	3·4
			3 33 10	30 49 18	6
			3 45 58	30 28 21	6
55.					
Preced. before the first bend.	μ		5 00 53	25 24 13	4
			3 11 25	30 1 49	5·6
			3 36 38	38 27 13	6
			4 07 46	38 24 20	6
Middle before the first bend.	ω		6 43 03	27 50 40	5
60.					
Small one contiguous to it.	b		7 43 46	27 30 49	6
			7 59 51	32 49 13	6
			7 41 00	35 4 52	6
Subseq. before the first bend.	ψ		8 53 02	29 48 30	5
That next the rise of the river.			10 41 18	27 16 56	6
65.					
North. in the rise of the river towards Orion's leg.	h		10 57 20	25 53 48	3
			11 15 40	27 17 50	6
South. in the rise of the river.	λ	♊	10 52 55	31 34 10	4
		♉	10 9 25	53 15 26	
			7 56 29	54 19 1	4
70.					
			6 42 35	55 33 22	4
			5 4 58	54 50 10	4
			1 6 33	57 4 48	5
		♈	22 53 15	58 2 36	5
	θ		19 19 17	53 44 52	3
75.					
			14 45 56	51 43 3	4
	l		11 59 23	54 13 13	4
	κ		3 57 45	56 57 53	4
	φ	♓	27 1 3	58 56 48	4
	χ		22 9 13	56 58 17	4
80.					
Archernar.	α		11 19 46	59 19 6	1
Inform. between the last bend of the river.		♉	0 42 41	44 44 32	4
Between the river and tail of Xiphias.			11 57 58	61 43 43	4

ERIFFS, a name given to canary birds when about two years old. See CANARY *bird*.

ERIGENS *penis*. See ERECTOR *penis*.

ERIGERON, or SENECIO. See GROUNDSEL.

ERINACEA, in *Botany*, the name of a genus of plants, the characters of which are these: the flowers and fruit are the same with those of the broom; but the whole plant is so beset with prickles as to resemble a hedge-hog. Tourn. Inst. p. 646.

According to Mr. Tournefort there are two species.

ERINACEUS, in *Zoology*. See *Hedge*-HOG.

ERINACEUS, is also a name given by Dillenius and some other botanists to the pectinated agarics, called by others *hydnum*. These differ from the agarics, properly so called, which are lamellated underneath, and from others which are porous, for these are echinated, or beset with pointed prickles.

ERINGO, in *Botany*. See ERYNGO.

ERINOPTERUS. See PRIVET-*fly*.

ERINUS, in *Botany*, a genus of the *didynamia angiospermia* class. Its characters are these: the flower hath a five-leaved empalement, and one tubulous petal, which is of the ringent kind, cut into five equal segments, and is short and reflexed: it hath four stamina situated within the tube, two of which are a little longer than the other. In the bottom of the tube is situated an oval germen, which afterwards becomes an oval capsule, with two cells filled with small seeds. Miller.

ERIOCAULON, in *Botany*, a genus of the *triandria trigynia* class. The characters of which are, that the calyx is common; that it has a small imbricated head, three equal petals, and the stamina above the germen.

ERIOCEPHALUS, in *Botany*, Dill. Hort. Elth. 110. a genus of the *syngenesia polygamia necessaria* class. Its characters are these: it hath a radiated flower, composed of female half florets, which form the rays, and hermaphrodite florets which form the disk: the hermaphrodite flowers are funnel-shaped, and cut into five parts at the brim, and have five stamina, with a naked germen. The female florets have their petals stretched out on one side like a tongue, divided at the end into three small lobes; they have no stamina, but an oval naked germen: they have one naked seed sitting on the naked plain receptacle. There is but one species. These plants retain their leaves all the year, and so add to the variety of exotics in the winter season.

ERIOPHORUM, in the Linnæan system of *Botany*, the name of the cotton-grass, or cotton-rush, common in marshy places, and called *linagrostis* by other writers. This is by that author, made a distinct genus of plants, of the *triandria monogynia* class, whose characters are, that the flower-cup is an imbricated spike, made up of oblong oval scales a little bent in, and separating the flowers: it has no petals. The stamina are three capillary filaments; the antheræ are erect and oblong. The germen of the pistil is extremely small; the style is thread-like, and of the same length with the scales of the cup; the stigmata are three, longer than the style, and bent backward. The seed is three-cornered, pointed, and covered with hairs longer than the spike.

ERIOPHORUS, in *Botany*, a name given by Vaillant to a genus of plants, since described by Linnæus under the name of *andryala*. See ANDRYALA and *Sow*-THISTLE.

ERIOX, or EROX, in *Ichthyology*, a name given by Albertus and some other authors to the common salmon, called by others, *anchorago*, and *salmo*. See SALMON.

ERISTALIS, in *Natural History*, the name of a stone, mentioned by Pliny and the ancients, and of which a very memorable quality is recorded by them, which is, that though it was naturally white, it would occasionally turn red.

ERISTICI, from ἔρις, *dispute*, in *Botany*, such authors as have attempted the study of that science in a philosophical way, and have been publicly engaged in disputes about the true foundation of its several distinctions, &c.

ERITHACE, a name given by the ancients to the yellow matter collected on the hinder legs of the bees after their excursions in search of the materials for their hives; we usually esteem this to be real wax, and the French call it *cire brute*, or *rough wax*: it is certain, however, that though the matter of which wax is to be formed is contained in this substance; yet the Dutch and some other nations have the most just idea of it, in calling it *pain de abeilles*, or *the food of the bees*.

This substance is only the farina of flowers, and no experiment has been able to separate real wax from it. The most probable opinion concerning it, is, that it serves the bees as food, and that after this it is converted in their bowels into the substance called wax.

ERITHALIS, in *Botany*, a genus of the *pentandria monogynia* class. The corolla is divided into five segments, the calyx is arceolated, and the fruit is a berry consisting of ten cells.

ERMESIA, a name given to a composition used among the ancients, and famous for its effects in making people beget handsome children. It consisted of honey, myrrh, saffron, and palm-wine, all beat together. This mass was to be taken mixed in milk. The women took it as well as the men, and many had great faith as to its effects.

ERMIN, or ERMINE, in *Heraldry*, denotes a white field or fur, powdered or interspersed with black spots, called powdering. See FUR.

It is supposed to represent the skin of an animal of the same denomination. In effect, there is no animal whose skin naturally corresponds to the herald's *ermin*.

The animal is milk white; and so far is it from having spots, that tradition reports, that it will rather die, or be taken, than sully its whiteness. Whence its symbolical use.

But white skins having for many ages been used for the linings of the robes of magistrates and great men; the furriers at length, to add to their beauty, used to sew bits of the black tails of those creatures upon the white skins, to render them the more conspicuous. Which alteration was introduced into armoury. See *Tab.* II. *Herald. fig.* 60.

The sable spots in *ermin* are not of any determinate number, but they may be more or less, at the pleasure of the painter or furrier.

ERMIN, an order of knights, instituted in 1450, by Francis I. duke of Bretagne, and formerly subsisting in France. The collar of this order was of gold, composed of ears of corn in saltier; at the end of which hung the *ermin*, with this inscription, *a ma vie*. But the order expired when the dukedom of Bretagne was annexed to the crown of France.

ERMINE'. A *cross ermine* is a cross composed of four *ermine* spots, placed in the figure represented *Tab.* II. *Herald. fig.* 62.

It must be observed, that the colours in such arms are not to be expressed, because neither the cross nor the arms can be of any colour but a white and black.

Colombiere blazons it *quatre queues d'ermine en croix*. The editor of Guillim describes it thus; a cross of four *ermines*;

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ermines; or, more properly, four *ermine* ſpots in croſs. It is the coat of Hurſton in Cheſhire.

ERMINE, *timbre of*. See TIMBRE.

ERMINES, is uſed by ſome Engliſh writers for the reverſe of *ermine*, i. e. for white ſpots on a black field; but on what foundation nobody can tell; for the French, from whom we have our heraldry, have no ſuch term; but call this black powdered with white, *contre-ermine*; as denoting the counter, or reverſe of *ermine*; which is white powdered with black. See *Tab.* II. *Herald. fig.* 63.

ERMINEUM *animal*, *ſtoat*, or *ermine*, the creature whoſe ſkin is the *ermine*, ſo much eſteemed as a fine fur.

This creature is properly a ſpecies of weaſel, and is called by Mr. Ray, and other authors, *muſtela candida*, the *white weaſel*, and by Linnæus *muſtela erminea*. It is in all reſpects like the common weaſel, and is all over of a pure ſnow white, except the tip of the tail, which is of as beautiful a black, and that it has a little yellowiſh grey about the eyes, and a mark, or ſpot, of the ſame colour, on the head, another on the ſhoulders, and a third near the tail. Its colour is, however, very different in degree and elegance, according to the ſeaſon of the year. It is frequent about rivers, and in meadows, in thoſe countries which produce it, and feeds on moles, mice, and other ſmall animals. The ſkins and tails are a very valuable article of commerce in Norway, Lapland, and Ruſſia, and other cold countries, where they are found in prodigious numbers, and regularly change their colour in winter, becoming white. In Siberia, they burrow in the fields, and are taken in traps, baited with fleſh. In Norway they are ſhot with blunt arrows, or taken in traps. The *ſtoat* is ſometimes found white in Great Britain, and called the *white weaſel*.

ERMINITES ſhould ſeem a diminutive of *ermines*, and naturally to ſignify little *ermines*; but it is otherwiſe. *Erminites* expreſſes a white field powdered with black; only that every ſpot has a little red hair therein.

Some authors uſe the word *erminites*, for a yellow field powdered with black; which the French expreſs much better by *or ſemée d'ermines de ſable*.

ERMINOIS expreſſes an or field, with ſable powdering.

ERNES, in our *Old Writers*, ſignify the looſe ſcattered ears of corn that are left on the ground, after the binding or cocking of it.

It is derived from the old Teutonic *ernde*, *harveſt*; *ernden*, *to cut* or *mow corn*. Hence *ern* is, in ſome places, to glean.

ERODINUM, a word uſed, by ſome of the enthuſiaſtic writers in alchemy, to ſignify the prognoſtic, good or bad, of any operation.

EROS, of ἐρως, *love*, in *Mythology*, one of the two chiefs over all the other Cupids, being the cauſe of love. See ANTEROS.

EROSION, in *Medicine*, the act of ſharp, acrid fluids, or humours, gnawing and tearing off parts from the fleſh, and other ſubſtances. Arſenic, and other poiſons, make *eroſions* in the inteſtines. See CORROSION.

EROSUM *folium*, among *Botaniſts*. See LEAF.

EROTESIS, Ερωτησις, in *Rhetoric*, the ſame with INTERROGATION.

EROTIA, Ερωτια, a feſtival among the Greeks, in honour of Cupid, being celebrated every fifth year with ſports and games.

EROTIC, derived from ἐρως, *love*; whence ἐρωτικος, is applied to any thing which has a relation to the paſſion of love.

In *Medicine*, we particularly uſe the phraſe *delirium eroticum*, for a kind of melancholy contracted through exceſs of love.

Though, among the ſeveral ſpecies of pulſes, there be no amorous pulſe, that is, no pulſe peculiar to that paſſion; yet we can certainly diſcover where the diſorder is *erotic*, by the beating of the pulſe, which, in that caſe, is changeable, unequal, turbulent, and irregular. Speak to the patient of the perſon he loves, and his pulſe inſtantly changes, becoming higher and quicker; and the minute you change the converſation, the pulſe is loſt again, and is diſturbed anew.

EROTIDIA, Ερωτιδια, the ſame with *erotia*.

EROTYLOS, in *Natural Hiſtory*, the name of a ſtone, of which we have no deſcription left us, but which the ancients are ſaid to have uſed in divination.

EROWA, the name of a kind of nettle, which grows in the mountains at Otaheite in the South Sea, with which the inhabitants make fiſhing lines, which ſerve to hold the ſtrongeſt and moſt active fiſh, and are much ſtronger than our ſilk lines of twice the thickneſs.

ERRANT, in *Law*, the ſame with *itinerant*; the term is attributed to judges who go the circuit; and to bailiffs at large.

ERRANTS, *knight*. See KNIGHT.

ERRATA, a liſt uſually placed at the beginning or end of a book, containing the faults that have eſcaped in the impreſſion, and, ſometimes, even in the compoſition of the work.

Lindenberg has an expreſs diſſertation on typographical errors, De Erroribus Typographicis; wherein he obſerves, that there is no book exempt from them, not even the ſacred books. He ſets himſelf to enquire into all the cauſes thereof; and propoſes means to prevent them. But he advances nothing on that article, but what is either common, or impracticable.

ERRATIC, in *Aſtronomy*, an epithet applied to the planets, which are called *erratic*, or wandering ſtars, in contradiſtinction to the fixt ſtars.

ERRATIC *fevers*, in *Medicine*, a term uſed to expreſs ſuch fevers as, according to the language of medical writers, obſerve no regular type, that is, are not determinate either in their attacks, or in their general period. They are thus called by way of diſtinction from the typic fevers, which are regular in both. See FEVER.

ERRATIC *winds*. See WIND.

ERRHINA, Ἐρρινα, from ἐν, *in*, and ῥὶν, *noſe*, in *Medicine*, are remedies taken by the noſe to enliven the ſpirits, ſtop bleeding, &c. but principally to purge the humidities of the head, and, by the general ſhock they occaſion, to remove the moſt diſtant obſtructions. Hence reſults their uſe in lethargies, epilepſies, palſies, apoplexies, headachs, vertigoes, catarrhs, gutta ſerena, &c.

Of theſe, ſome are taken in powders, as betony, tobacco, marjoram, iris, white hellebore, euphorbium, &c. Others in a liquid form, made of the juice of marjoram, ſage, beer, cyclamen, iris, &c. Others in form of liniments, incorporated with unguent. roſat. Others, ſolid, formed like pyramids, to ſtop bleeding at the noſe; compoſed of Armenian bole, terra ſigillata, maſtic, human or hogs-blood dried, &c. Such *errhines* as are dry, and made up in powders, to excite ſneezing, are properly called *ſternutatories*. Some moderns call them *caputpurgia*.

ERRIPSIS, from ῥιπτω, *I precipitate*, in *Medicine*, is uſed in different ſenſes, ſometimes for a weakneſs of the whole body, ſometimes only of ſome one part. When applied to the whole body, it expreſſes that utter dejection and proſtration of ſtrength which makes a man fall down like a dead carcaſs; and, when applied to the eyes, it expreſſes ſuch a debility, as renders it impoſſible to keep them open.

ERROR, a miſtake of the mind, in giving aſſent to a thing, or propoſition, which is not true. See FALLACY.

Some philoſophers define *error* an act of the mind, whereby things that ſhould be joined, are ſeparated; or, things that ſhould be ſeparated, are joined; or a wrong judgment, diſagreeing with the things whereon it is paſſed.

Error ſtands in oppoſition to *truth*, which conſiſts in an agreement between the propoſition, and the thing whereof it is affirmed, or denied.

However, a bare failure, or non-attainment of truth, does not conſtitute *error*; that being common both to ignorance and doubting.

Error only ſtands diſtinguiſhed from *falſhood*, in that the former is in the mind, and the latter only in the propoſition.

The great origin of all *error*, i. e. of believing that to be true, which is falſe, is a liberty, or power, in the human mind, of giving its aſſent to ideas, or propoſitions, that are obſcure, as if they were perſpicuous and plain.

Particular cauſes of *error* are, inadvertency, ignorance, impatience, intereſt, authority, education, &c. See FAITH, PROBABILITY, OPINION.

Againſt all which, there is this one general rule or caution laid down, by F. Malebranche and others; viz. never to give our full aſſent to any propoſition, unleſs the evidence for it be ſo ſtrong, as that we can no longer with-hold it, without incurring the ſecret reproaches of our own reaſon.

Mr. Locke reduces the cauſes of all our *errors* to theſe four; viz. 1. Want of proofs. 2. Want of ability to uſe them. 3. Want of will to uſe them. And, 4. Wrong meaſures of probability.

F. Malebranche conſiders five occaſional cauſes of *error*, or rather five different kinds of *errors*, accommodated to the different manners we have of perceiving things. 1. *Errors of ſenſe*. 2. Of the *imagination*. 3. Of the *underſtanding*. 4. Of our *inclinations*. And, 5. Of the *paſſions*. See SENSE, IMAGINATION, UNDERSTANDING, INCLINATION, and PASSION.

ERRORS, *popular*. See POPULAR.

ERROR, in *Law*, generally denotes a fault, or overſight, either in pleading, or in proceſs; upon either of which is brought a writ, by way of remedy, called a *writ of error*; in Latin, *de errore corrigendo*.

Fitzherbert defines a writ of *error* to be, that which lies to redreſs falſe judgment given in any court of record, having

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having power by charter, or prescription, to hold plea of debt or trespass of above twenty shillings. There is also a *writ of error* for reversing a fine, &c.

ERROR, *to assign.* See ASSIGNING.

ERRORS, *clerk of the.* See CLERK.

ERROR *loci*, a term often used by Boerhaave. This author observes, that in the body there is a decreasing series of vessels; by which he means, that the first orders of the vessels are adapted to receive the red globules of the blood, while the rest are, perhaps, smaller, and receive only the serum, the next in order the lymph, and the next the yet finer fluids. Now when the red globules of blood are propelled into the vessels destined only to receive the serum, or when the serum gets into those vessels in which a finer fluid ought only to circulate; this he calls an *error loci*, and attributes much to it.

ERUCA, in *Zoology.* See CATERPILLAR.

ERUCA *marina grisea fusca.* See APHRODITA.

ERUCA, in *Botany.* See ROCKET.

ERUCAGO, in *Botany.* See BUNIAS.

ERUCTATION, *Belching*, the same as RUCTATION.

ERUDITION, denotes learning, or knowlege; and chiefly that of history and antiquity, of languages and of books, which is the result of hard study, and extensive reading. The Scaligers were men of deep *erudition:* the writings of M. Launoy, a priest of the Oratory, are full of *erudition.*

Mr. Locke says, it is of more use to fill the head with reflections, than with points of *erudition.* If the mind be not just and right, ignorance is better than *erudition*, which only produces confusion and obscurity. M. Balzac calls a heap of ill chosen *erudition*, the luggage of antiquity.

ERUPTION, in general, a bursting forth, or exclusion of something which was before covered, or concealed.

In *Medicine*, it denotes a sudden and copious excretion of humours, as pus or blood, and any breaking out of pustules or spots in various disorders; as in the small-pox, measles, plague, fevers, &c. See EXANTHEMA.

The *eruption* of volcanos, or burning mountains, is frequently the effect, and issue, of earthquakes. See EARTHQUAKE, &c.

The *eruptions* of mount Ætna, and Vesuvius, are observed to be somewhat periodical: they are of two kinds; the one less violent, happening once in two or three months, and lasting usually three or four days, without much damage to the adjacent country. The other more furious, and of longer continuance, happening to mount Vesuvius about once in eighty years. That in 1362 was so violent, that, by the best of S. Peccacio's observations, it cast the rocks three miles into the air. Hartop, in Phil. Trans. N° 202.

The honourable Mr. Hamilton has communicated several accounts of later eruptions of Vesuvius to the Royal Society, which may be seen in the Phil. Trans. for 1767, 1768, and 1769. He observes, that the violent *eruption* in 1767, is reckoned to be the twenty-seventh since that which destroyed Herculaneum and Pompeii, in the time of Titus. See VOLCANOS.

Mr. Oldenburg gives us an historical account of the several *eruptions* of mount Ætna, recorded in authors. The first, whereof we have any credible account, was at the time of the expedition of Æneas, described by Virgil, Æneid. lib. iii. The second, described by Thucydides, was four hundred and seventy-six years before Christ. In the time of the Roman consuls there were four; another in Cæsar's time, so fierce, that Diodorus assures us, the ships near the island of Lipara were injured with the extreme heat of the water; another under Caligula; another at the time of the martyrdom of St. Agatha, said to have been stopped at her intercession; another in the year 812; several between the years 1160, and 1169; others in 1284, 1329, 1408, 1444, 1536, 1633, 1650. Phil. Trans. N° 48.

Another extraordinary *eruption* happened in 1669, particularly described in the said Transactions, N° 51. It was preceded, for the space of eighteen days, with a dark thick sky, thunder, lightning, and frequent concussions of the earth; the place of the *eruption* was twenty miles from the old mouth.

The matter here yielded, was a stream, or river, of melted metals and minerals, rendered liquid by the fierceness of the fire, and boiling up, and gushing forth, as water does at the head of some great river; till having run in a full body for a stone's cast, or more, the extremity thereof began to crust and curdle, and turned, when cold, into hard, porous stones, called *sciarri*, as resembling huge cakes of sea-coal, full of a fierce fire. These came rolling and tumbling over one another, and where they met a bank, wall, building, &c. would fill up, and swell over; by their weight bearing down any common building, and burning up what was combustible. The progress of this inundation was at the rate of a furlong a day; which it continued for fifteen or twenty days, running, at first, into the sea, but afterwards into the city of Catanea; in its course it overwhelmed fourteen towns and villages, containing three or four thousand inhabitants. The noise of the *eruption* at the mouth was heard sixty miles.

Dr. St. Clair, in the Philosophical Transactions, gives an account of a constant *eruption* of fire on one side of one of the Apennines, between Bologna and Florence; a spot of ground three or four miles in diameter, he observes, incessantly sends up a flame, rising very high, without noise, smoke, or smell, though it gives a very great heat. In great rains it sometimes intermits, but rekindles with greater vigour and heat. Within three or four yards of it, he adds, there grows corn. The flame he conjectures to arise from a vein of bitumen, or naphtha. There are three other such fires on the same hills.

ERUPTIONS *in infants.* See INFANTS.

ERUPTIVE *fevers.* See FEVER.

ERVUM, *Bitter Vetch*, in *Botany*, a genus of the *diadelphia decandria* class: the characters of which are, that the empalement of the flower is divided into five equal parts, which end in acute points; the flower is of the butterfly kind, having a large, roundish, plain standard, two obtuse wings of half the length of the standard, and a shorter keel, which is pointed; it hath ten stamina, nine joined, and one separate, terminated by single summits. It hath an oblong germen, supporting a rising style, crowned by an obtuse stigma; the germen afterwards becomes an oblong, taper pod, jointed between each seed.

ERVUM *orientale.* See SOPHORA.

ERYCINA, in *Mythology*, a surname given to Venus, from Erix, a mountain in Sicily, where she had a temple. Venus *Erycina* has also a temple at Rome, which was deemed very ancient even in the time of Thucydides.

ERYNGO, or SEA-HOLLY, *Eryngium*, in *Botany*, a genus of the *pentandria digynia* class. Its characters are these: it hath many small flowers, sitting upon one common conical receptacle; the flowers have a five-leaved erect empalement, sitting upon the germen, and form a roundish general umbel, which is uniform; each flower has five oblong petals, and five stamina, standing above the flowers. Under the empalement is situated a prickly germen, which afterward becomes an oval fruit divided in two parts, each having one oblong, taper seed.

There are several species of the *eryngium* plant propagated in the gardens of the curious; but the common sea-kind is the only one of any use. The roots of this are, in great quantities, both dried and candied in the shops; they may all be propagated, either by parting their roots, or sowing their seeds; but the first is the most convenient and expeditious method. This is to be done in autumn, when the leaves decay; and the soils they most delight in are gravel and sand; but in dry seasons they require a great deal of watering. The second year after their removal from the old plant, they will flower; but the flowers are not so strong as in the older plants. They spread very much at the root.

The true *eryngo* has creeping roots, which run deep into the ground; the leaves are roundish, stiff, and of a grey colour, set with sharp spines on the edges; the stalks rise a foot high, and divide upwards into two or three; they are smooth, and garnished at each joint with leaves of the same form as the lower, but smaller, and embrace the stalks with their base; at the end of the branches come out the flowers in roundish prickly heads; under each is situated a range of narrow, stiff, prickly leaves, spreading like the rays of a star; the flowers are of a blue whitish colour; they appear in July, and the stalks decay in autumn.

The root of *eryngium* is attenuant and deobstruent, and is therefore esteemed a good hepatic, uterine, and nephritic. Its whole virtue, it is to be observed, consists in the external or cortical part. Their virtues, however, appear to be but weak; and they are now scarcely otherwise used than as made into a sweetmeat.

The London College directs it to be candied in the following manner: boil the roots till the rind will easily peel off; when peeled, slice them through the middle, and the pith being taken out, wash them three or four times in cold water; then for every pound of roots thus prepared, take two pounds of double refined sugar; dissolve the sugar in water, set it on a fire, and as soon as it begins to boil, put in the roots, and continue the boiling till they become soft.

These candied roots are an ingredient in artificial asses milk, which is thus made: take of candied *eryngo* root one ounce, pearl barley half an ounce, liquorice root three drams; boil them in two pints of water to one pint, to which add a pint of new milk from the cow; boil

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boil them gently together, then ſtrain the liquor for uſe, of which half a pint ſhould be drank three times a day.

ERYNGIUM is alſo a name given, by ſome of the old authors, to aloes; a medicine as different from the root of this name as any one thing can well be from another.

ERYNNIS, or FURIOUS, a name given to Ceres by the Sicilians.

ERYSIMUM. See *Hedge* MUSTARD.

ERYSIPELAS, Ερυσιπελας, in *Medicine*, a diſeaſe of the ſkin, called alſo *ſacer ignis*, and *St. Antony's fire*; and in many parts of Great Britain, the *roſe*.

In an ancient inſtrument belonging to the church of St. Antony at Marſeilles, this diſorder is called *ignis infernalis*, or *fire of hell*.

The word is formed of the Greek, ερυειν, *trahere*, *to draw*, and πελας, *prope*, *near*; whence it is alſo called by the Latins *vicinitraha*, and *vicinirubia*. Others derive it from ερυθρος, *red*, and πελος, *livid*, or *black*.

The ſanguine and plethoric, young people, and pregnant women, are moſt ſubject to this diſorder.

Dr. Quincy accounts for the *eryſipelas*, from a too fizy blood, which, obſtructing the capillaries, occaſions inflammations; others, from a too ſharp and bilious blood, which, on account of its great ſubtility, occaſions no ſenſible tumor, but ſpreads, or diffuſes itſelf, all around; and from the humours not being duly diſcharged by perſpiration. The colour of the tumor, though red, generally inclines towards a yellow, on account of the mixture of the bile; and always the more there is of the bile, the more dangerous the diſeaſe.

This diſorder may be occaſioned by any thing that overheats the blood, checks perſpiration, and obſtructs or diminiſhes either the natural or artificial evacuations.

In *eryſipelatous* fevers, which are juſtly ranked among the exanthematous kind, the blood and humours being in an intenſe motion, an acrid ſerum of a ſulphureous and cauſtic nature is, by that means, propelled to the ſurface of the body, and produces a ſwelling, accompanied with redneſs, heat, and pain.

This fever is far from being innocent and ſimple, as it is generally thought, and is often violent and dangerous, nay mortal, and, in ſome caſes, appears to be nearly allied to peſtilential fevers, the moſt formidable of all diſorders. The ſymptoms in both are of the ſame kind; and on the third or fourth day the morbid matter in both is thrown out to the ſurface, and the violence of the ſymptoms on this ſomewhat abates. But the great difference is, that the one is contagious, the other not ſo; and the peſtilential is much more fatal than the other uſually is found to be.

Phyſicians diſtinguiſh the *eryſipelas* into two kinds, the ſimple, and the ſcorbutic. The ſimple or genuine *eryſipelas* affects only the ſurface of the body, and eaſily gives way to proper remedies, in a ſhort time; but the ſpurious, or ſcorbutic kind, is more deeply rooted, and hard to be removed. There is alſo a third kind, called an exulcerated *eryſipelas*, in which the eruptions are yellow, and contain an acrid pungent humour, which gives a terrible gnawing pain. This diſeaſe affects every part of the body, but particularly the legs and face, eſpecially the latter; and happens at all times of the year, but moſt frequently at the cloſe of ſummer. It ſometimes ſpreads over the whole face, and ſwells and inflames it in ſuch a manner as to endanger ſuffocation; being attended with an intenſe pain, and a number of little puſtules, which, as the inflammation increaſes, become veſiculæ. It often ſeizes people in a moment, while they are abroad, and is called by the country people a *blaſt*, or *ſideratio*; becauſe they imagine it proceeds from foul air, or ill wind; but it is generally occaſioned by cold caught after the body has been greatly heated or fatigued. It, in reality, differs very little from the effects of the ſtings of waſps and bees, except that the heats often riſe into puſtules. One kind of *eryſipelas* wholly reſembles the ſtinging of nettles; this is uſually brought on by drinking, and is very troubleſome, the pimples appearing and diſappearing at times, ſometimes for a long while together.

Etmuller gives it as the diſtinguiſhing character of an *eryſipelas*, that when preſſed very lightly by the finger, there follows a white ſpot, which preſently after becomes red again; which does not happen in an ordinary inflammation, unleſs when violently preſſed. Scorbutic people are moſt ſubject to this diſeaſe. It is diſputed, whether purging be good in the *eryſipelas?* Sydenham recommends it the next day after bleeding. Etmuller cautions us againſt them both, and recommends diaphoretics. Dr. Freind obſerves, that in the laſt ſtage of an *eryſipelas* of the head, attended with a coma, delirium, &c. unleſs cathartics will do good, the caſe is deſperate. All unctuous, aſtringent, and cold applications, externally, are dangerous, and ſometimes make the *eryſipelas* degenerate into a gangrene.

However mild the more common kinds of this diſorder may naturally be, yet ill management will make even the ſlighteſt of them dangerous; and the ſtriking the eruptions in has been often known to be of fatal conſequence. Hoffman mentions a patient he knew, who by taking a vomit, and a draſtic purge, in the time of the eruption, had an inflammation of the ſtomach brought on, and died in a few days. In many kinds of the *eryſipelas*, nature does much, and, with a little proper aſſiſtance, the whole terminates kindly in a ſhort time; but the bad kinds, nay, and too often the beſt, when treated unſkilfully, turn to violent burning fevers, and the eruptions to gangrenes.

The true method of curing an *eryſipelas* conſiſts in three intentions: firſt, that the febrile motion of nature be by no means hindered, but rather promoted, if it be found defective, and only reduced to a due temperament, if exceſſive. Secondly, that the ſubtile cauſtic matter be corrected and prepared for ſecretion and excretion; and thirdly, that the inflammatory ſtagnation of putrid and cauſtic lymph in the external parts be diſcuſſed, and perfectly expelled. Bleeding in an *eryſipelas* is ſometimes beneficial, ſometimes hurtful, and a good general rule is to order it in plethoric habits, and for perſons accuſtomed to drink ſpirituous liquors, and when the diſeaſe attacks the head, but to forbid it in others. In caſes where bleeding is neceſſary, the body ſhould be kept open by emollient clyſters, or ſmall doſes of nitre and rhubarb. When the inflammation is mild and gentle, it may ſometimes be removed by external warmth alone; but when it is more violent, it requires the help of internal, and ſometimes external remedies. Of the internal kind, the *mixtura ſimplex* is one ſtanding good medicine; and of the external, an ointment made of elder-bark, or the rob of elder, is known to have performed great cures; though ointments and plaſters tend rather to obſtruct and repel, than to promote any diſcharge from the affected part. Fine wool, or ſoft flannel, are the ſofteſt applications, which, by defending from the cold air, and promoting perſpiration, have a great tendency to remove the diſeaſe. Bathing the feet and legs in warm water is of conſiderable ſervice, when the diſorder has ſeized the face or brain; and if theſe fail, pultices, or ſharp ſinapiſms applied to the ſoles of the feet, may be more effectual.

In the ſcorbutic *eryſipelas*, gentle laxatives will be proper, and ſuch things as purify the blood, and promote the perſpiration. When the inflammation has been checked by opening medicines, a decoction of ſarſaparilla root, ſhavings of guaiacum, ſaſſafras, and liquorice, may be drank, and ſucceeded by a courſe of bitters.

There is, beſide the common kinds of the *eryſipelas*, yet one more to be mentioned, which is always very terrible, and often fatal; this is an *eryſipelas* of the lungs. In this caſe the patient is ſeized with a highly burning fever, and an acute pain both in the anterior and poſterior parts of the body, but eſpecially about the ſpine. He always holds his neck ſtraight upright when he breathes, and his noſtrils dilate with an exceſs of heat and pain, and, in the more advanced ſtages, his tongue hangs out of his mouth like that of a dog that pants with heat and wearineſs. He vomits ſometimes bile, and at other times phlegm, and is ſubject to very frequent faintings; he coughs much, and either ſpits not at all, or elſe a yellowiſh or bloody matter. This diſeaſe almoſt always proves mortal; and the only accident that can give the patient the leaſt hope, is its quitting the internal parts, and ſhewing itſelf on the ſurface.

Heiſter thinks that the grand intention, in the curing this diſorder, muſt be to dilute the inſpiſſated blood, and break and divide it where it ſtagnates, and is obſtructed. Plenty of thin and weak drinks are therefore to be adminiſtered, by which a gentle and laſting ſweat may be excited, and the teſtaceous powders, and nitrous medicines, are frequently found alſo to have great and good effects. If the inflammation be but very ſlight, it is often cured by external warmth; but when warmth alone does not prove ſufficient, cloths, with the rob of elder ſpread upon them, are found of great benefit, being laid warm on the part, and kept on by warm compreſſes, and the proper bandages. Ointments made of the middle green bark of elder, are alſo very beneficial; and notwithſtanding that many do not approve the practice, yet ſpirit of wine camphorated, with a mixture of ſaffron and Venice treacle, are found often of very great ſervice, applied warm with coarſe paper, or with linen rags; and a mixture of lime-water, and ſpirit of wine camphorated, often does great ſervice. It ſometimes happens, that an *eryſipelas* comes to ſuppuration; and from this generally ariſe the moſt untractable ſpreading and eating ulcers. In this caſe, the ulcer is to be carefully cleanſed, and dreſſed with ointments of ceruſs, red lead, or litharge, and plaſters of the ſame ingredients; and the patient

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must, at the same time, take internal remedies to sweeten the blood, some gentle purges, and observe a strict regimen in regard to diet. Heister's Surgery, p. 193.

If the black, livid, or blue colour of the diseased part shews a tendency to mortification, the Peruvian bark may be given in the quantity of a dram every two hours, when the symptoms are threatening; and cloths dipped in warm camphorated spirits of wine, or the tincture of myrrh and aloes, or pultices of the bark, may be applied to the part, and often renewed; or it may be fomented with a strong decoction of bark.

Those who are subject to frequent attacks of the *erysipelas* should guard against violent passions, strong liquors, and fat, viscid, and highly nourishing food. They should use sufficient exercise, and avoid the extremes of heat and cold. Their food should be chiefly milk and vegetables; and their drink small beer, whey, butter-milk, &c. They should prevent too long a state of costiveness, either by suitable diet, or by often taking a gentle dose of rhubarb, cream of tartar, lenitive electary, or some other mild purgative. See Tissot's Advice, p. 288, &c. Buchan's Dom. Med. p. 270, &c.

ERYSIPELATOIDES, from ερυσιπελας, and ειδος, *likeness*, in *Medicine*, is a swelling like that of the *erysipelas*, though with easier symptoms; and therefore may be taken for a kind of *bastard erysipelas*; in this the skin is of a more dark colour.

ERYTHREAN, an appellation given to Hercules, from a temple which he had at Erythres, in Arcadia.

ERYTHREAN *Sibyl*. See SIBYLS.

ERYTHREMA, a word used, by the old writers in *Medicine*, to express a redness of the cheeks, occasioned by the violent heat in fevers. Some also have applied the same word, in the plural number, to the red inflammatory eruptions in an ERYSIPELAS.

ERYTHRINA, in *Botany*, a name given, by Linnæus, to a genus of supposed vegetables, called by Tournefort, Dillenius, and the generality of other writers, CORAL-LODENDRON, and CORAL.

ERYTHRINUS, in *Ichthyology*, the name of a fish, called by some authors also the *rubellio*, *travolino*, and *alboro*, or *arboro*, by the Venetians. It is a small fish, something like the aurata, or gilt-head, in shape, but much smaller, and of a pale red colour all over. Its tail is forked, its nose sharp, and its eyes large, with silvery irises, and sometimes a slight tinge of red amongst the white. The mouth is small, the fore-teeth broad, and the hinder ones are rather tubercles than teeth; the coverings of the gills are scaly. It has one back-fin, the anterior rays or nerves of which are prickly, the other soft and smooth to the touch. Rondelet. de Pisc. lib. v. cap. 13. p. 144.

ERYTHROCYANEUS, in *Ornithology*, the red and blue maccaw, with a wedge-like tail, and the sides of the head naked and rough. See MACCAW.

ERYTHRODANUM, in the *Materia Medica*, a name by which some authors have called the rubia tinctorum, or MADDER.

ERYTHROIDES, in *Anatomy*, the first of the proper membranes that inclose the testicles.

It is interspersed with fleshy fibres, derived to it from the cremaster muscle, which makes it appear reddish. And hence its name from ερυθρος, *red*, and ειδος, *form*.

ERYTHRONIUM, in *Botany*. See DOG'S *Tooth*.

ERYTHROPHTHALMUS. See RED *Eye*.

ERYTHROXYLON, in *Botany*, a genus of the *decandria trigynia* class: the calyx is turbinated, the corolla has a scaly, nectariferous, emarginated base, to which the stamina are joined; the fruit is a single-celled drupe. Linnæus enumerates two species.

ERZ, or ERZI, in the botanical writings of the *Ancients*, a word used originally by the Hebrews, and by them made the name of the CEDAR.

ESAPHE, from εσαφαω, *I feel with the fingers*, a word used by Hippocrates, to express the touching the mouth of the uterus, in order to discover its state or diseases.

ESCALADE, or SCALADE, a furious attack of a wall or a rampart; carried on with LADDERS, to pass the ditch, or mount the rampart; without proceeding in form, breaking ground, or carrying on regular works to secure the men.

When the troops are prepared to pass the ditch, either with the assistance of boards, hurdles, and fascines, when it is muddy, or with small boats of tin, or baskets covered with skins, or oil-cloth, when it is deep, and filled with water, a party must be placed on the counter-scarp, opposite to the landing-place, ready to fire at the garrison, if they are alarmed, and oppose the mounting on the rampart. If the ditch is dry, the ladders are fixed in some place farthest distant from the centry; and as soon as they get upon the rampart, they put themselves in order to receive the enemy; if the centry should be surprised, and silently overcome, the detachment hastens to break open the gate, and to let in the rest of the party. If the ditch is wet, the rampart high, and provided with a revetement, it will be difficult to surprise the town in this way; but if there is no revetement, the troops may hide themselves along the outside of the rampart, till all are over. Since the invention and use of gun-powder, and the walls of cities have been flanked, they are seldom taken by *escalade*.

ESCALLION, in *Botany*. See SCALLION.

ESCAMBIO, from the Spanish *cambier*, *to change*, was anciently a licence granted any one for the making a remittance, or giving a bill of exchange, to another beyond sea.

For, by stat. 5 Rich. II. no person might exchange, or return money beyond sea, without the king's licence.

ESCAPE, in *Law*, an evasion out of some lawful restraint, either by violence or stealth.

Escapes are either *voluntary*, or *negligent*.

Voluntary, as when one arrests another for felony, or other crime, and afterwards lets him go; in which *escape*, the party that permits it, is by law to suffer punishment as if guilty of the fault committed by the person who *escapes*, be it felony, treason, or trespass; after the original delinquent is actually found guilty or convicted.

Negligent escape is, when one is arrested, and afterwards *escapes* against his will that arrested him; and is not pursued by fresh suit, and taken again, before the party pursued hath lost sight of him.

Keepers of prisons conniving at *escapes* shall forfeit 500*l*. and in civil cases, the sheriff is answerable for the debt.

ESCAPE *warrant*, in *Law*. If any person committed or charged in custody in the king's bench or Fleet prison in execution, or on mesne process, &c. go at large; on oath thereof before a judge of the court where the action was brought, an *escape warrant* shall be granted, directed to all sheriffs, &c. throughout England, to retake the prisoner, and commit him to goal when taken, there to remain until the debt is satisfied; and a person may be taken on a Sunday upon an *escape warrant*. Stat. 1 Anne, cap. 6.

ESCAPEMENT, in *Horology*. See PALLET, and TIME-KEEPER.

ESCARTELE', in *Heraldry*, *quartered*, or QUARTERLY. See QUARTERING.

ESCH, in *Ichthyology*, a name given by Hildegard and others, to the fish we call the grayling, or umber, and the generality of authors, the thymallus. It is of the coregonous kind, and is distinguished by Artedi by the upper jaw being longer, and the back-fin containing twenty-three bones. The Germans call it *asch*, and the Italians *temello*.

ESCHALLOT, *Cepa Ascalonica*, in *Botany*, a species of onion, cultivated in gardens for its use in cookery, and nearly resembling the *Welch* ONION.

ESCHAR, in *Surgery*, a hard crust, or scab, formed on the flesh, by means of a hot iron, or a caustic medicine, or some sharp corrosive humour within.

The word εσχαρα signifies *crust*, or *scab*; which some authors derive from εξ and καιω, *I burn*; but this comes with some difficulty, because καιω is written with a κ, and εσχαρα with a χ.

The caustic stone, or lapis infernalis, produces a round *eschar* in the place where it has burnt. See ESCHAROTICS, CAUSTIC, and CAUTERY.

ESCHARA, in *Natural History*, the name of a species of coralline, &c. the characters of which are these: they are of a stony, or coral-like hardness, and resemble a woven cloth in their texture; and the microscope informs us that they consist of arrangements of very small cells, whose surfaces appear much in that form. Linnæus makes it a species of *millepora*, in the class of lithophytes. See *Tab.* II. *Corallines*, *fig.* 9. and 10.

ESCHAROPEPA, a word used, by the old writers in *Medicine*, to express a coarse kind of barley-meal, which had been torrified over the fire.

ESCHAROTICS, from εσχαρα, *eschar*, medicines, which, being applied externally, produce *eschars*, or scabs, by burning the flesh. See ESCHAR.

Such are the lapis infernalis, red precipitate, &c. These are also called *caustics*.

A composition of sulphur, resin, and honey, proves an *escharotic*, with little or no pain.

ESCHATON, in *Music*, the difference between the diesis enharmonica and the hyperoche; that is, what remains, after taking the difference between the semi-tone minor and diesis enharmonica, from the latter. Henfling, in Misc. Berolin. vol. i. p. 279, 280.

Thus the difference between the semi-tone minor and the enharmonic diesis is $\frac{25}{24} : \frac{128}{125} = \frac{3125}{3072}$, and this taken from the diesis, is $\frac{128}{125} : \frac{3125}{3072} = \frac{393216}{390625}$. This interval

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is about $\frac{53}{100}$ of a comma, as will eaſily appear by logarithms. Mr. Henſling has taken notice of this interval. He calls it *eſchaton*, from its being the leaſt and the laſt interval that occurs in his ſyſtem.

The word is Greek, εσχατον. See INTERVAL.

ESCHEAT, from the French *eſcheoir*, *to happen*, in *Law*, ſignifies lands, or other profits, falling to a lord within his manor, either by way of forfeiture, or the death of his tenant dying without heir general or ſpecial, or leaving his heir within age, and unmarried.

The civilians call ſuch *eſcheats*, or forfeitures, *bona caduca*; and in the ſame ſenſe as we ſay the fee is *eſcheated*, they ſay *feudum aperitur*.

The word *eſcheata* ſometimes alſo ſignifies a lawful inheritance deſcending on the heir. But then it is uſually diſtinguiſhed by the addition of *recta*; as *recta eſcheata*.

ESCHEAT is alſo uſed for the place or circuit within which the king, or other lord, hath *eſcheats* of his tenants.

ESCHEAT is alſo ſometimes uſed for a writ, lying where the tenant having eſtate of fee-ſimple, in any lands or tenements holden of a ſuperior lord, dies ſeiſed, without heir general, or ſpecial: in which caſe, the lord brings this writ againſt him that poſſeſſes the lands, after the death of his tenant; and thereby recovers the ſame in lieu of his ſervices.

ESCHEATOR, an officer, who anciently took care of the king's eſcheats in the county, and certified them into the exchequer, or chancery.

He was appointed by the lord-treaſurer; held his office only for one year; nor could any perſon be *eſcheator* above once in three years. But this office, having its chief dependence on the court of wards, is now out of date.

ESCHEL, in *Mineralogy*, a term uſed, by the ſmalt-workers, to expreſs a ſort of grey ſubſtance reſembling aſhes, which is uſually mixed with the ſmalt when in fuſion. This is carefully ſeparated from it, before it is powdered for uſe, otherwiſe it would debaſe the colour. Phil. Tranſ. N° 396.

ESCHEQUER. See EXCHEQUER.

ESCHEVIN, or ECHEVIN, *Scabinus*, in the French and Dutch *Polity*, a magiſtrate elected by the inhabitants of a city, to take care of their common concerns, the good order, conveniency, and decoration of the city, &c.

At Paris, there is a prevot, and four *eſchevins*; in moſt other cities, a maire, or mayor, and *eſchevins*. In Languedoc, Provence, and Dauphiné, they are called *conſuls*; at Toulouſe, *capitouls*; and *jurats* at Bourdeaux.

Anciently, the *eſchevins* were the aſſeſſors, and counſellors of the comites, or judges of cities; on which account they were called, in ſome places, *pairs*, *pares*; they even took cognizance of petty cauſes themſelves.

Du-Cange obſerves, that the judges, and their aſſeſſors, who were choſen by the inhabitants, were called *ſcabini*, *eſchevini*, and their college, *ſcabinagium*, or *eſchevinage*. He adds, that ſome authors call them *paciarii*, becauſe their office and juriſdiction extended to the ſecuring peace in their city and banlieue, called *pax villæ*.

In Holland, the *ſcabins*, or *eſchevins*, judge of all civil affairs at firſt hand. They alſo take cognizance of criminal matters; and if the criminal confeſs himſelf guilty, they can ſee their ſentence executed without appeal. They can even give torture. The number is not the ſame in all cities; at Amſterdam there are nine, at Rotterdam ſeven, &c.

ESCHRAKITES, or ESRAKITES, a ſect of philoſophers, among the Mahometans, who adhere to the doctrines and opinions of Plato.

The word is derived from the Arabic שרק, *ſchraka*, which in the fourth conjugation אשרק, *aſchráka*, ſignifies *to ſhine, glitter like the ſun*; ſo that *Eſchrakite* ſeems to import *illumined*.

The *Eſchrakites*, or Mahometan Platoniſts, place their higheſt good and happineſs in the contemplation of the Divine Majeſty; deſpiſing the groſs imaginations of the Alcoran touching paradiſe. See MAHOMETANISM.

They are very careful in avoiding all vice; they preſerve an equal and eaſy temper, love muſic, and divert themſelves with compoſing little poems, or ſpiritual ſongs. The ſheics, or prieſts, and the chief among the preachers of the imperial moſques, are *Eſchrakites*.

ESCHYNOMENOUS *plants*. See ÆSCHYNOMENOUS.

ESCLAIRCISSEMENT, a French term, which we find retained in ſome late Engliſh writers: it properly ſignifies the act, or effect, of clearing a thing, or rendering it more bright and tranſparent; being formed from the verb *eſclaircir*, *to clear*, &c.

It is chiefly uſed in a figurative ſenſe, for an explanation of an obſcurity, or difficulty: The *eſclairciſſement* of difficult paſſages in the Bible, is to be ſought for from ſimilar paſſages, or paſſages of the like kind occurring in other places.

ESCLAME, in the *Manege*, an obſolete French word, formerly uſed to ſignify a light-bellied horſe.

ESCLATTE', in *Heraldry*, is applied to a thing violently broken. Thus a bend, or other partition, *eſclatté*, is repreſented torn, or broken off, like a ſhield ſhattered with the ſtroke of a battle-ax.

ESCORT, a French term, ſometimes uſed in Engliſh authors, to denote a convoy, or company of armed men, attending ſome perſon or thing, in a journey or voyage, to defend or ſecure it from inſults.

Some derive the word from the Latin *cohors*. See CONVOY.

ESCOUADE, or SQUAD, is uſually the third or fourth part of a company of foot; ſo divided for mounting guards, and for the more convenient relieving of one another. It is equivalent to a brigade of a troop of horſe. See BRIGADE.

ESCROL, or SCROLL, in *Heraldry*, a long ſlip, as it were, of parchment, or paper, whereon a motto is placed.

Leigh obſerves, that no perſon, under the degree of a knight, might, long after king Henry V. place his creſt on a wreath, as is now uſually done, but only on an *eſcrol*.

ESCROW, a deed delivered to a third perſon, to be the deed of the party making it, upon a future condition, when ſuch thing is performed; and then it is to be delivered to the party to whom made. It is to be delivered to a ſtranger, mentioning the condition; and has relation to the firſt delivery. 2 Roll. Abr. 25, 26. 1 Inſt. 31. See DEED.

ESCU, or ECU, the French crown, of ſixty ſols, or three livres. The *eſcu* was thus called, becauſe the eſcutcheon, or arms of France, which they call *eſcu*, was ſtruck thereon. See COIN.

*Emaux de l'*ESCU. See EMAUX.

ESCUAGE, or SCUTAGE, an ancient kind of knight's ſervice, called alſo *ſervice of the ſhield*; the tenant holding by which, was obliged to follow his lord to the Scottiſh or Welſh wars, at his own expence. But perſonal attendance being inconvenient, the tenants compounded for it, by a pecuniary ſatisfaction, which was levied by aſſeſſments at a certain rate for every knight's fee; and thus it became a pecuniary, in lieu of a military ſervice. The firſt inſtance that occurs was in 5 Hen. II. on account of his expedition to Toulouſe; it afterwards became more general and oppreſſive; ſo that king John was obliged to conſent, by his Magna Charta, that no *ſcutage* ſhould be impoſed without conſent of parliament; but the clauſe was omitted in the charter of Henry III. which directs that it ſhould be taken as it uſed to be in the time of Henry II. or in a reaſonable and moderate manner. However, it was afterwards enacted by ſtat. 25 Edw. I. cap. 5 and 6. and many ſubſequent ſtatutes, that the king ſhould take no aids or taſks, but by the common aſſent of the realm; and it appears that *ſcutages* were the ground-work of all ſucceeding ſubſidies, and of the land-tax of later times. Blackſt. Comm. vol. ii. p. 74.

ESCUAGE was alſo a reaſonable aid, demanded by the lord of his tenants, who held of him by knight's ſervice. See AID.

Conceſſerunt domino regi ad maritandum filiam ſuam de omnibus qui tenent de domino rege in capite de finglis ſcutis 20 *ſolidos ſolvendos*. Matt. Paris. anno 1242.

ESCULAPIUS, in *Mythology*, the god of medicine. He was the ſon of Apollo, by the nymph Coronis, born at Epidaurus, where he had a famous temple; in which his image, made of gold and ivory, was placed on a throne of the ſame materials; it was crowned with rays, had a knotty ſtick in one hand, and the other arm leaned upon a ſerpent, and a dog lay at his feet. The Epidaurians inſtituted ſolemn games, which were celebrated in honour of him once every five years. This god was brought to Rome, by order of Apollo, when a peſtilence raged in that city, in the times of the republic, and was honoured as one of the chief of their made-gods. He is ſaid to have ſtolen away from his old worſhippers under the ſhape of a ſerpent. He is repreſented with a mild look, and with hair and beard not unlike thoſe of the mild Jupiter; his right arm is bare, in order to denote his readineſs for any operation; his left holds a ſtick, with a ſerpent twiſted round it. The dog and cock have been reputed ſacred to this deity, on account of their vigilance; and the raven for his forecaſt. Statius, lib. iii. Sylv. 4. ver. 25. Ovid. Met. xv. ver. 662.

ESCULENTS, from *eſculentus*, *eatable*, a term uſually applied to vegetables which are fit for food, as artichokes, carrots, turneps, parſneps, cabbages, cauliflowers, &c.

ESCULUS, in *Botany*, a name given, by many authors, to the phagus, or ſweet oak, called alſo the eſculent oak.

ESCULUS, or ÆSCULUS. See *Horſe* CHESTNUT.

ESCURIAL, by the Spaniards written ESCORIAL, a term that

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that occurs pretty frequently in our gazettes, and newspapers, for a place of reſidence of the kings of Spain.

Eſcurial originally denotes a little village in Spain, ſituate in the kingdom of Toledo, ſeven leagues to the weſt of Madrid, and nine to the eaſt of Avila, on the ſide of a chain of mountains, called by ſome the Carpetane, or Carpentanian mountains, and by others the Pyreneans, as being the branch of the Pyrenean ridge. Here king Philip II. built a ſtately monaſtery of the order of St. Jerom, held by the Spaniards for one of the wonders of the world, and called the *Eſcurial*. It was begun in 1557, and finiſhed in about twenty-two years.

Fa. Franciſco de los Padros, in a deſcription thereof, intituled, Deſcription breve del Monaſterio de S. Lorenzo el real del Eſcorial, &c. aſſures us it was built by that prince in memory of the battle of St. Quintin, gained on the day of St. Laurence, Lorenzo, a famous Spaniſh ſaint, and at his interceſſion; accordingly the plan of the work reſembles a gridiron, the inſtrument of the ſaint's martyrdom.

The king and queen have their apartments there; the reſt being poſſeſſed by the monks. Whence many of the great tranſactions of that court are dated from the *Eſcurial*.

The *eſcurial* has a very fine church, to which Philip IV. built a beautiful chapel, called the Pantheon, or Rotondo, wherein the kings and queens of Spain, who leave any poſterity, are interred; the reſt being laid in another vault of the ſame church, together with the infantas, and other princes.

It has eleven thouſand windows, fourteen thouſand doors, one thouſand eight hundred pillars, ſeventeen cloiſters or piazzas, and twenty-two courts; with every convenience and ornament that can render a place agreeable in ſo hot a climate; ſuch as an extenſive park, groves, fountains, caſcades, grottoes, &c. This palace contains three libraries, in which are eighteen thouſand volumes, and three thouſand Arabian manuſcripts. Part of this ſuperb palace was burnt in 1671.

ESCUTCHEON, or SCUTCHEON, in *Heraldry*, the field, or coat, wherein the bearing, or arms, of any perſon, are repreſented.

The word *eſcutcheon* is formed of the French *eſcuſſon*, and that from the Latin *ſcutum*, *ſhield*; which was the place arms were originally borne on, before ever they came on banners; and ſtill, where-ever they are placed, it is on ſomething repreſenting the form of a ſhield. The Latin *ſcutum*, no doubt, came originally from the Greek, σκυτος, *leather*, wherewith the ſhields were uſually covered. See SHIELD.

The *eſcutcheon* is of a ſquare figure, excepting the bottom part, which is uſually a little rounded, ending in a point in the middle. See *Tab. Herald. fig.* 38.

Till within a few hundred years, the *eſcutcheons* of the French and Engliſh were triangular: thoſe of the Spaniards are ſtill quite round at bottom, without any point; thoſe of the Italians are oval; and thoſe of the Germans in form of cartoozes.

The ancient *eſcutcheons* were generally couched, or inclined; and they only began to place them upright, when crowns, &c. were put over them by way of creſt.

In France, eſcuſſon, *eſcutcheon*, was formerly reſtrained to a ſhield, or coat, pointed at bottom; by which it was diſtinguiſhed from the *eſcu*, which was quite ſquare, and was only allowed to be borne by the counts and viſcounts. Thoſe of inferior quality were confined to the eſcuſſon, or pointed eſcu.

The ſeveral parts and points of the *eſcutcheon* have their proper names: the point A, for inſtance, is the *dexter chief point*; B the *middle chief*; and C the *ſiniſter chief point*; D is the *honour point*; E the *feſſe point*; F the *nombril point*; G the *dexter baſe*; H the *middle*; and I the *ſiniſter baſe* point.

The *dexter ſide* of the *eſcutcheon* anſwers to the left-hand, and the *ſiniſter ſide* to the right hand of the perſon that looks on it.

The *eſcutcheon* is differently denominated, according to its diviſions. It is called *dextered*, when the perpendicular line that divides it, is to the right of a third part of the *eſcutcheon*; *ſiniſtered*, when on the left; *tierced in pale*, when this line is double, and divides the whole *eſcutcheon* into three equal parts; *paled*, when increaſed to the number of ſix, eight, or ten. A horizontal line makes the *chief*, when at one third part from the top; the *plein*, when at a third from the bottom; and when double, in the middle, at an equal diſtance from both extremes, it makes the *feſſe*, and the *tierced in feſſe*; when it is multiplied, it denominates it *feſſed*; when there are eight or ten equal ſpaces, *burrellé*. A diagonal from the dexter point of the chief to the ſiniſter of the baſe, makes it *tranché*; the contrary, *doublé*; if it be doubled at equal diſtances, the firſt makes *bandé*, and the *tierce in bend*; and the other *barré*, or *tierce in bar*; increaſing the number of the firſt makes *bandé*, and *cottické*; and increaſing that of the ſecond, *barré*, and *traverſé*.

ESCUTCHEON *of pretence*, is an *ineſcutcheon*, or little *eſcutcheon*, which a man, who has married an heireſs, and has iſſue by her, may bear over his own coat of arms, and in it the arms of his wife; and, in this caſe, the ſurviving iſſue will bear both coats quarterly. See *Tab.* II. *Heraldry*, *fig.* 64.

ESCUTCHEON-*grafting*, in *Gardening*. See ENGRAFTING.

ESDRAS. See EZRA.

ESEBON, a name given, by ſome of the chemical writers, to common ſea ſalt.

ESNECY, *Æſnecia*, *dignitas primogeniti*, in *Law*, a private prerogative, allowed to the eldeſt *coparcener*, where an eſtate is deſcended to daughters for want of heirs male, to chuſe firſt after the inheritance is divided. Fleta, lib. v. cap. 10. *Jus eſneciæ* is *jus primogenituræ*; in which ſenſe it may be extended to the eldeſt ſon, and his iſſue, holding firſt. In the ſtatute of Marlbridge, cap. 9. it is called *initia pars hereditatis*.

ESOTERIC, in *Antiquity*. See EXOTERIC.

ESOX, in *Ichthyology*, the name of a genus of fiſhes, of the claſs of abdominales, in the Linnæan ſyſtem; the characters of which are theſe: they are of the malacopterygious, or ſoft-finned kind. The branchioſtege membrane contains from ſeven to twelve bones. The body is oblong; the back fin not large, and is placed very near the tail. The ſpecies of this genus, enumerated by Artedi, are three, and by Linnæus nine.

The word *eſox* is truly Roman. Pliny, and other of the ancient Latin authors, have uſed it as the name of the ſame fiſh. It ſeems to have been derived from the verb *eſito*, *to eat*; for all the ſpecies of this fiſh are very voracious.

ESPALIER, in the *French Gardening*, a wall-tree; or a fruit-tree, which is not left to grow at liberty in full air, but has its branches nailed, or faſtened, to a wall, or ſome other flat ſurface, near which it is planted; and, thus growing, it is made to conform itſelf to the flat, though unnatural, figure thereof. See FRUIT-*Tree*, WALL, &c.

ESPALIERS, in our *Gardening*, are rows of trees, planted regularly round the outſide of a garden, or plantation, for the general ſecurity thereof from the violence and injury of the winds; or elſe only round ſome part of a garden, for the particular ſecurity of a plantation of orange-trees, lemon-trees, myrtles, or other tender plants; or, laſtly, for the bounding of borders, walks, avenues, &c.

Eſpaliers are now come into great uſe, with reſpect to the firſt of theſe intentions: in effect, it is found, by experience, that the beſt brick, or ſtone walls, are not of themſelves ſufficient ſecurity to fruit-trees, from the ravages of blighting winds.

The reaſon may be, that, being built cloſe and compact, they repel the winds, and, by that means, damage the tender plants, that lie within the reach of the repulſion; but theſe *eſpaliers* ſerve to deaden the violence of the winds, ſo that the tender greens, or plants, encompaſſed by them, reſt ſerene and quiet.

Thus, if the *eſpaliers*, for inſtance, be of ſpruce, fir, holly, or yew, they give way to the force of tempeſtuous winds beating againſt them, without occaſioning any reſilition thereof. Meſſrs. London and Wiſe direct them to be planted at ſome diſtance, without the outmoſt bounds, or walls, of gardens, &c. Two or three rows of trees they think ſufficient, from eighteen or twenty to twenty-five feet apart; and as to the method, or order, of diſpoſing the trees, the moſt commodious is, where the middle row makes every where equilateral triangles with the extreme rows, in the following manner. See QUINCUNX.

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The trees recommended for making, or planting, theſe *eſpalier* fences, are, the elm, lime, beech, Scotch fir, oak, pine, and ſycamore; but, particularly, the two firſt.

Eſpaliers are moſt commonly made of fruit-trees trained up to a lattice of wood-work, formed either out of aſh-poles, or ſquare pieces of fir-wood; and their moſt uſual office is the ſheltering, and at the ſame time hiding the quarters of kitchen gardens.

The trees principally planted for *eſpaliers* now, are apples and pears, and ſome plums. The apples intended for *eſpaliers* ſhould be grafted on crab-ſtocks, for large gardens, and for ſmaller on codling-ſtocks. The trees for the ſame hedge in an *eſpalier*, ſhould be all ſuch as are of the ſame age, from the grafting, and produced from the ſame ſtocks, that ſo the hedge may be the more regular. The more quick growing, and ſpreading ones, muſt be planted at thirty or thirty-five feet aſunder, and thoſe of ſmaller

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ſmaller growth, at twenty-five feet; the walk between them in a large garden ſhould be ſixteen feet wide; and if the *eſpaliers* are intended to be carried up high, it ſhould be more, that both hedges may have the benefit of the ſun.

The beſt ſorts of apples for *eſpaliers*, are the golden pippin, the nonpareil, the rennet griſe, the aromatic pippin, the Holland pippin, the French pippin, Wheeler's ruſſet, and Pile's ruſſet; for the choice and pruning of theſe trees, ſee APPLES and PRUNING.

The pears fitteſt for *eſpaliers*, are the ſummer and autumn kind; for the winter ones ſeldom ſucceed well. Theſe trees, if deſigned for a ſtrong moiſt ſoil, ſhould be on quince-ſtocks; but if for a dry ſoil, upon free ſtocks. The diſtance for pears grafted on free ſtocks ſhould be thirty feet, for moderately growing trees, and for the moſt vigorous ſhooters, it ought to be, at leaſt, forty feet. And the beſt kinds of pears for this purpoſe, are the jargonelle, the blanquette, the poire ſans peau, the ſummer boncretien, Hamden's burgamot, the poire du prince, autumn burgamot, l'ambrette, gros rouſſelet, chaumontelle, beurre du roy, the le marquis, and the creſſane.

The third year after the trees are planted, the frame-work of the *eſpalier* ſhould be made. Till this time the young ſhoots need only be trained to upright ſtakes, as nearly as can be in an horizontal direction. The beſt way of making the wood-work is of aſh-poles, which are not only cheap, but ſtrong and durable. Theſe are of two kinds; the largeſt poles, deſigned for upright ſtakes, ſhould be cut about ſeven feet and a half long, and placed at a foot diſtance, in a right line, and about ſix feet above the ground, at the ſame height; a row of ſtrait ſlender poles ſhould be nailed along the tops of the upright ſtakes, in order to keep them even, and the ſtakes ſhould be croſſed with the ſmaller poles, at about nine inches diſtance, row from row, from the top to the bottom, and theſe rows of poles ſhould be well faſtened to the ſtakes with wire. Then the branches of the fruit-trees are all to be trained horizontally to theſe, and none ſhould be ſuffered to croſs one another, nor to come too near, and faſtened to them with ſmall oſier twigs, or rope yarn. In the trees which produce large fruit, no branches ought to be nearer to each other than ſix or eight inches; in the ſmaller fruited ones, four or five inches will be ſufficient; the advantages of the trees planted in *eſpaliers*, above thoſe propagated as dwarfs, in the room of which theſe have been introduced, are many and very great. They take up very little room in a garden, and are of no injury to the plants cultivated in the quarters; and the fruit is always more regularly ripened and better taſted, as the ſun and air can have every way free acceſs to it. Miller.

To prevent the diſorders that might befal *eſpalier* fruit-trees, when in bloſſom, Mr. Bradley mentions a nurſery-man, who, having moſt ſorts of fruit in *eſpaliers*, had portable hedges made of reeds in frames, which he ſet both at the back and front of his *eſpaliers*, as he ſaw occaſion.

ESPAULE, ESPAULEMENT, &c. in *Fortification*. See EPAULE, EPAULEMENT, &c.

ESPHLASIS, from εσφλαομαι, *to recede inwards*, a term uſed by the old writers in *Medicine*, for the receding inward of the ſkull in depreſſions from contuſions.

ESPLANADE, in *Fortification*, called alſo GLACIS; a part which ſerves the counterſcarp, or covert way, for a parapet; being a declivity, or ſlope of earth, commencing from the top of the counterſcarp, and loſing itſelf, inſenſibly, in the level of the champaign.

ESPLANADE alſo ſignifies the ground which has been levelled from the glacis of the counterſcarp, to the firſt houſes; or the vacant ſpace between the works and the houſes of the town.

The term is alſo applied, in the general, to any piece of ground which is rendered flat, or level, and which before had ſome eminence that incommoded the place.

ESPLEES, *Expletiæ*, from *expleo*, in *Law*, the products which ground or land, &c. yield; as the hay of the meadows, the herbage of the paſture, corn of the arable, rents, ſervices, &c. and of an advowſon, the taking of tithes in groſs by the parſon; of wood, the felling of wood; of an orchard, the fruit growing there; of a mill, the taking of toll, &c. Theſe and ſuch like iſſues are termed *eſplees*. And it is obſerved, that in a writ of right of land, advowſon, &c. the demandant ought to allege in his court, that he or his anceſtors took the *eſplees* of the thing in demand; otherwiſe the pleading will not be good.

Sometimes this word hath been applied to the farm, or land, &c. themſelves—*Dominus E. habebit omnia expletias & proficua de corona emergentia.* Plac. Parl. 30 Edw. I.

ESPOUSALS, *Sponſalia*, in *Law*, a contract or mutual promiſe between a man and a woman to marry each other. Marriage or matrimony is ſaid to be an *eſpouſal de preſenti*.

ESQUADRILLE. See QUADRILLE.

ESQUADRON. See SQUADRON.

ESQUIAVINE, in the *Manege*, an old French word, ſignifying a long and ſevere chaſtiſement of a horſe in training him.

ESQUINANCY, in *Medicine*, a diſeaſe called alſo *angina*, *ſquinancy*, and, popularly, QUINZY.

ESQUIRE, a title of diſtinction, next below that of knight, and above that of a ſimple gentleman.

The origin, both of the name, and the thing, *eſquire*, is very obſcure: the Engliſh denomination is confeſſedly borrowed from the French, *eſcuyer*; and that from the Latin *ſcutum*, *ſhield*, as ſome will have it; or, as others, from *ſcutarius*, or *ſcutiger*, *ſhield-bearer*; or from *ſcuria*, *ſtable*; or from *equiſo*, *groom*. So many different opinions of the formation of the word, have given riſe to as many about the primitive office of *eſquires*; unleſs, perhaps, the latter hath given occaſion to the former. Paſquier, in his Recherches, liv. ii. chap. 15. maintains the title of *eſquire*, *eſcuyer*, *ſcutarius*, to be very ancient. From the time of the declenſion of the Roman empire, he obſerves, there were two extraordinary kinds of ſoldiery in the Roman army; the one called *gentiles*, and the other *ſcutarii*.

Ammian. Marcellin. lib. xiv. cap. 7. and lib. xvi. cap. 4. ſpeaks of theſe *ſcutarii* as men of redoubted proweſs, and even deemed invincible: it is added, that Julian the Apoſtate ſet a mighty value on thoſe troops, when he was among the Gauls; and hence, probably, it was, that the Gauls, or, perhaps, only the Franks, finding the braveſt among the Roman forces were called *gentiles*, and *ſcutarii*, gave the like names to the boldeſt and braveſt among themſelves: ſuch, according to that curious antiquary, is the original of *eſquires*.

Eſquire, however, afterwards came to be uſed in a ſomewhat different ſenſe; viz. for a gentleman who attended a knight in the wars, and on other military occaſions; bearing his ſhield, *ſcutum*, before him (whence he was called *ſcutarius*, *ſcutiger*, or *ſcutifer*), as alſo his lance, and other weapons; whence his other Latin appellation, uſual among us, *armiger*, q. d. *armour-bearer*. And hence, likewiſe, it is, that, in all our ancient romances, the hero is conſtantly attended by a gentle and truſty *ſquire*.

After all, the moſt probable derivation of *eſcuyer* is not from *eſcu*, *ſcutum*, as is the common opinion; but from *equus*, *horſe*; the primitive *eſquires* being no other than what the Latins call *equiſones*, who had the care and intendance of the equerries, or ſtables, only.

Be this as it will, the title *eſquire*, *armiger*, as now eſtabliſhed among us, is next below that of knight, *eques*. They who bear this title, are all younger ſons of noblemen, and the eldeſt ſons of ſuch younger ſons; the eldeſt ſons of knights, and their eldeſt ſons ſucceſſively; both which ſpecies of *eſquires* Sir Henry Spelman entitles *armigeri natalitii*; the four *eſquires* of the king's body, and *eſquires* created by the king, by putting about their necks a collar of SS's, and beſtowing on them a pair of ſilver ſpurs; letters patent, or other inveſtiture, and their eldeſt ſons. Laſtly, divers others, in the ſuperior public offices, are reputed *eſquires*, or equal to *eſquires*; as ſheriffs of counties, ſerjeants at law, juſtices of peace, mayors of towns, counſellors at law, lieutenant-colonels, majors, captains, &c. during the time of their commiſſion. Laſtly, the heads of ſome ancient families are likewiſe *eſquires* by preſcription. To theſe may be added the *eſquires* of knights of the Bath, each of whom conſtitutes three at his inſtallation; and all foreign, nay, Iriſh peers; for not only theſe, but the eldeſt ſons of peers of Great Britain, though frequently titular lords, are only *eſquires* by the law, and muſt be ſo named in all legal proceedings. See GENTLEMAN.

ESQUISSE, in the French *Painting*, a term ſignifying the firſt ſlight ſketch, or draught, of a picture; the firſt thought of a deſign drawn haſtily with a crayon, or in colours, on paper, canvas, or the like; in order to be finiſhed, and painted, or engraven, afterwards.

He had not the trouble of making a finiſhed and correct deſign, but went to work upon the *eſquiſſe*.

The word is formed of the Italian *ſchizzo*, a *ſplaſh*; becauſe an *eſquiſſe* of a painting only repreſents, as it were, ſplaſhes, or dabs, of colours.

ESRAKITES. See ESCHRAKITES.

ESSÆANS. See ESSENI.

ESSART, or ASSART. See ASSART.

Du-Cange derives the word from ſome of the barbarous Latin words, *exartus*, *exartum*, *eſſartum*, *aſſartum*, *ſartum*, and *ſartus*; which all ſignify a foreſt cut down, or dug up; though Spelman chooſes to deduce it from the Latin *exertum*, *torn up*, or *unrooted*. Others from *ſarrire*, *to weed*;

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weed; and others, laſtly, from *exaro*, *I plow*; whence *exarare*; and, by contraction, *exartum*. In our ancient law-books, *exartum facere in ſylva*, is to *eſſart* a place in a foreſt.

To *eſſart*, is to grub up, or extirpate, buſhes, trees, old roots, ſtumps, or the like; in order to fit the ground for tillage.

ESSATUM, a word uſed by ſome of the chemical writers, to expreſs the medicinal power or ſanative property reſiding in ſimple medicines.

ESSAY, a trial, or experiment, to prove whether a thing be of the requiſite quality, or goodneſs.

The word is French, *eſſai*; which ſome authors derive farther from the Latin *examen*.

ESSAY is alſo uſed for an attempt, or tentative, to learn whether or no a thing will ſucceed.

Eſſays of machines ſhould be made in large; it is not enough that they ſucceed in little.

ESSAY, in *Monaſteries*, is particularly uſed for a trial which a perſon makes of the monaſtic life, in a ſecular habit.

This *eſſay* is of one, two, and, in ſome monaſteries, of three months. The *eſſay* is not reckoned in the noviciate. See PROBATION.

ESSAY, or ASSAY, or ſimple SAY, in *Coinage*. See ASSAY.

ESSAY, in matters of learning, is a peculiar kind of compoſition; whoſe character is to be free, eaſy, and natural; not tied to ſtrict order, or method, nor worked up, and finiſhed, like a formal ſyſtem.

The matter of an *eſſay* is ſuppoſed to conſiſt principally of ſudden and occaſional reflections, which are to be wrote much at the rate, and in the manner, a man thinks; ſometimes leaving the ſubject, and then returning again, as the thoughts happen to ariſe in the mind.

At leaſt, this has hitherto been the practice; and Montagne, who has acquired no ſmall reputation by this way of writing, ſeldom keeps many lines to the ſubject he propoſes; though it is our opinion, that lord Bacon, in many of his works, is a better pattern in the *eſſay* kind. Mr. Locke, however, and a few other authors, uſe *eſſay* in a ſeverer ſenſe: the Eſſay of Human Underſtanding, every body knows, is a regular, artful, and laboured work; though perhaps ſo called, to guard againſt too ſevere ſtrictures, by pleading the title.

ESSAY-*batch*, is the miners term for a little trench or hole, which they dig to ſearch for *ſhoad*, or ore. See TIN.

ESSAY-*maſter*. See MINT, and ASSAY.

ESSE, in the *School Philoſophy*, is uſed in the ſame ſenſe with eſſence; principally for that which is actual, or actually exiſting.

The word is pure Latin; being the infinitive of the verb *ſum*, *I am*; whence *eſſe*, *to be*.

From *eſſe* ariſes *eſſatum*, a barbarous term, now almoſt obſolete, ſignifying that which is endued with eſſence, or nature; or affected with the virtue, or efficacy, of another. Some diſtinguiſh *eſſe* into *real* and *intentional*; and, again, into *eſſatum* and *volitum*.

ESSEDARIUS, among the Romans, a gladiator, who fought in a car, or chariot. See Hiſt. Acad. Inſcript. vol. ii. p. 376, ſeq.

ESSENCE, that which conſtitutes, or determines, the nature of a thing; or which is abſolutely neceſſary to its being what it is. This Mr. Locke calls the nominal *eſſence*, in contradiſtinction to the real *eſſence* or conſtitution of ſubſtances, on which this nominal *eſſence* depends: thus, the nominal *eſſence* of gold is that complex idea which the word gold repreſents; e. g. a body, yellow, heavy, malleable, fuſible, and fixed; but its real *eſſence* is the conſtitution of its inſenſible parts, on which thoſe qualities, and all its other properties depend; which is wholly unknown to us.

In philoſophy, the *eſſence* of a thing is defined to be, that whereby a thing is diſtinguiſhed from every other thing.

The Carteſians hold the *eſſence of matter* to conſiſt in extenſion; and, on that principle, deny that there is any ſuch thing as mere ſpace, or vacuity; but the hypotheſis is falſe, as is ſhewn under the articles MATTER, SPACE, VACUITY, PLENUM, &c.

Gaſſendus, and moſt of the corpuſcular philoſophers, hold the *eſſence* of matter to conſiſt in ſolidity, or impenetrability, or reſiſtance, or, more adequately, in a ſolid impenetrability reſiſting the touch; which, it muſt be allowed, of all the properties of matter, ſeems to have the faireſt title to it.

The ſchool philoſophers give us two ſignifications of the word *eſſence*: the firſt denotes the whole eſſential perfection of a being, and, conſequently, its entity, with all its intrinſic, or eſſential, and neceſſary attributes, taken together: in which ſenſe, *eſſence* may be defined to be, all that whereby a thing is, and what it is. In which caſe, the *eſſence* of a thing is to the thing itſelf, what humanity, e. gr. is to man.

The ſecond ſignification of *eſſence* is, that whereby it denotes the principal, and moſt intimate, of all the attributes of a thing; or that which agrees to every ſuch thing, and ſuch alone, and that always, and in ſuch manner, as that the mind, with all its attention, cannot perceive any thing prior thereto; by which, *eſſence* is diſtinguiſhed from the eſſential attributes, i. e. from ſuch as flow from its *eſſence*, or firſt attribute. Thus, the *eſſence* of the human mind is commonly ſuppoſed to conſiſt in the power of thinking; becauſe all its other perfections ſeems to pre-ſuppoſe this; but this pre-ſuppoſes none. And thus the powers of underſtanding, doubting, aſſenting, willing, &c. do all flow from the power of thinking; and cannot exiſt without it, though this may without any of them.

It muſt be allowed, however, that the eſſential properties of a thing do ſo cloſely cohere, nay, and inhere, in the *eſſence* itſelf, that it is ſcarce poſſible to diſtinguiſh the one from the other. Hence, what ſome urge, that, ſetting aſide all the attributes and properties of a thing, and what remains is its *eſſence*; is a mere chimera. For ſet aſide, e. gr. from the mind, the powers of underſtanding and willing, with the reſt of its attributes, and what will there remain to call its *eſſence*?

It is greatly diſputed, in the ſchools, whether the *eſſences* of created things be eternal? or, whether the *eſſences*, as well as the exiſtences, had their origin in time? The Carteſians hold, that the *eſſences* of things depend abſolutely on the free concurring will of God.

ESSENCE, in *Medicine* and *Chemiſtry*, denotes the pureſt, moſt ſubtil, and balſamic part of a body, extracted from the reſt by means of fire.

Of theſe there is a great variety, drawn from flowers, fruits, and the like, uſed on account of their agreeable ſmells, and taſtes, by the apothecaries, perfumers, &c. The principal are, *eſſence* of roſemary; of turpentine; of aniſe; of cloves; of cinnamon; and of citron.

The *eſſences* commonly ſold by the perfumers, are only the diſtilled oils of behn, and of bitter almonds; to which they give the ſmell of certain flowers, or ſpices; as violets, jeſſamine, cinnamon, &c.

The *eſſences* to be drank, or mixed, with liquors, are of a more elaborate compoſition: the moſt uſual, and beſt, is prepared with ſpirit of wine, cloves, cinnamon, mace, long-pepper, and coriander. The whole, being put up in a very cloſe veſſel, is expoſed to the ſun for ſix weeks, or two months, during the day-time, and in the night ſet near the fire.

In winter they uſe the fire alone. This *eſſence* being exceedingly ſtrong, is frequently uſed only to give a ſtrength to other weaker liquors. After the ſame manner may the *eſſences* of ambergriſe, muſk, &c. be drawn.

The *eſſence* of odoriferous flowers, to give a fine ſmell to liquors, is drawn by diſpoſing ſtrata, or lays, of the flowers, and of ſugar, alternately, in a proper veſſel, and leaving them to infuſe, in a cellar, for twenty-four hours; and, after that, as long in the ſun; and, laſtly, ſtraining, or percolating, the whole through a ſieve, without ſqueezing the flowers.

ESSENCE *of wine*, a term uſed by Paracelſus, and ſome of the German chemiſts ſince his time, to expreſs what is called ſometimes the philoſophical ſpirit of wine, or the ſpirit of wine of the ancients. It is not a diſtilled ſpirit like what we call ſpirit of wine, but approaches more to what Stahl has greatly recommended to the world, under the name of concentrated wine, or wine whoſe ſtrength has been reduced to a ſmaller compaſs, by ſeparating its aqueous part only by freezing. Stahl recommends the immediately expoſing wine to the froſty air on this occaſion; but the proceſs ordered by Paracelſus for the preparation of this liquor is more tedious. He orders that the fineſt and beſt flavoured wine be choſen; that it be put into a glaſs, filling it up three parts in four; and the neck being then ſealed hermetically, it is to be put into horſe-dung for three months, and then expoſed to the froſty air for a month, after which the ice is to be thrown away, and the liquid part, which is the *eſſence*, preſerved. Shaw's Chemical Eſſays.

ESSENDO *quietum de tollonio*, in *Law*, a writ to be quit of toll, and lies for citizens and burgeſſes of any city or town that by charter or preſcription ought to be exempted from toll, where the ſame is exacted of them. Reg. Orig. 258.

ESSENI, ESSENES, or ESSÆANS, an ancient ſect among the Jews.

As to the etymology of the name, critics have been much divided. Philo derives it from ὁσιος, *holy*; Epiphanius from יִשַׁי, *Jiſhai*, *Jeſſe*, the father of David; Salmaſius from a city called *Eſſa*, mentioned by Joſephus; whence he apprehends this ſect firſt ſprung; Godwin derives it from the Syriac word אסא, *aſa*, which ſignifies *to heal*; becauſe Philo calls one branch of the *Eſſenes* therapeutæ:

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and Serrarius enumerates at leaſt a dozen different etymologies. Philo in Tract. Omnis probus Liber. Oper. p. 678. Colon. Allobr. 1613. Epiphan. Hæreſ. xix. lib. i. Salmaſ. Plin. exercit. in Solin. cap. 35. Serar. Trihæres. Jud. lib. iii. cap. 1. p. 106. 110. edit. Trigland. 1703. The principal ancient writers, who give any conſiderable account of the *Eſſenes*, are Joſephus, Philo, and Pliny. Joſ. de Bell. Jud. lib. ii. cap. 1. cap. 8. & 12. and Antiq. lib. cxiii. cap. 9. 13. 19. lib. xviii. cap. 1. & cap. 2. & alibi. Philo, ubi ſupra, & De Vita contemplativâ, p. 688. ed. Col. Allobr.

As to the origin of this ſect, Pliny aſſerts, without mentioning his authority, that it had ſubſiſted for ſeveral thouſand years. The moſt probable opinion is, that this ſect was formed by Jewiſh exiles, a little before the time of the Maccabees, who were forced to fly from the perſecution of their enemies into caves and deſerts. The firſt *Eſſenes* we read of are mentioned in the fourth book of Maccabees, under the name of Haſidanim, and by Joſephus; both which accounts agree, that they were already ſettled in Judæa, in the time of Jonathan, the brother and ſucceſſor of Judas Maccabæus, about a hundred and fifty years before Chriſt. Philo and Joſephus agree, that their number in Judæa was about four thouſand; but Philo makes the number in Egypt much greater. Some have expreſſed their ſurprize, that no mention ſhould be made of this ſect in the New Teſtament. This proceeded, as ſome imagine, from their retired mode of living, by reaſon of which they never came under our Saviour's obſervation, as the Phariſees and Sadducees often did. Others ſuppoſe, that, being very honeſt and ſincere, without guile or hypocriſy, they gave no reaſon for that reproof and cenſure, which the others very juſtly merited. Prid. Conn. vol. iii. p. 384. However, it has been ſuppoſed, that they are referred to by the apoſtle Paul in his Epiſtle to the Coloſſians, ch. ii. 18, 21, 23.

Joſephus, making mention of the ſeveral ſects among his countrymen, diſtinguiſhes three; viz. the Phariſees, Sadducees, and *Eſſeni*; which laſt he prefers to the two former, as to their manner of life. He aſſures us, farther, that they were Jews, by original; from which it ſhould appear, that St. Epiphanius was miſtaken, in ranking them among the Samaritans.

In effect, the *Eſſeni* appear to have been true Pythagorean philoſophers, in every thing that related to their manner of living; for they greatly affected ſolitude and retirement, and avoided all converſation with women, to devote themſelves more entirely to the contemplative life.

Grotius will have the *Eſſeni* the ſame with the ancient חסדים, *Haſidim*, or *Haſidæi*; thus called, according to Philo, from their ſingular piety, humility, and devotion. Among theſe, Gale obſerves, it was, that the Hebrew philoſophy chiefly flouriſhed. Porphyry is very prolix in his praiſes of the *Eſſeni*: Ειϛι τοινυν οι Εσσαιοι Ιυδαιοι μην το γενω φιλαλληλον, &c. He repreſents them as deſpiſers of pleaſures, riches, glory, and delicacy; and ſtrenuous retainers to continency, auſterity, ſtudy, &c. He adds, they decline marriage, and adopt and educate other people's children in the principles of religion and philoſophy; they are all on a level, hold every thing in common, neither buy nor ſell, &c. By long habit, they arrived at ſuch a degree of patience, that Porphyry aſſures us, flames and tortures had not the leaſt effect on them. They ſcorned to intreat their tormentors; nor ever ſhed a tear; but would ſmile under all their agonies, &c. As to their learning, Philo Judæus, in his treatiſe, That every good Man is free, tells us, that they deſpiſed logic, as uſeleſs to the acquiring of virtue; phyſics they left to the ſophiſts and diſputants, as judging it to tranſcend the human faculties; and applied themſelves wholly to morality. Porph. de Abſtin. lib. iv. § 11. ſeq. Gale, Philoſ. Gener. lib. i. cap. 1. § 11.

Both Joſephus and Philo give a ſurpriſing account of their auſtere way of life, which the curious reader may ſee at large in Prideaux's Conn. ubi ſupra. Their houſes were mean; their cloaths made of wool, without any dye; they never changed their cloaths or ſhoes, till they were quite worn out; their food was plain and coarſe, and their drink water; they neglected all bodily ornaments, and would by no means anoint themſelves with oil, according to the faſhion of thoſe times. They lived in ſodalities, and had all their goods in common; their morals were very exact and pure, and they kept the Sabbath more ſtrictly than any of the Jews: Before any of them were admitted to the common table, they bound themſelves by a ſolemn oath to obſerve the rules of the ſociety, which were very ſtrict and exemplary.

Some have ſaid that the *Eſſenes*, as well as the Pythagoreans, prohibited oaths; that they uſed only inanimate ſacrifices, and that they not only worſhipped towards the riſing ſun, but worſhipped the ſun itſelf. But it has been urged, that neither of theſe charges ſeem to be well founded; or, at leaſt, that it is difficult to reconcile them with their known veneration for the writings of Moſes, and other inſtances of their conduct. Pliny, and others on his authority, have aſſerted, that they wholly declined marriage; and Pliny (lib. v. cap. 17.) with more wit than juſtice, ſays, that for ſeveral thouſands of years, this people is perpetually propagated without any being born among them, ſo fruitful and prolific unto them is the repentance of others. But Joſephus informs us (De Bell. Jud. lib. ii. cap. 1.) that there was one ſort of *Eſſenes*, who agreed with the others, except in the article of marriage. For they reckoned, that thoſe that do not marry cut off a great part from the number of the living, and that thus the whole race of mankind would ſoon be extinguiſhed. Accordingly they made choice of thoſe women, who, after three years trial, were found fit to bear children, and never cohabited with them after they were known to be with child; conſulting the propagation of their ſpecies, and not their own gratification in this buſineſs.

With reſpect to the religious opinions of the *Eſſenes*, they believed the exiſtence of angels, the immortality of the ſoul, and a future ſtate of rewards and puniſhments, but denied the reſurrection of the body. They maintained, that fate governs all things, and that nothing happens to man but by its appointment.

The *Eſſeni* ſeem to have been, among the Jews, what the moſt retired and auſtere monks are, or were, among the Chriſtians; which was what gave them their denomination of Ιυδαικοι ασκηται, *Jewiſh aſcetics*.

Many catholic writers have even deduced the origin of monks from them; building, principally, on what Philo relates of them, who divides them into two branches, or ſects; the one who married, and the other who lived in celibacy.

Joſephus ſeems likewiſe to have had an eye to theſe two ſorts of *Eſſeni*. Serrarius, who has wrote very amply on the ſubject, follows Philo, in making two claſſes of *Eſſeni*. The firſt are thoſe whom he calls *Practici*, and who lived in community; the ſecond, thoſe called *Theoretici*, who lived in ſolitude, and led a life of pure contemplation. He adds, that Joſephus only makes mention of the firſt; omitting the contemplative kind, whom Philo calls *Therapeutæ*, and who were principally found in Egypt. See THERAPEUTÆ.

Euſebius holds, that the *Eſſeni*, called *Therapeutæ*, were real Chriſtians, or Jews converted by St. Mark, who had embraced this kind of life. Scaliger, on the contrary, maintains, that theſe *Therapeutæ* were no Chriſtians, but real *Eſſeni*, who made profeſſion of Judaiſm: however, he allows of the two kinds of *Eſſeni* above mentioned. But Valeſius, in his notes on Euſebius, abſolutely rejects any ſuch diſtinction: he denies, that the *Therapeutæ* were any real *Eſſeni*; and that chiefly on the authority of Philo himſelf, who never calls them *Eſſeni*, and who places the *Eſſeni* in Judæa and Paleſtine; whereas the *Therapeutæ* were ſpread throughout Greece, Egypt, and other countries.

Some traces of the *Eſſenes* are found under the emperor Trajan, and under Juſtinian; but they were much degenerated from their primitive purity both of doctrine and manners; and the ſect about that time became extinct. Though the *Therapeutæ*, as well as the *Eſſenes*, were ſtrictly Jews, and not Chriſtians, it is not impoſſible, that ſome of them, becoming Chriſtians, might ſtill affect their former recluſe way of living; and being imitated by others, lay the foundation of monkery among Chriſtians.

ESSENTIA *dulcis*, in *Chemiſtry*, a name given by Kunkel, and ſome others of the German authors, to a menſtruum of which they relate wonderful effects; but the preparation of which ſeems hitherto a ſecret. They ſay this menſtruum has nothing acid or corroſive in it, but that it approaches to the nature of ſpirit of wine, yet that it is capable of diſſolving the moſt denſe metals, and of converting any of them into a pure white ſalt, which has all their virtues, but nothing of that vitriolic acrimony, which they have when prepared in the common way. The ſalts of mercury and of gold thus prepared, have great praiſes beſtowed on them, and are ſaid to cure epilepſies, the venereal diſeaſe, and many other diſtempers, without any violence or danger. Kunkel, De Salis Metal. See METAL.

ESSENTIAL, ſomething that is neceſſary to conſtitute a thing, or that has ſuch a connexion with the nature and reaſon of a thing, that it is found, or ſuppoſed, whereever the thing itſelf is.

Thus, it is *eſſential* to God to be juſt. Mr. Locke has laboured to overturn that great principle of the Carteſians, that thinking is *eſſential* to the ſoul.

The heart, brain, and ſpinal marrow, are parts ordinarily

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rily ſuppoſed *eſſential* to life, or without which life cannot be; yet we have inſtances, in hiſtory, of children being found, and alive, without almoſt any of thoſe parts. See BRAIN, &c.

ESSENTIAL *oils* are ſuch as are really contained in a plant, and are drawn from it, by diſtillation, in an alembic, with water: they are thus called, in contradiſtinction to empyreumatic oils, which are raiſed by a naked fire, without water. See OILS.

ESSENTIAL *properties*, are ſuch as neceſſarily depend on, and are connected with, the nature and *eſſence* of any thing, ſo as to be inſeparable from it; in diſtinction from *accidental*.

ESSENTIAL *ſalts*, are thoſe prepared from decoctions, or thoſe which are found cryſtallized in the juices or infuſions of plants; in contradiſtinction to thoſe made by incineration. See SALT.

ESSENTIAL *Fever, Form, Mode, Part, Perfection*. See the ſubſtantives.

ESSERE, SORA, and SARE, in *Medicine*, are little puſhes or wheals, ſomewhat red and hard, which quickly infect the whole body with a violent itching, as if one were ſtung with bees, waſps, flies, or nettles; and therefore called the nettle-raſh; yet they vaniſh after a little time, and leave the ſkin as ſmooth and well-coloured as before. It differs from an *epinyctis* in this, that an *epinyctis* ſweats out matter, but an *eſſere* does not.

ESSES, in *Military Language*, are fixed to draught chains, made in the form of an S; one end of which is faſtened to the chain, and the other to hook to the horſe's harneſſes, or to a ſtaple; they ſerve likewiſe to lengthen and piece chains together.

ESSLISORS, in *Law*, perſons appointed by a court of law, to whom a writ of *venire facias* is directed, to impanel a jury, on challenge to the ſheriff and coroners. They are to return the writ in their own names, with a panel of the jurors names. 15 Edw. IV. 24. pl. 4.

ESSOIGN, or ESSOIN, in *Law*, an excuſe for him who, being ſummoned to appear and anſwer to an action real, or to perform ſuit to a court baron, &c. cannot attend, becauſe of ſome legitimate hindrance.

The word is formed of the French *eſſoine*, or *exoine*; and that from the barbarous Latin *eſſonia*, or *exonia*, which ſignifies the ſame.

The cauſes that ſerve to *eſſoin*, are diverſe; yet they may be reduced to five heads. The firſt is, *eſſoin de ultra mare, when the party is beyond ſea*; the ſecond, *de Terra Sancta, when an an expedition in the Holy Land*; the third, *de malo veniendi, when he is infirm of body, and cannot come*; which is alſo called the *common eſſoin*; the fourth, *eſſoin de malo lecti, when the defendant is ſick a-bed*; the fifth, *de ſervitio regis, when he is in the king's ſervice*. Horn mentions ſeveral other *eſſoins* touching the ſervice of the king celeſtial, &c.

ESSOIGN *day of term*, is the firſt day of that term, when the court ſits to take *eſſoigns*, or excuſes, for ſuch as do not appear according to the ſummons of the writ. But the perſon ſummoned hath three days grace beyond the return of the writ, in which to make his appearance; and if he appears on the fourth day incluſive, the *quarto die poſt*, it is ſufficient.

ESSOIGN *de malo villæ*, in *Law*, is when the defendant is in court the firſt day, but gone without pleading; and being afterwards ſurpriſed with ſickneſs, &c. cannot attend, but ſends two *eſſoiners*, who openly proteſt in court that he is detained by ſickneſs in ſuch a village, that he cannot come *pro lucrari & pro perdere*; and this will be admitted: for it lieth on the plaintiff to prove, whether the *eſſoign* is true or not.

ESSOIGNS, *clerk of the*. See CLERK.

ESSORANT, from the French *eſſorer, to air, in order to dry*, in *Heraldry*, a term uſed to expreſs a bird ſtanding on the ground with the wings expanded, as if it had been wet, and were drying itſelf.

ESTABLISHMENT *of dower*, in *Law*, is the aſſurance and ſettlement of *dower*, made to the wife by the huſband, on marriage; and *aſſignment of dower*, ſignifies the ſetting it out by the heir afterwards, according to the *eſtabliſhment*.

ESTACHE is uſed, in our *Old Writers*, for a bridge or ſtank of ſtone and timber.

ESTANDARD. See STANDARD.

ESTATE, in *Law*, the title, or intereſt, a man hath in lands, or tenements.

Eſtates are acquired divers ways, viz. by deſcent from a father to the ſon, &c. conveyance, or grant, from one man to another; by gift or purchaſe, deed, or will; and a fee-ſimple is the largeſt *eſtate* that can be in law. 1 Litl. 541.

Eſtates are real, of lands, &c. or perſonal, of goods and chattels; otherwiſe diſtinguiſhed into freeholds that deſcend to the heir, and chattels, which go to the executors.

Eſtate likewiſe is either ſimple or conditional. See FEE-*ſimple*, and FEE-*tail*.

The word *eſtate* generally, in deeds and grants, comprehends the whole, in which the party hath an intereſt or property; and will paſs the ſame. 3 Mod. 46. See FEE, and TAIL.

ESTATE, *additions of*. See ADDITION.

ESTATE, *baſe*. See BASE.

ESTATE, *que*. See QUE *eſtate*.

ESTATE, or ſimply STATE, denotes alſo the empire, kingdom, provinces, or extent of lands, under the government of any ſovereign.

The *eſtates* of the grand ſeignior, of the king of Spain, &c. are very extenſive; thoſe of the king of France are compact, and well peopled. Italy is cantoned out into a great number of petty *eſtates*. We ſay, miniſters of *eſtate*, ſecretaries of *ſtate*, &c.

ESTATE, or STATE, is alſo generally applied in the ſame ſenſe with claſs or order: thus, the lay part of his majeſty's ſubjects, or ſuch of the people as are not comprehended under the denomination of CLERGY, may be divided into three diſtinct *eſtates*, or *ſtates*, the CIVIL, the MARITIME, and the MILITARY.

ESTATE is more particularly applied to the ſeveral ranks, or claſſes, of a people aſſembled together, for concerting meaſures, reforming public abuſes, or compoſing the diſturbances of a ſtate.

In England, the three *eſtates*, viz. king, lords, and commons, meet ordinarily in parliament. In France, the *eſtates* conſiſt of the churchmen, the nobility, and the people, or third *eſtate*. Some will have theſe aſſemblies of *eſtates* to be a very ancient conſtitution: all we know is, that there were general aſſemblies held, among the Gauls, before Cæſar's conqueſt; but then the people, or third *eſtate*, had no ſhare in them. Under the firſt and ſecond race of the French kings, there were alſo ſolemn convocations, called *parliamenis*; but the great lords of the realm were the only perſons that were called to them. See PARLIAMENT.

ESTATES *General*. } See STATES *General*, &c.
ESTATES *of Holland*. }

ESTERLING, or EASTERLING. See STERLING.

ESTETE', in *Heraldry*, is uſed by the French to ſignify a beaſt whoſe head has been, as it were, torn off by force; and, conſequently, the neck left rough and rugged; in contradiſtinction to *deffait*, or *decapité*, where the neck is left ſmooth; as if the head had been cut off.

ESTHER, a canonical book of the Old Teſtament; denominated from a celebrated Jewiſh captive of that name, in Perſia, whoſe beauty preferred her to the bed of Ahaſuerus (ſuppoſed by ſome to have been Darius Hyſtaſpes, by others Xerxes, but probably Artaxerxes Longimanus, though Jacob. Capellus makes him to be Ochus, called in Perſia *Aſhaſch-Veroſh*), and the throne of Perſia; and who, in that quality, ſaved her countrymen, the Jews, from the death to which Ahaſuerus had doomed them, by the counſels of his favourite Haman; the hiſtory of which tranſaction makes the ſubject of the book of *Eſther*.

The critics are divided about the author of this book: St. Epiphanius, St. Auguſtine, and Iſidore, attribute it to Ezra; but Euſebius will have it to be of a later date. Some aſcribe it to Joachim, high-prieſt of the Jews, and grandſon of Joſedek; others will have it compoſed by an aſſembly, or ſynagogue, of the Jews, to whom Mordecai wrote letters, informing them of what happened. Eſth. ix. 29.

But the generality of interpreters, Hebrew, Greek, Latin, &c. aſcribe the book to Mordecai himſelf; Elias Levita, in his Maſſ. Hamum. pref. 3. mentions this opinion as unqueſtionable.

It is chiefly founded on that paſſage, chap. ix. ver. 20. where it is ſaid, that *Mordecai wrote theſe things, and ſent letters unto all the Jews, that were in all the provinces*, &c. It is alſo ſuppoſed, that queen *Eſther* herſelf might have ſome ſhare therein; it being expreſſed, in the ſame chapter, ver. 29. that *Eſther* and Mordecai wrote a ſecond letter, by the king's authority, to ordain the ſolemnizing a yearly feaſt, called *purim*, that is, *day of lots*, in commemoration of the Jews being delivered from the lots, or ſortes, whereby they had been condemned.

Some will have this book to be only deuterocanonical, or apocryphal; others contend for its being canonical, as far as chap. x. ver. 3. incluſive; and all the reſt deuterocanonical. Of this ſentiment are, St. Jerome, De Lyra, Dionyſius the Carthuſian, Cajetan, and others. The council of Trent turned the ſcale for its being canonical throughout; ſo that the matter is determined for the Catholic countries.

But the proteſtants retain the old opinion, and only admit it as far as the third verſe of the tenth chapter; the reſt, to the end of the ſixteenth chapter, is thrown among

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among the apocryphal books. See DEUTEROCANONICAL, and APOCRYPHAL.

ESTIÆA, Εστιαια, in *Antiquity*, ſolemn ſacrifices to Veſta, called in Greek εστια, of which it was unlawful to carry any away, or communicate any part to any beſides the worſhippers. Potter, Archæol. Græc. lib. ii. cap. 20. tom. i. p. 396.

ESTIATORES, Εστιατορες, among the Athenians, perſons appointed by lot to provide an entertainment for the whole tribe. Beſides thoſe appointed by lot to this office, others voluntarily undertook it to ingratiate themſelves. Potter, Archæol. Græc. lib. i. cap. 15. tom. i. p. 86.

ESTIMIONE, in *Natural Hiſtory*, a name by which ſome call the *harmeſion*.

ESTIVAL *occident*. See OCCIDENT.

ESTIVAL *orient*. See ORIENT.

ESTIVAL *ſolſtice*. See ÆSTIVAL, and SOLSTICE.

ESTOILE'. A *Croſs* ESTOILE' is a ſtar with only four long rays, in manner of a croſs; and, accordingly, broad in the center, and terminating in ſharp points.

ESTOPPEL, formed of the French *eſtouper*, *oppilare*, *obſtipare*, *to ſtop*, or *block up*, in *Law*, an impediment, or bar, of action, ariſing from a man's own act, or deed; againſt which a man is forbidden, by law, to ſpeak, though it be to ſay the truth. See BAR.

Goddard defines an *eſtoppel* to be, any bar, or hindrance, to one to plead the truth; and extends it not only to the impediment given by his own act, but by another's alſo. There are three kinds of *eſtoppel*; viz. *matter of record*, by *matter in writing*, and by *matter in pais*.

ESTOVERS, in *Law*, is uſed, by Bracton, for that ſuſtenance which a man, committed for felony, is to have out of his lands, or goods, for himſelf and his family, during impriſonment.

In ſtat. 6 Edw. I. it is uſed for an allowance in meat, or cloaths. In ſome manors, the tenants have *common of eſtovers*; that is, neceſſary botes, or allowances, out of the lord's wood: in which laſt ſenſe, *eſtovers* comprehends *houſe-bote*, *hay-bote*, and *plow-bote*; ſo that if a man have in his grant theſe general words, *de rationabili eſtoverio in boſcis*, &c. he may thereby claim all three.

Eſtovers is alſo uſed for ALIMONY, which, if the huſband refuſes to pay, there is, beſides the ordinary proceſs of excommunication, a writ at common law, *de eſtoveriis habendis*, in order to recover it.

ESTRAC, in the *Manege*, ſignifies a horſe that is light bodied, lank-bellied, thin-flanked, and narrow-cheſted. See BELLY.

ESTRADE, a French term, literally ſignifying a *public road*, or *high-way*. Hence the military phraſe, *battre l'eſtrade*, *to beat the eſtrade*, that is, to ſend ſcouts, or horſemen, to get intelligence, to learn the diſpoſitions of the enemy, and inform the general of every thing likely to fall in the way. An army never marches, without ſending *batteurs d'eſtrade* on every ſide.

The word is formed of the Italian *ſtrada*, *ſtreet*, or *road*; which is derived from the Latin *ſtrata*, a *paved ſtreet*. Some derive it from *eſtradiots*, who were cavaliers anciently employed in *beating the eſtrade*.

ESTRADE is alſo uſed for a little elevation on the floor of a room, frequently encompaſſed with an ALCOVE, or rail, for placing a bed in; and ſometimes, as in Turky, only covered with fine carpets, for receiving viſitors of diſtinction.

ESTRANGEL, ESTRANGELUS, in the Syriac *Grammar*. *Eſtrangel character*, is a particular ſpecies, or form, of Syriac letters; ſerving as the majuſcule letters in that language.

Abraham Ecchellenſis takes the *eſtrangel* character for the true, ancient Chaldee character; and it is certain, the Abyſſinians, who call themſelves Chaldeans, ſtill occaſionally uſe the *eſtrangel* character, if we may credit Hottinger, in his Theſaur. Philol. p. 286. Biſhop Walton, in his Prolegomena, gives us an *eſtrangel alphabet*.

ESTRAPADE, in the *Manege*, is the defence of a horſe that will not obey, but to get rid of his rider, riſes much before, and while his fore-hand is yet in the air, yerks furiouſly with his hind-legs, ſtriking higher than his head was before; and during this countertime goes back rather than advances.

ESTRAY, or STRAY, ſignifies any tame beaſt, as ſheep, oxen, ſwine, and horſes, or ſwans, found within a lordſhip, and not owned by any man; in which caſe being cried, according to law, in the church, and two market-towns adjoining, if it be not claimed by the owner, within a year and a day, it becomes the lord's of the ſoil where found. If the owner claims it within the year and day, he muſt pay the charges of finding, keeping, and proclaiming them; and he may ſeize it, without telling the marks, or proving his property, which may be done at the trial, if conteſted. If the beaſt ſtray within the year to another lordſhip, the firſt lord cannot retake it. An *eſtray* muſt be fed and kept, uninjured, and without labour, till it is reclaimed, or the limited time expires.

ESTREAT, *Extractum*, in *Law*, is uſed for the true copy, or duplicate, of ſome original writing, eſpecially of amercements, or penalties, ſet down in the rolls of a court, to be levied by the bailiff, or other officer, on every offender.

ESTREATS, *clerk of the*. See CLERK.

ESTREPEMENT, in *Law*, an impoveriſhing, or making of land barren, by continual plowing and ſowing, without due manuring, reſt, and other huſbandry.

The word is derived from the French *eſtropier*, *to maim*; or the Latin *extirpare*, *to extirpate*, *root up*.

ESTREPEMENT is alſo uſed for any waſte, or ſpoil, made, by the tenant for life, upon lands, or woods, to the prejudice of him in reverſion; as the cutting down of trees, or lopping them farther than the law allows, &c.

ESTREPEMENT is alſo a writ which lies in two caſes: the one, when a man having an action depending, as a formedon, writ of right, or the like, ſues, to inhibit the tenant from making waſte during the ſuit.

The other is for the demandant, who is adjudged to recover ſeiſin of the land in queſtion; and before execution, for fear of waſte to be made till he can get poſſeſſion, ſues out this writ.

ESULA, in *Botany*, a name given by many authors to ſome of the ſmall ſpecies of SPURGE.

ESULA *rara*, in *Botany*, a name given by John Bauhine, and ſeveral other authors, to a plant, called alſo by ſome *alypum*, but properly a ſpecies of dog's bane, and diſtinguiſhed by Mr. Tournefort by the name of *apocynum maritimum Venetum ſalicis folio flore purpureo*, or the purple-flowered ſea dog's bane of Venice, with willow-like leaves. See DOG'*s Bane*.

ESULÆ *radix*, in the *Materia Medica*, the name of a root of a plant of the ſpurge kind, ſometimes uſed in medicine. The root conſiſting of a cortical part, and an inner ſticky one, the bark only is uſed; and ſuch ſhould be choſen as is new dried, and of a reddiſh colour without and within, and ſuch as when held in the mouth affords a very diſagreeable taſte, with very great acrimony. It is a very violent purge, and has been ſaid to have performed cures in dropſical caſes, when more gentle medicines have proved ineffectual. It is a good method to macerate it a day or two in vinegar before it is uſed.

The plant which produces it, is the *eſula riveri et officinarum* of Mr. Ray: it is cultivated by ſome curious people in their gardens.

ESURINE *ſalts*, in ſome authors, denote thoſe of a fretting, eating, or corroding nature; which chiefly abound in places near the ſea-ſide, and where a great quantity of ſea-coal is burnt; as appears, from the ſpeedy ruſting of iron in ſuch places.

ESUS, in *Mythology*, a deity among the Gauls, to which they ſacrificed after victory whatſoever came alive into their poſſeſſion. They ſometimes ſprinkled the altars of this deity with the blood of their women and children.

ETAPPE, in *War*, an allowance of proviſions and forage, made to the ſoldiers, upon march through a kingdom, or province, to or from winter-quarters.

Hence, he that contracts with the country, or territory, for furniſhing the troops in their march, is called *etappier*.

ETCH. See EDDISH.

ETCH-*crop*, among *Farmers*, the third crop of corn upon land newly broke up. Dict. Ruſt.

ETCHING, a method of engraving on copper; wherein the lines, or ſtrokes, inſtead of being cut with a tool, or graver, are eat with aqua fortis.

Etching was invented about forty or fifty years after ENGRAVING on copper, properly ſo called, probably by Albert Durer and Lucas. It has ſeveral advantages peculiar to itſelf, and which renders it, on ſome accounts, preferable to engraving: as, that it is done with greater eaſe and expedition; that it requires fewer inſtruments; and even that it repreſents divers kinds of ſubjects better and more agreeably to nature, as landſchapes, ruins, grounds, and all ſmall, faint, looſe, remote objects, buildings, &c. The inſtruments employed in *etching* are needles, ſtifts, oil-ſtones, ſcrapers, and bruſh pencils. The needles are of the common kind, mounted on ſticks about ſix inches long; and the artiſt ſhould be provided with ſeveral of various ſizes and ſharpneſs. The ſtift is a needle, the point of which is blunted and poliſhed, that it may glide freely over the paper, without ſcratching or cutting it: this is uſed for calking and overtracing the deſign on the varniſh. The oil-ſtones are well known; with reſpect to which it may be remarked, that they ſhould be ſo ſoft, as not to take too faſt hold of the needles,

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needles, but to give a keen, ſmooth edge. See SCRAPER.
The bruſh pencil ſhould be large and ſoft, of camel's hair, and is uſed for cleaning the ſurface of the varniſh after the engraving, and for other purpoſes.
The method of *etching* is thus: the plate, being well poliſhed (ſee COPPER-*plates*) is put upon a chafing-diſh, and heated over the fire; or, if ſmall, is held with a hand-vice, the poliſhed ſide being upwards, and heated with the flame of paper burning under it; when hot, it is rubbed over with ſoft varniſh (ſuch as is deſcribed in the ſequel of this article) wrapped up in taffety, which ſhould be gently paſſed from one ſide to the other in a right line, ſo as to form ſeveral rows, till the plate is every where moderately covered; then with a cotton ball, tied up in taffety, let every part of the plate be beat gently, while the varniſh is in a fluid ſtate; and, in order to give it a fine grain, continue to beat it with the ball, after the plate is taken from the fire, till it attains a harder conſiſtence in cooling; but the uſe of the ball ſhould be diſcontinued before the varniſh is quite cold, leſt it ſhould be made to riſe from the plate.
When the plate is thus uniformly and thinly covered with the varniſh, it muſt be blackened by a piece of flambeau or of a large wax-candle, which affords a copious ſmoke; two, or even four ſuch candles are uſed together for the ſake of diſpatch, that the varniſh may not grow cold during the operation, which ſhould be performed, if poſſible, at one heating of the plate, for repeated melting of the varniſh does it much damage. Large plates may be ſuſpended from the cieling of a room by four cords and iron rings, with the varniſhed ſide downwards, for the greater convenience of being blackened. Care ſhould be taken that the flambeau or candles be kept at a proper diſtance from the plate, that the wick may not touch the varniſh. The varniſh may be made white, if that colour is preferred to black, by grinding white lead in water, and putting it into a glazed earthen diſh with a little good glue diſſolved, and melting the whole together. This mixture is ſpread with a bruſh or pencil of hog's hair thinly and evenly on the varniſh laid on the plate and ſmoothed. The colour is then left to dry; if it fixes with difficulty on the varniſh, the compoſition ſhould be mixed with a drop or two of ox-gall. On this ground, thus prepared, the back of the deſign or draught is laid. When this is done, the deſign remains to be calked, or transferred upon the plate, which is more eaſily effected than in the common graving; for the back of the deſign having been before rubbed over with red chalk, or flake-white, or, when the varniſh is whitened, with powdered black-lead, nothing remains but to trace over all the lines and ſtrokes of the draught with a needle or point; which, preſſing the paper cloſe down to the ground, occaſions the wax thereon to lay hold of the chalk, and ſo bring off the marks of the ſeveral lines, ſo as at length to ſhew a copy of the whole deſign in all its correctneſs. Inſtead of rubbing the back of the deſign with the red chalk or black lead, it may be proper in ſome caſes to ſpread the one or the other upon a piece of very thin paper of the exact ſize of the drawing, which ſhould be laid on the plate with the daubed ſide towards the varniſh under the drawing. The draught being thus calked, the artiſt proceeds to draw the ſeveral lines and contours with a point through the ground upon the copper. See CALQUING. When a picture or drawing is deſigned to be engraven on the ſame ſize, and turned the ſame way on the plate, ſo that the print will be turned to the oppoſite or contrary ſide to that of the original, a thin piece of paper varniſhed with the Venetian varniſh very dry and tranſparent, or thin fan-paper oiled with linſeed-oil, and perfectly dry, muſt be fixed to it: on this paper the lines of the original, which will appear through it, muſt be marked with a common *etching* point on the varniſhed paper, and with a black-lead pencil on the oiled paper, and afterwards calked upon the varniſh, by reddening the back of this paper with red chalk, or by interpoſing another very thin paper, not oiled but reddened, between the oiled paper and the varniſhed plate. To finiſh his work, the artiſt makes uſe of points of various ſizes, and preſſes on them, ſometimes more ſtrongly, and ſometimes more lightly, as the ſeveral parts of the figures, &c. require a greater or leſs ſtrength or boldneſs; ſome of the points being as fine as needles for the tender fair ſtrokes, and the remoter fainter objects; and others again as big as bodkins, ſometimes made with oval points, for the deeper ſhadows and the figures in the front of the work. Theſe oval-pointed needles have been rejected by ſeveral artiſts in working on the ſoft varniſh; they are uſeful only in engraving architecture: thoſe who are accuſtomed to the uſe of them may make the fineſt and ſmalleſt as well as the larger ſtrokes, and *etch* a whole plate without any other inſtrument, by furrowing it more or leſs, according to the magnitude of the intended ſtrokes. Some engravers uſe needles that do not cut at all, nor make any perceptible impreſſion on the copper. Care ſhould be taken to preſerve the ſoft varniſh on the plate, for which artiſts have various contrivances. The moſt eaſy way is to lay the plate on a table in form of a deſk, and to cover that part of the varniſh which allows of being covered in the engraving with a ſoft napkin of diaper or damaſk, folded evenly in four doubles, or with a piece of ſheep-ſkin dreſſed in oil, having the ſoft ſide turned towards the varniſh; or with a board called a bridge, ſuſpended at the ends by two pieces of wood about one-fourth of an inch thick, juſt ſo as to let the plate lie freely under it. After all, if the varniſh ſhould be injured, the injury may be repaired by taking turpentine varniſh; and having tempered it with a little lamp-black, covering, by means of a ſmall pencil, the ſcratches, flaws, or falſe ſtrokes, with the mixture. The plates, thus repaired, may be equally well engraved upon with others, and therefore this modern invention is extremely uſeful. The ſame compoſition may alſo be applied to thoſe flaws occaſioned by the ſcaling of the varniſh, which ſometimes happens in the operation.
Things being thus prepared, a rim or border of wax, compoſed of four parts of common bees wax and one part of Burgundy pitch melted together, is raiſed round the circumference of the plate covered with the varniſh, and aqua fortis poured on, which is kept by the ſaid border from running off at the edges. The ground being impenetrable to that corroſive water, the plate is defended from it every where but in the lines or hatches cut through it with the points, which lying open, the water paſſes through them to the copper and eats into it to the depth required; and when this is done it is poured off. Of *etching* grounds there are two kinds, the one ſoft and the other hard: the latter was formerly much uſed, being better accommodated to the intention of imitating the engraving with the tool; but the former has now wholly ſuperſeded the uſe of the other, as it gives a power of expreſſion incompatible with the greater inflexibility of the hard varniſh that confines the lines and hatches to ſuch a ſameneſs and regularity as give a ſtiffneſs of manner and coldneſs of effect to the work. There are various directions for preparing the ſoft varniſh. Le Boſſe recommends the following: take of virgins wax, very white and clean, and of grains of maſtic, very clear and pure, each one ounce; and of calcined aſphaltum, half an ounce; grind the maſtic and aſphaltum ſeparately, very ſmall, and melt the wax over the fire in an earthen pot well glazed. When the wax is thoroughly melted, and very hot, ſprinkle the maſtic into it gradually that it may melt, and ſtir the mixture that the ingredients may incorporate. Then ſprinkle the aſphaltum into the mixture, ſtirring the whole compoſition over the fire till the aſphaltum be entirely melted: take the pot from the fire, and let the mixture cool; and pour the varniſh into clean water, and by working it with the hand, form it into a roll of about an inch in diameter, or into ſmall balls, which may be wrapt up in taffety and kept for uſe. The quantity of wax ſhould be increaſed in winter.
The following ſoft varniſh is uſed by many of the engravers at Paris: take of virgin's wax, and aſphaltum of each one ounce; half an ounce of black pitch, and a quarter of an ounce of Burgundy pitch: the aſphaltum muſt be pounded in a mortar, and the wax melted over a ſlow fire in a pot of glazed earthen ware, and the reſt of the ingredients added by little and little, ſtirring the mixture, till the whole be well melted and incorporated. Then throw the whole maſs into a veſſel of clean water, and proceed as before. The following preparation has been well approved: take of virgin's wax two ounces and a half; of Burgundy pitch, three ounces; of reſin, half an ounce; of aſphaltum, two ounces; and of turpentine, one pennyworth: the proceſs of making it is the ſame as the former.
Rembrandt prepared a white varniſh to be laid over a thin coat of any of the other kinds in the following manner; take of virgin's wax, one ounce; of maſtic, half an ounce; of calcined aſphaltum, or of amber, half an ounce: pound the maſtic and aſphaltum ſeparately in a mortar; and having melted the wax in a new earthen pot well glazed, ſprinkle them into it gradually, and ſtir the mixture, till the whole be incorporated. Pour the melted maſs into clean water, and form it into a ball for uſe. When this varniſh is uſed, the plate ſhould not be too much heated; the firſt coat of varniſh ſhould be laid very thin; and inſtead of blackening the varniſh with ſmoak, take a piece of flake white, and having ground it fine and tempered it with gum water, lay a thin coat of it with a pencil over the plate when it is quite cold. In this way Rembrandt varniſhed his plates.

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There are alſo two kinds of aqua fortis; the one white, which is only uſed with the ſoft ground, and applied as above directed: this is ſpirit of nitre, ſuch as is uſed by the refiners, except that it is not purified with ſilver. It may be prepared thus: take of the white kind of crude nitre, or of refined ſalt-petre, twenty-four pounds; put it into a retort, and add twelve pounds of oil of vitriol: place the retort in a ſtrong ſand heat, and lute on to the retort a large receiver, containing about a gallon of water: diſtil over all that will riſe with a heat gradually increaſing; when the whole is cold, take off the receiver, and pour the aqua fortis into a bottle, and ſecure it with a glaſs ſtopper. This ſpirit of nitre is bought ready prepared of the chemiſts for four ſhillings a pound, and muſt be lowered with water; about one part of nitre to four or five parts of water is in general the proper mixture; but the nature of the work will indicate how much ſtronger or weaker it ſhould be. The green aqua fortis is not at all in uſe. It is to be obſerved that the aqua fortis muſt not continue equally long on all the parts of the deſign; the remote parts muſt be bitten more ſlightly than thoſe which are nearer to the view. To manage this they have a compoſition, which Le Boſſe directs to be made thus: oil-olive is heated in a varniſhed earthen-ware pot, and the tallow of a candle is added to it; and the proportion of oil and tallow is adjuſted by trying the mixture, and dropping it on any hard and cold ſubſtance till the drops are found to be moderately fixed and firm. It ſhould then be well boiled for an hour, till the mixture acquires a reddiſh colour. The following mixture is recommended by M. Cochin as a ſubſtitute for the oil and tallow, which is never uſed now: take equal parts of wax and turpentine, as much olive-oil as both of them together, with the ſame quantity of hogs lard: melt the whole in an earthen veſſel, mixing the ingredients, and leave them to boil for ſome time till they are well incorporated. With this compoſition, or with the turpentine varniſh and lamp-black mentioned before, they cover the parts that are to be bitten no farther. The conduct of the aqua fortis is one of the principal concerns in the whole art, and that on which the effect of the whole very much depends. The operator is alſo to be very attentive to the ground, that it do not fail or give way in any part to the water; and where it does, to ſtop up the place with the above compoſition. Laſtly, let it be remembered, that whenever the aqua fort is taken off, fair water muſt be poured upon the plate; and it ſhould be dried with a very gentle heat, ſo as not to melt the varniſh. The aqua fortis may be applied as often as neceſſary, with this precaution. When the aqua fortis has done its part, the ground is taken off, by warming the plate at the fire, and removing the border of wax; it is then more heated till the compoſition and varniſh melt, and wiped well with a clean linen cloth, and rubbed in every part with oil of olives. When the varniſh is taken off, pour upon it a ſmall quantity of olive-oil, rubbing the oil ſtrongly over every part of it, and clean the plate with a freſh linen cloth: after which, nothing remains but for the artiſt to examine the work with his graver in his hand, to touch it up, and heighten it where the aqua fortis, &c. has miſſed. The editor is indebted for the inſpection and correction of this article to the ingenious artiſt who executes the plates for this Dictionary. For the laws relating to *etching*, ſee ENGRAVERS.

ETERNAL *flower*, *xeranthemum*, in *Botany*, a genus of the *ſyngeneſia polygamia ſuperflua* claſs. Its characters are theſe; the flower is compoſed of hermaphrodite and female florets, which have one common ſcaly empalement. The hermaphrodite florets which form the diſk are funnel-ſhaped, and cut into five points: the female florets, which form the border or rays, are tubulous, and cut into five leſs equal points: the hermaphrodite florets have five ſhort ſtamina terminated by cylindrical ſummits, and a ſhort germen ſupporting a ſlender ſtyle, crowned by a bifid ſtigma: the germen becomes an oblong ſeed crowned with hairs, which ripens in the empalement. There are ſix ſpecies.

We have ſeveral ſpecies of this plant cultivated in our gardens, and known in Engliſh by the name of *everlaſting flowers*, a name common to all the ſpecies of this plant, and of the amaranthoides.

Theſe flowers are of ſo dry and durable a ſtructure, that if gathered juſt when they are ripe they will laſt many years in perfection, and appear as freſh as while growing: they are alſo capable of ſeveral tinges, and hence are often ſeen of fine blues and greens, colours not natural to them.

They are all propagated by ſowing their ſeeds in Auguſt in a warm border, obſerving to water and ſhade them till they come up if the weather proves too dry. When the young plants are two inches high they ſhould be removed to another warm border under the ſhelter of a wall, and there planted at five inches diſtance from each other. They will here ſtand the winter very well, and in ſpring will be ready to grow up for flowering without any farther tranſplanting; they are only to be kept clear of weeds, and in June they will flower. The flowers ſhould be gathered in July for drying, and ſome of the fineſt ſhould be ſuffered to ſtand for ſeed; for the plants periſh as ſoon as they have perfected their ſeeds, and muſt be renewed by ſowing every year.

ETERNITY, duration which is conceived incommenſurable with time, and excluſive of beginning, progreſs, ending, &c. See GOD.

Authors are much at a loſs for a proper and juſt definition of *eternity:* that of Boethius, De Conſol. Philoſ. lib. v. part 6. viz. *Interminabilis vitæ tota ſimul & perfectæ poſſeſſio*, i. e. *a perfect poſſeſſion of a whole endleſs exiſtence altogether*, though retained by S. Thomas and others, is faulty in divers reſpects.

Cenſorinus, De Die Natal. defines *eternity* by infinite duration, that is, duration which has always been, and always will be. Others more fully deſcribe it by a duration that exiſts all together, without any flux or ſucceſſion of parts prior or poſterior to each other: where the word *duration*, taken abſtractedly, imports no more than the perſeverance of a thing in its exiſtence, the τὸ *durare* being here oppoſed to the τὸ *ceſſare*, *in exiſtendo*.

But ſoften the word duration how you will, it is ſcarce conceivable but by conceiving a quantity thereof, nor a quantity without conceiving a ſucceſſion. Others, therefore, define *eternity* by a *perpetuum nunc*, a *perpetual now*, or a *nunc ſemper ſtans*, an *ever-ſtanding now*; but neither are theſe unexceptionable, the words *perpetuum* and *ſemper ſtans* importing an obſcure ſort of duration. See DURATION.

ETERNITY, in *Mythology*, a divinity among the Romans, who had neither temples nor altars. They repreſented it under the figure of a woman, who held the ſun in one hand and the moon in the other: her ſymbols were a phœnix, globe, and elephant.

ETESIÆ, or ETESIAN *winds*, are ſuch as blow at ſtated times of the year, from what part ſoever of the compaſs they come. They are ſo called from the Greek word ἔτος, *year*, being yearly or anniverſary winds, ſuch as our ſeamen call monſoons and trade-winds, which, in ſome parts of the world continue conſtantly blowing for certain ſtated ſeaſons of the year. Thus, the north winds, which, during the dog-days, conſtantly blow upon the coaſts of Egypt, and hinder all ſhips from ſailing out of Alexandria for that ſeaſon, are called *eteſiæ* in Cæſar's Commentaries. In other authors, the weſt and eaſt-winds are called *eteſiæ*, when they continue blowing for certain ſeaſons of the year. Vid. Salmaſ. Exercit. in Solin. p. 421.

Cellarius endeavours to prove that thoſe winds are properly *eteſian* which blow from that part of the horizon which is between the north and weſt about the time of the ſolſtice. Geog. Antiq. lib. i. cap. 8. See MONSOON and WIND.

ETHELING, or ÆTHELING. See ATHELING.

ETHER. See the article ÆTHER.

ETHERIAL *oil*. See ÆTHERIAL *oil*.

ETHESIUS *lapis*, a name given by ſome authors to the chryſolite.

ETHICAL *good*, ETHICAL *poſſible*. See the reſpective articles.

ETHICS, Ἠθικὴ, the doctrine of manners, or the ſcience of moral philoſophy. See PHILOSOPHY and MORALITY.

The word is formed of ἦθος, *mores*, *manners*, becauſe the ſcope or object thereof is to form the manners.

Gale makes *ethics* only the firſt part or branch of moral philoſophy, viz. that which regards private perſons, or in a private capacity.

By manners or morals is here meant, a way or manner of living confirmed by cuſtom or habit, or certain habitudes of doing, or actions which are often repeated, which, if they be according to right reaſon, the morals or manners are ſaid to be good, otherwiſe, evil and vicious.

Hence the object of *ethics* is the exerciſe of right reaſon in all our affairs, actions, and relations; or it is man himſelf conſidered as dirigible, and to be conducted according to reaſon; and the end of *ethics* is to make him good and happy: ſo that if a man conducted himſelf according to right reaſon in all the circumſtances of his actions, affairs, and relations, he would arrive at the higheſt pitch of moral perfection and beatitude.

Whence *ethics* may be defined a right manner of thinking in order to attain to human felicity, or a ſcience whereby man is directed to conduct his will, and the actions

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actions thereof, ſo as to live well and happily. See WILL.

The principal, nay, the only topics thereof, are happineſs and manners, whence ariſe two parts or branches of *ethics*; the firſt, on moral happineſs, conſidered as the end; and the ſecond on moral virtues or good manners, as the means to arrive at that end.

ETHICOPROSCOPTÆ, formed of ἦθος, *manners*, and προσκοπτω, *offendo*, *I offend*, in *Antiquity*, the name of a ſect. Damaſcenus, in his Treatiſe of Hereſies, tells us, that the denomination of *Ethicoproſcoptæ* was given to ſuch as erred in matters of morality and things relating to practice that were to be done or to be avoided, &c. who blamed things laudable and good in themſelves, or recommended or practiſed things evil. On this footing the *Ethicoproſcoptæ*, though a numerous body, were no particular ſect.

ETHIOPIC *verſion*. See BIBLE *Ethiopic*.

ETHIOPIC *year*. See YEAR.

ETHMOIDAL, ETHMOIDALIS, in *Anatomy*, a denomination given to one of the ſutures of the human cranium.

The common ſutures are thoſe which ſeparate the bone of the cranium from thoſe of the cheeks, and are four; the tranſverſal, *ethmoidal*, ſphenoidal, and zygomatical. See SUTURE.

The *ethmoidal* takes its denomination from its turning round the os ethmoides.

ETHMOIDES, Εθμοειδης, in *Anatomy*, a bone ſituate in the middle of the baſis of the forehead or os frontis, and at the top of the root of the noſe, filling almoſt the whole cavity of the noſtrils.

It has its name from εθμος, *cribrum*, *ſieve*, and ειδος, *form*, becauſe all ſpongy and porous.

By its cribrous part, it is joined to the head; by the ſpongious part, to the cavity of the noſtrils; and by the plain and broad part, to the orbits of the eyes.

In the cribrous part is an apophyſis, which jets out in a point into the cavity of the ſkull, called from its figure *criſta galli*, or the *cock's comb*. From its under-ſide there goes a thin bone, which divides the cavity of the noſtrils into two, called the *vomer*. It is perforated by a number of ſmall holes, through which the fibres of the olfactory nerves paſs.

J. Philip Ingraſſias, a Sicilian, who was born in Sicily in 1510, and died in 1580, was the firſt who gave a juſt account of the ſtructure of the *os ethmoides*, or *cribroſum*, in a work printed at Palermo in 1603. fol.

The figure of this bone is very ſingular, and may be ſaid to be in ſome meaſure cubical. This bone may be divided into a middle and two lateral portions; in the middle three parts may be diſtinguiſhed, an upper, a middle, and a lower. The upper part of the middle portion is an eminence, called *criſta galli*, which is often ſolid; ſometimes, however, it has been found hollow in ſeveral degrees, and perforated by a ſmall opening which communicates with the frontal ſinuſes: a groove is ſometimes alſo met within its anterior edge, which leads to the ſpinal or blind hole in the os frontis. The middle part of this portion is a ſmall horizontal plate perforated by ſeveral holes, and called *lamina cribroſa*; and in its back part it has a little notch for its articulation with the ſphenoidal bone; this lamina may be called the body of the bone, as being what principally ſupports all the other parts of it.

The lower part is a perpendicular lamina, which makes part of the ſeptum narium: the edge of this is rough and uneven, for its better connection with the verna.

The lateral portions of the *ethmoidal* bone are by far the moſt conſiderable, if we regard ſize only; each of theſe may be divided into two, one ſuperior, which is the largeſt, and which may be called the labyrinth of the noſtrils, it being full of turnings and windings, and irregularly cellular; and one inferior, in the ſhape of a ſhell. It is of a very tender and delicate ſtructure, though compact, and without any diploe, being almoſt all compoſed of thin bony plates. It is joined to the os frontis, os ſphenoides, oſſa naſi, oſſa maxillaria, oſſa unguis, oſſa palati, and verna; the uſes of it are to be a very principal part in the organ of ſmell, and to give a very great extent to the pituitary membrane in a ſmall compaſs. Winſlow's Anatomy, p. 29.

ETHNARCHA, ETHNARCH, formed of εθνος, *nation*, and αρχη, *command*, a governor or ruler of a nation.

There are ſome medals of Herod I. ſurnamed the *Great*, on one ſide whereof is found Ηρωδου, and on the other Εθναρχου, q. d. *Herod the Ethnarch*. After the battle of Philippi, we read that Antony paſſing over into Syria, conſtituted Herod and Phaſael his brother tetrarchs, and in that quality committed to them the adminiſtration of the affairs of Judea, Joſ. Ant. lib. xiv. cap. 23. Herod therefore had the government of the province before ever the Parthians entered Syria, or before Antigonus's invaſion, which did not happen till ſix or ſeven years after Herod was commander in Galilee. Joſ. lib. xiv. cap. 24, 25. Conſequently, Herod was then truly *ethnarch*, for he can be no otherwiſe denominated; ſo that it muſt have been in that ſpace of time that the medals were ſtruck, which only give him this title: which medals are a confirmation of what we read in hiſtory of the government which that prince was intruſted with before he was raiſed to the royalty.

Joſephus gives Herod the appellation of *tetrarch* in lieu of that of *ethnarch*; but the two terms come ſo near to each other, that it is eaſy to confound them together.

Though Herod the Great left by will to Archelaus all Judea, Samaria, and Idumea, yet Joſephus tells us he was then only called *ethnarch*.

ETHNOPHRONES, in *Antiquity*, a ſect of heretics in the ſeventh century who made a profeſſion of Chriſtianity, but joined thereto all the ceremonies and follies of paganiſm, as judicial aſtrology, ſortileges, auguries, and other divinations.

They derive their denomination from εθνος, *nation*, and φρην, *thought*, *ſentiment*, q. d. *paganizers*, or perſons whoſe thoughts or ſentiments were ſtill heathen or gentile.

They practiſed all the expiations of the gentiles, celebrated all their feaſts, and obſerved all their days, months, times, and ſeaſons. See Damaſcenus, Hæreſ. N° 94.

ETHOLOGUS, among the ancients, a mimic or actor, who could repreſent all the various habits and diſpoſitions of the mind.

ETHOPŒIA, or ETHOPEA, in *Rhetoric*, called alſo ETHOLOGY, a draught or deſcription, expreſſing the manners, paſſions, genius, tempers, aims, &c. of another perſon.

The word is of Greek original, being formed of ἦθος, *mos*, *conſuetudo*, and ποιεω, *facio*, *fingo*, *deſcribo*. Quintilian, lib. ix. cap. 2. calls this figure *imitatio morum alienorum*; and in Greek, μιμησις, *imitation*. In Engliſh we denominate it a *picture* or *character*.

Such is that beautiful paſſage in Salluſt, in his Bellum Catilinarium, wherein he gives us a picture of Catiline: "He had an uncommon ſtrength both of body and "mind, but an ill-turned and wicked diſpoſition. "When very young, his great pleaſure was in inteſtine "broils, rapine, ſlaughter, and civil diſcord. His body "was formed to undergo faſting, cold, and watching, "beyond all belief. His mind was daring, deceitful, "and various, and could imitate or accommodate itſelf "to every body: he was extremely covetous of other "people's goods, and profuſe of his own. His luſts "and deſires were very high; his ſtock of eloquence "conſiderable; but he had little or no diſcretion."

The *ethopœia* is divided into *proſopographia* and *ethopœia*, properly ſo called; the former of which is a picture of the body, countenance, make, dreſs, gait, &c. and the latter of the mind.

ETHULIA, in *Botany*, a genus of the *ſyngeneſia polygamia æqualis* claſs. The receptacle is naked, and the ſeed has no down.

ETIQUETTE, a French term, primarily denoting a ticket or title affixed to a bag or bundle of papers, expreſſing its contents. It is alſo uſed when applied to the Spaniſh and ſome other courts, to ſignify a particular account of what is to be done daily in the king's houſhold, and in the chief ceremonies relating to it. It likewiſe denotes thoſe forms that regulate the decorum of conduct towards perſons of various ranks and ſtations.

ETRUSCA *terra*, in the *Materia Medica*, a kind of bole of which there are two ſpecies, the white and the red; theſe are called by many authors the *terra ſigillata alba & rubra magni ducis*, as they are brought to us ſealed with different impreſſions.

The *white Tuſcan earth* is a denſe and compact ſubſtance of a dull deadiſh white, which in drying acquires ſome degree of yellowneſs; it is of a ſmooth ſurface, and does not ſtain the fingers in handling. It is not eaſily broken, and but ſlightly adheres to the tongue, and freely melts into a ſubſtance like butter in the mouth. It makes a ſlight efferveſcence with acid menſtruums.

The *red Tuſcan earth* is a pure bole, very heavy, and of a compact texture, and of a dull browniſh red colour. It is naturally of a ſmooth ſurface, breaks eaſily between the fingers, and does not ſtain the hands; it adheres ſtrongly to the tongue, and melts freely in the mouth, and has a ſtrong aſtringent taſte, and leaves no ſandy harſhneſs between the teeth. It makes an efferveſcence with acid menſtrua. This is made up of ſmall flat cakes, and impreſſed with a ſhield bearing a ducal coronet, &c. Theſe are the characters by which both theſe earths may be known from others of the ſame colour: they are both dug in ſeveral parts of Italy, particularly

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cularly in the neighbourhood of Florence; they are kept in the ſhops there, and preſcribed with ſucceſs in fevers of many kinds, and in diarrhœas, dyſenteries, and the like caſes.

ETYMOLOGICON, is uſed for a book containing the etymologies of any language. See ETYMOLOGY.

ETYMOLOGY, Ετυμολογια, that part of grammar which conſiders, deduces, and explains the origin, reaſon, and derivation of words, in order to arrive at their firſt and primary ſignification.

The word is formed of the Greek, ετυμος, *verus*, *true*, and λεγω, *dico*, *I ſpeak*; whence λογια, *diſcourſe*, &c. and thence Cicero calls the *etymology*, *notatio* and *veriloquium*, though Quintilian chooſes rather to call it *originatio*.

In all ages there have been people curious in *etymologies*: Varro has written on the *etymology* of the Latin Words; and we have a Greek *Etymologicon*, under the name of Nicas.

The *etymologies* of our Engliſh words have been deduced from the Saxon, Welſh, Walloon, Daniſh, Latin, Greek, &c. by Somner, Camden, Verſtegan, Spelman, Caſaubon, Skinner, Henſhaw, Junius, &c.

Thoſe of the French and Italian words by Menage, Henry Stephens, Tripot, Borel, Caſeneuve, Guichard, F. Thomaſſin, Poſtel, and Falconet.

We have a Latin *Etymologicon* of Gerard Voſſius, another of Martinius, &c. Octavio Ferrari has given a Body of *Etymologies* of the Italian Tongue, and Bernard d'Aldretta another of the Spaniſh.

A ſtrict and ſolicitous inquiry into *etymologies*, is no frivolous and impertinent deſign, but has conſiderable uſes. Nations who value themſelves on their antiquity have always looked on the antiquity of their language as one of the beſt titles they could plead. The *etymologiſts*, by ſeeking the true and original reaſon of the notions and ideas annexed to each word and expreſſion, may often furniſh an argument of antiquity from the veſtigia or traces remaining thereof, and from the indices ſtill ſubſiſting in the preſent uſe of the words compared with the ancient uſes.

Add, that *etymologies* are neceſſary to the thorough underſtanding of a language; for, to explain a term preciſely, there ſeems a neceſſity of recurring to its firſt impoſition, in order to ſpeak juſtly and ſatisfactorily thereof. The force and extent of a word is generally better conceived and entered into when a perſon knows its origin and *etymology*.

It is objected, however, that the art is arbitrary and built altogether on conjectures and appearances; and the *etymologiſts* are charged with deriving their words from what originals they pleaſe; but the ſcience is certainly real, and as regular as diverſe others, having its proper principles and method.

It muſt be owned, indeed, that it is not eaſy to return into the ancient Britiſh and Gauliſh ages; to follow, as it were, by the track, the diverſe imperceptible alterations a language has undergone from age to age. A ſober *etymologiſt* has need of all the lights he can come at, to conduct and bring down words variouſly diſguiſed in their paſſage, and remark all the changes that have befallen them; and as thoſe alterations have ſometimes been owing to caprice or hazard, it is eaſy to take a mere imagination or conjecture for a regular analogy; ſo that it is not ſtrange the public ſhould be prejudiced againſt a ſcience which ſeems to ſtand on ſo precarious a footing.

EVACUANTS, in *Medicine*, remedies proper to expel or carry off any ill peccant or redundant humours in the human body, by the proper outlets or emunctories.

Of *evacuants*, there are diverſe kinds, diſtinguiſhed according to their various humours and emunctories. Some, e. gr. carry off their matters by ſtool, called *purgatives* or CATHARTICS; others by urine, called DIURETICS; others by perſpiration, called DIAPHORETICS; others by ſweat, called SUDORIFICS; others by the mouth, called *vomitories* or EMETICS; others by the ſalival glands, as SIALOGOGUES; and others, laſtly, by the menſes and lochia, as EMMENAGOGUES and *ariſtolochics*.

EVACUATION, in *Medicine*, a diminution of the animal fluids, in order to a diſcharge of ſome morbid or redundant matters; or only for the ſake of thinning, attenuating, and their promoting motion and circulation.

The matter of a diſeaſe, or what is preſcribed by art to remove or eaſe it, is evacuated two ways: 1. By the natural emunctories or outlets of the ſkin; the noſtrils, mouth, fauces, oeſophagus, ſtomach, inteſtines, bladder, and urethra.

And 2. By artificial outlets, made either in the blood-veſſels, as by phlebotomy, arteriotomy, ſcarifications, and leeches; or in the lymphatic veſſels, as by cauſtics and veſicatories; or laſtly, in both, as by iſſues, ſetons, ulcers, fiſtulas, &c. Hence the firſt diviſion of *evacuants* is derived from the different emunctories; and the ſecond, from the diverſity of matters evacuated through them.

Moſt of the chronical diſeaſes, the infirmities of old age, and the ſhort periods of the lives of Engliſhmen, Dr. Cheyne obſerves, are owing to repletion. This is evident from hence, that *evacuation* of one kind or another is nine parts in ten of their remedy; for not only cupping, bleeding, bliſtering, iſſues, purging, vomiting, and ſweating, are manifeſt *evacuations* or drains to draw out what has been ſuperfluouſly taken down; but even abſtinence, exerciſe, alteratives, cordials, bitters, &c. are but ſeveral means to diſpoſe the groſs humours to be more readily evacuated by inſenſible perſpiration. Eſſay on Health.

For the periodical *evacuations* of women, ſee MENSES. For the *evacuations* of women after delivery, ſee LOCHIA.

EVACUATION, is likewiſe uſed in the *Art of War*, where, to *evacuate a place* is to make the garriſon quit or march out of it, in order for another power to take poſſeſſion of it, or to make room for another garriſon.

EUCŒMIA, of ευ, *well*, and αιμα, *blood*, is uſed by Tremelius and ſome other writers to denote a good and healthy ſtate of the maſs of blood.

EVANGELICAL *harmony* and *œconomy*. See the ſubſtantives.

EVANGELISTS, the inſpired authors of the Goſpels.

The word is derived from the Greek, ευαγγελιον, formed of ευ, *bene*, *well*, and αγγελος, *angel*, *meſſenger*.

The denomination *evangeliſts* was likewiſe given in the ancient church to ſuch as preached the goſpel up and down, without being attached to any particular church, being either commiſſioned by the apoſtles to inſtruct the nations, or of their own accord, abandoning every worldly attachment, conſecrated themſelves to the ſacred office of preaching the Goſpel.

In which ſenſe ſome interpreters think it is that St. Philip, who was one of the ſeven deacons, is called the *evangeliſt*, in the twenty-firſt chapter of the Acts of the Apoſtles, ver. 8. Again, St. Paul writing to Timothy, Ep. ii. cap. iv. ver. 5. bids him do the work of an *evangeliſt*. The ſame apoſtle, Eph. iv. 11. ranks the *evangeliſts* after the apoſtles and prophets.

EVANID, a name which ſome authors give to thoſe colours which are tranſient, or not of long duration; as thoſe in the rainbow, in clouds before and after ſun-ſet, &c.

Evanid colours are the ſame with thoſe otherwiſe called *fantaſtical* and *emphatical* colours. Some authors alſo uſe the ſame term to expreſs thoſe flowers of plants whoſe petals fall off as ſoon as they are opened.

EVANTES, in *Antiquity*, the prieſteſſes of Bacchus, thus called, becauſe in celebrating the orgia they ran about as if diſtracted, crying, *evan, evan, obé evan!*

The word is formed from Ευαν, a title or appellation of Bacchus.

EUANTHI *colores*, in *Painting*, a term uſed by the Greeks to expreſs what the Romans call the *floridi colores*; theſe were ſuch colours as had a remarkable brightneſs in their works. The other coarſer and duller colours the Romans called *auſteri colores*, and the Greeks *bathyci*. Of the firſt ſort were cinnabar, lapis armenus, chryſocolla, minium, indigo, and purpuriſſa, according to the Romans; but the Greeks, as we find by Dioſcorides, made cinnabar one of the auſtere colours.

EVAPORATION, in *Philoſophy*, the act of diſſipating the humidity of a body in fumes or vapour.

Evaporation and exhalation, though often uſed indiſcriminately as ſynonymous terms, differ from each other. See EXHALATION.

Common ſalt is formed by evaporating all the humidity in the ſalt-water or brine; which *evaporation* is either performed by the heat of the ſun, as in the ſalt-works by the ſea-coaſt, &c. or by means of fire, as at the ſalt-ſprings, &c.

By the obſervations of M. Sedileau, it appears, that what is raiſed in vapour exceeds that which falls in rain.

Though the *evaporation* of fluids be generally looked on as an effect of the heat and motion of the air, yet M. Gauteron, in the Memoires de l'Acad. des Scienc. an. 1705, ſhews, that a quite oppoſite cauſe may have the ſame effect, and that fluids loſe more of their parts in the ſevereſt froſt than when the air is moderately warm. In the great froſt of the year 1708, he found, that the greater the cold ſtill the more conſiderable the *evaporation*; and that ice itſelf loſt full as much as the warmer liquors that did not freeze.

There are few ſubjects of philoſophical inveſtigation that have occaſioned a greater variety of opinion than the theory

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theory of *evaporation*, or of the aſcent of water in ſuch a fluid as air, between eight and nine hundred times lighter than itſelf, to different heights according to the different denſities of the air; in which caſe it muſt be ſpecifically lighter than the air through which it aſcends. The Carteſians account for it by ſuppoſing, that by the action of the ſun upon the water, ſmall particles of the water are formed into hollow ſpheres and filled with the *materia ſubtilis*, which renders them ſpecifically lighter than the ambient air, ſo that they are buoyed up by it.

Dr. Nieuwentyt, in his Religious Philoſopher, cont. 19. and ſeveral others have alleged, that the ſun emits particles of fire which adhere to thoſe of water, and form *moleculæ*, or ſmall bodies, lighter than an equal bulk of air, which conſequently aſcend till they come to an height, where the air is of the ſame ſpecific gravity with themſelves; and that theſe particles, being ſeparated from the fire with which they were incorporated, coaleſce and deſcend in dew or rain. Dr. Halley has advanced another hypotheſis, which has been more generally received: he imagined, that by the action of the ſun on the ſurface of the water, the aqueous particles are formed into hollow ſpherules filled with a finer air highly rarefied, ſo as to become ſpecifically lighter than the external air. Phil. Tranſ. N° 192. or Abr. vol. ii. p. 126. Dr. Deſaguliers, diſſatisfied with theſe two hypotheſes, propoſes another in the Phil. Tranſ. N° 407. or Abr. vol. vii. p. 61. See alſo his Courſe of Experimental Philoſophy, vol. ii. p. 336, &c. He ſuppoſes that heat acts more powerfully on water than on common air; that the ſame degree of heat which rarefies air two-thirds will rarefy water near 14,000 times; and that a very ſmall degree of heat will raiſe a ſteam or vapour from water, even in winter, whilſt it condenſes the air; and thus the particles of water are converted into vapour by being made to repel each other ſtrongly, and deriving electricity from the particles of air to which they are contiguous, are repelled by them and by each other, and form a fluid, which, being lighter than the air, riſes in the air, according to their relative gravities. The particles of this vapour retain their repellent force for a conſiderable time, till, by ſome diminution of the denſity of the air in which they float, they are precipitated downwards and brought within the ſphere of each other's attraction of coheſion, ſo that they join again into drops of water. Many objections have been urged againſt this opinion by Mr. Clare, in his Treatiſe of the Motion of Fluids, p. 294, &c. and by Mr. Rowning in his Syſtem of Philoſophy, part. ii. diſſ. 6. to which Dr. Hamilton has added the two following, viz. that if heat were the only cauſe of *evaporation*, water in a warm cloſe room would evaporate faſter than when expoſed in a colder place, where there is a conſtant current of air, which is contrary to experience; and that the *evaporation* of water is ſo far from depending on its being rarefied by heat, that it is carried on even whilſt water is condenſed by the coldneſs of the air, for water is gradually condenſed by cold till it freezes; and ſince it evaporates even when frozen into hard ice, it muſt alſo evaporate in all the leſſer degrees of cold. Heat, therefore, does not ſeem to be the principal, much leſs the only cauſe of *evaporation*.

Others have attempted to account for the phænomena of *evaporation* on another principle, viz. that of ſolution; and ſhewn, from a variety of experiments, that what we call *evaporation* is nothing more than a gradual ſolution of water in air, produced and ſupported by the ſame means, or by attraction, heat, and motion, by which other ſolutions are effected.

The abbé Nollet ſeems to have been the firſt who ſtarted this opinion, without much purſuing it, in his Leçons de Phyſique Experimentale, the firſt edition of which was publiſhed in 1743: he offers it as his conjecture, that the air of the atmoſphere ſerves as a ſolvent or ſponge with regard to the bodies that encompaſs it, and receives into its pores the vapours and exhalations that are detached from the maſſes to which they belong in a fluid ſtate; and he accounts for their aſcent on the ſame principles with the aſcent of liquors in capillary tubes: on his hypotheſis, the condenſation of the air contributes, like the ſqueezing of a ſponge, to their deſcent. See the work above cited, ſixth edit. 1767, tom. ii. p. 199, and p. 440.

Dr. Franklin, in a Paper of Philoſophical and Meteorological Obſervations, Conjectures, and Suppoſitions, delivered to the Royal Society about the year 1747, and read in 1756, ſuggeſted a ſimilar hypotheſis: he obſerves, that air and water mutually attract each other; and hence concludes, that water will diſſolve in air, as ſalt in water; every particle of air aſſuming one or more particles of water; and when too much is added it precipitates in rain. But as there is not the ſame contiguity between the particles of air as of water, the ſolution of water in air is not carried on without a motion of the air, ſo as to cauſe a freſh acceſſion of dry particles. A ſmall degree of heat ſo weakens the coheſion of the particles of water, that thoſe on the ſurface eaſily quit it, and adhere to the particles of air: a greater degree of heat is neceſſary to break the coheſion between water and air. Air moderately heated will ſupport a greater quantity of water inviſibly than cold air; for its particles being by heat repelled to a greater diſtance from each other, thereby more eaſily keep the particles of water that are annexed to them from running into coheſions that would obſtruct, refract, or reflect the light; and hence it happens, that when we breathe in warm air, though the ſame quantity of moiſture may be taken up from the lungs as when we breathe in cold air, yet that moiſture is not ſo viſible. On theſe principles he accounts for the production and different appearances of fogs, miſts, and clouds. He adds, that if the particles of water bring electrical fire when they attach themſelves to air, the repulſion between the particles of water electrified joins with the natural repulſion of the air to force its particles to a greater diſtance, ſo that the air being more dilated, riſes and carries up with it the water; which mutual repulſion of the particles of air is increaſed by a mixture of common fire in the particles of water. When air, loaded with ſurrounding particles of water, is compreſſed by adverſe winds, or by being driven againſt mountains, &c. or condenſed, by taking away the fire that aſſiſted it in expanding, the particles will approach one another, and the air with its water will deſcend as a dew; or if the water ſurrounding one particle of air comes in contact with the water ſurrounding another, they coaleſce and form a drop, and we have rain; and ſince it is a well-known fact, that vapour is a good conductor of electricity as well as of common fire, it is reaſonable to conclude with Mr. Henly, that *evaporation* is one great cauſe of the clouds becoming at times ſurcharged with this fluid. Phil. Tranſ. vol. lxvii. part i. p. 134. See Phil. Tranſ. vol. lv. art. 24. p. 182. or Franklin's Letters and Papers on Philoſophical Subjects, p. 42, &c. and p. 182, &c. Ed. 1769. M. le Roi, of the Academy of Sciences at Paris, hath alſo advanced the ſame opinion, and ſupported it by a variety of facts and obſervations in the Memoires, &c. for the year 1751. He ſhews, that water does undergo in the air a real diſſolution, forming with it a tranſparent mixture, and poſſeſſing the ſame properties with the ſolutions of moſt ſalts in water; and that the two principal cauſes which promote the ſolution of water in the air are heat and wind; that the hotter the air is within a certain limit, the more water it will diſſolve; and that at a certain degree of heat the air will be ſaturated with water; and by determining at different times the degree of the air's ſaturation, he eſtimates the influence of theſe cauſes on which the quantity ſuſpended in the air in a ſtate of ſolution depends. Accordingly, the air, heated by evaporating ſubſtances to which it is contiguous, becomes more rare and light, riſes, and gives way to a denſer air; and, by being thus removed, contributes to accelerate the *evaporation*. The non-elaſtic air contained in the internal parts of evaporating bodies, put into action by heat, ſerves alſo to increaſe their *evaporation*, as is evident in the caſe of the ÆOLIPYLE. The wind is another cauſe of the increaſe of *evaporation*, principally by changing and renewing the air which immediately encompaſſes the evaporating ſubſtances; and from the conſideration of theſe two cauſes combined, it appears why the quantity of vapour raiſed in the night is leſs than that of the day, ſince the air is then both leſs heated and leſs agitated. M. le Roi farther ſhews, that winds blowing in particular directions are more favourable to *evaporation* than others; thus the north and north-weſt winds accelerate *evaporation* in Languedoc, and probably in other parts of Europe, and the ſouth-eaſt wind retards it. To the objection urged againſt this hypotheſis, on account of the *evaporation* of water in a vacuum, this ingenious writer replies, that the water itſelf contains a great quantity of air, which gradually diſengages itſelf and cauſes the *evaporation*; and that it is impoſſible that a ſpace containing water which evaporates ſhould remain perfectly free from air. To this objection a late writer, Dr. Dobſon of Liverpool, replies, that though air appears by unqueſtionable experiments to be a chemical ſolvent of water, and as ſuch, is to be conſidered as one cauſe of its *evaporation*, heat is another cauſe, acting without the intervention of air, and producing a copious *evaporation* in an exhauſted receiver; agreeably to an experiment of Dr. Irving, who ſays, that water in an exhauſted receiver riſes in vapour more copiouſly at 180° of Farenheit's thermometer than in the open air at 212° its boiling point.

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point. Dr. Dobſon farther adds, that water may exiſt in air in three different ſtates; in a ſtate of perfect ſolution, when the air will be clear, dry, and heavy, and its powers of ſolution ſtill active; in a ſtate of beginning precipitation, when it becomes moiſt and foggy, its powers of ſolution are diminiſhed, and it becomes lighter in proportion as its water is depoſited; and alſo, when it is completely precipitated, which may happen either by a more ſlow proceſs, when the diſſolved water falls in a driſling rain, or by a more ſudden proceſs, when it deſcends in briſk rain. Phil. Tranſ. vol. lxvii. part. i. p. 257. and Phipps's Voyage to the North Pole, p. 211. Dr. Hamilton, profeſſor of philoſophy in the univerſity of Dublin. tranſmitted to the Royal Society in 1765, a long Diſſertation on the Nature of *Evaporation*, in which he propoſes and eſtabliſhes this theory of ſolution; and though other writers had been prior in their conjectures, and even in their reaſoning on this ſubject, Dr. Hamilton aſſures us, that he has not repreſented any thing as new which he was conſcious had ever been propoſed by any one before him, even as a conjecture. Some of the facts alleged by profeſſor Hamilton, and ſome of the concluſions deduced from them, are ſimilar to thoſe of M. le Roi; but the ſimilarity appears to be merely accidental. The editor, having laid before the public a fair and impartial account of the hiſtory of the new theory, as it may be called, of *evaporation*, which is the moſt plauſible, and now the moſt generally received, will terminate this article with a brief view of Dr. Hamilton's arguments in ſupport of it, and the application of it to the phænomena of the atmoſphere. By ſolution, Dr. Hamilton underſtands with other writers, ſuch an intimate union between the particles of a body and thoſe of a fluid, that the whole ſhall appear an homogeneous maſs, as tranſparent as the fluid was before ſuch union, and ſhall continue ſo, till ſome external cauſe produces a change: he conſiders the tranſparence of the fluid as the criterion of a true ſolution, and that which diſtinguiſhes it from a mixture. He proceeds to ſhew, that there is a mutual attraction between the water and air of the ſame kind with that which is obſerved between the particles of any two bodies, one of which diſſolves the other. All water contains a conſiderable quantity of air which may be ſeparated from it; and as it retains its elaſticity, we may reaſonably ſuppoſe, that it is prevented from eſcaping by the force of attraction, juſt as the particles of gold are ſuſpended in aqua regia, by their attraction towards the particles of that fluid. Beſides, water exhauſted of its air will again imbibe a certain quantity, gradually drawing it into its pores till it is ſaturated, juſt as a lump of ſugar draws water into its pores. Air, likewiſe, evidently contains a quantity of water, which will be drawn from it even in its pureſt and drieſt ſtate by dry ſalt of tartar, ſo that the ſalt will become entirely fluid; and yet in this caſe the air is perfectly tranſparent. There is alſo a remarkable ſimilarity between the properties of common ſolutions and thoſe of *evaporation*. As ſalt beginning to diſſolve in water appears at firſt to thicken the water that ſurrounds it, and the ſolution of it to be promoted by agitation, the air that lies at reſt over water appears thick, and loaded with aqueous particles, in which caſe the *evaporation* proceeds very ſlowly, which is greatly promoted by a current of freſh air paſſing over the exhaling ſurface.

When a lump of any ſalt is diſſolved in clear cold water, the water that is firſt ſaturated with it will riſe on agitation in curled wreaths though the other water, render it ſomewhat opake, and give an apparent tremulous motion to an object ſeen through it, till by degrees the ſolution is complete, and the tranſparency of the water is reſtored: the caſe is the ſame when any two fluids of different denſities that will incorporate, are mixed together; thus, ſmoak or ſteam, when it firſt riſes into the air, exhibits ſimilar appearances; and the vapour riſing in a hot day from moiſt ground will make the air and any objects ſeen through it appear to have a tremulous motion, which is ſtill more obſervable when a teleſcope is uſed, that magnifies the floating vapours. Farther, heat, by expanding bodies, enlarging the pores, and leſſening the mutual coheſion of their particles, promotes, and cold, on the contrary, in ſome meaſure retards and checks both ſolution and *evaporation*. As very hot water diſſolves ſalt ſooner, and in a greater quantity than cold water, and when cooled, depoſits part of the ſalt after a ſtrong ſolution, which was before diſſolved; ſo water will evaporate faſter in warm than in cold air; and therefore, the air is generally clearer in cold than in hot weather. Thus the aqueous vapours ſuſpended in the air during the heat of the day, fall down at night, and form themſelves into drops of DEW, or if the night be very cold, appear next morning cryſtallized in a HOAR-FROST. If a bottle of very cold liquor be expoſed to the warm air in a hot day, the air contiguous to it being cooled, will let go part of its water, which will form a dew on the outer ſurface of the glaſs: by an experiment ſimilar to this M. le. Roi was firſt led to conclude that water is really diſſolved in air: for the ſame reaſon a dew is formed on the inſide of the windows of a warm room, which on their outſide are expoſed to the cold air. Again, the quantity of a body diſſolved, and of a fluid evaporated, depends, *cæteris paribus*, on its quantity of ſurface. Chemiſts produce cold by ſolution: thus, by diſſolving pounded ice or ſnow in ſpirit of nitre, a degree of cold has been produced ſufficient to freeze quickſilver. See FREEZING and THERMOMETER. Cold is alſo produced by *evaporation*: ÆTHER, or ſpirit of wine, of the ſame temperature with the air, rubbed lightly (with a feather) over the ball of a thermometer, will make the quickſilver ſink as they evaporate; and the quicker they evaporate, the faſter will the quickſilver ſink: any volatile ſpirit rubbed over the hand feels much colder than water of the ſame temperature; and æther feels colder than ſpirit, on account of their more ſudden *evaporation*.

M. Amontons, in a Memoir of the Academy of Paris, 1699, and M. Richman, in a Memoir of the Academy of Peterſburgh, 1747, have obſerved, that cold is produced by evaporating fluids; and Dr. Cullen has found, that the cold thus produced is nearly in the proportion of the volatility of the fluids, and that it is conſiderably greater *in vacuo* than in air. Eſſ. Phyſ. and Art. Edinb. vol. ii. 1756. See THERMOMETER.

Dr. Franklin mentions a practice recorded in Bernier's Travels through Indoſtan, written near a hundred years ago, to this purpoſe: in travelling over dry deſarts in that hot climate, they carry water in flaſks wrapt in wet woollen cloths, and hung on the ſhady ſide of the camel or carriage in the free air, whereby, as the cloths gradually grow drier, the water contained in the flaſks is made cool. Franklin's letters, &c, p. 364.

Again, there is a ſtronger attraction or affinity between ſpirit of wine and air than between water and air; and, ſince the ſpirit evaporates much faſter than the water, the *evaporation* of fluids ſeems to ariſe from an attractive force between their particles and thoſe of air. Finally, after diſſolving a body in any proper menſtruum, if another be added that has a greater affinity to the menſtruum than the firſt, this will be diſſolved, and the firſt will be precipitated; and in the ſame manner, any fluid will let go the air which it contains on the addition of another body to which it has a greater affinity than it has to the air; from which fact it may be inferred, that the air, imbibed by any fluid, is, properly ſpeaking, diſſolved in that fluid, and therefore, that any fluid which evaporates, or is imbibed by the air, is alſo, properly ſpeaking, diſſolved in air.

Dr. Hamilton, having evinced the agreement between ſolution and *evaporation*, concludes, that *evaporation* is nothing more than a gradual ſolution of water in air, produced and promoted by attraction, heat, and motion, juſt as other ſolutions are effected.

In order to account for the aſcent of aqueous vapours into the atmoſphere, this ingenious writer obſerves, that the loweſt part of the air being preſſed by the weight of the upper againſt the ſurface of the water, and continually rubbing upon it by its motion, attracts and diſſolves thoſe particles with which it is in contact, and ſeparates them from the reſt of the water. And ſince the cauſe of ſolution in this caſe is the ſtronger attraction of the particles of water towards the air than towards each other, thoſe that are already diſſolved and taken up will be ſtill farther raiſed by the attraction of the dry air which lies over them, and thus will diffuſe themſelves, riſing gradually higher and higher, and thereby leave the loweſt air, not ſo much ſaturated but that it will ſtill be able to diſſolve and take up freſh particles of water; which proceſs is greatly promoted by the motion of the wind. When the vapours are thus raiſed and carried by the winds into the higher and colder parts of the atmoſphere, ſome of them will coaleſce into ſmall particles, which ſlightly attracting each other, and being intermixed with air, will form CLOUDS; and theſe clouds will float at different heights, according to the quantity of vapour borne up, and the degree of heat in the upper parts of the atmoſphere. Thus clouds are generally higher in ſummer than in winter. When the clouds are much increaſed by a continual addition of vapours, and their particles are driven cloſe together by the force of the winds, they will run into drops heavy enough to fall down in RAIN. If the clouds are frozen before their particles are gathered into drops, ſmall pieces of them being condenſed and made heavier by the cold, fall down in thin flakes of SNOW. If the particles are formed into drops before they are frozen, they become HAIL-*ſtones*. When the air is replete with vapours, and a cold breeze ſprings up, which

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which checks the ſolution of them, clouds are formed in the lower parts of the atmoſphere, and compoſe a MIST or FOG, which uſually happens in a cold morning, and is diſperſed when the ſun has warmed the air, and made it capable of diſſolving theſe watry particles. Southerly winds generally bring rain, becauſe, being commonly warm and replete with aqueous vapours, they are cooled by paſſing into a colder climate; and therefore part with ſome of them, and ſuffer them to precipitate in rain: whereas northerly winds, being cold, and acquiring additional heat by coming into a warmer climate, are ready to diſſolve more vapour than they before contained; and therefore, by long continuance, they are dry and parching, and uſually attended with fair weather.

Changes of the air, with reſpect to its denſity and rarity, as well as its heat and cold, will produce contrary effects in the ſolution of water and the conſequent aſcent or fall of vapours. Several experiments prove, that air, when rarefied, cannot keep as much water diſſolved as it does in a more condenſed ſtate; and therefore, when the atmoſphere is ſaturated with water, and changes from a denſer to a rarer ſtate, the higher and colder parts of it will let go ſome of the water before diſſolved, form new clouds, and diſpoſe them to fall down in rain: but a change from a rarer to a denſer ſtate will ſtop the precipitation of the water, and enable the air to diſſolve either in whole or in part, ſome of thoſe clouds that were formed before, and render their particles leſs apt to run into drops and fall down in rain: on this account, we generally find, that the rarefied and condenſed ſtates of the atmoſphere are reſpectively attended with rain or fair weather. See more on this ſubject in the Phil. Tranſ. vol. lv. art. 23. p. 146, &c. or Hamilton's Philoſophical Eſſays. 8vo. 1766. p. 33, &c.

Dr. Halley furniſhes us with ſome experiments of the quantity or meaſure of the *evaporation* of water. The reſult is contained in the following articles:

1. That water ſalted to about the ſame degree as ſalt-water, and expoſed to a heat equal to that of a ſummer's day, did, from a circular ſurface of about 8 inches diameter, evaporate at the rate of ſix ounces in 24 hours. Whence, by a calculus, he finds that the thickneſs of the pellicle or ſkin of water, evaporated in 2 hours, was the 53d part of an inch; but, for a round number, he ſuppoſes it only a 60th part; and argues thence, that if water as warm as the air in ſummer evaporates the thickneſs of one 60th part of an inch in 2 hours from its whole ſurface; in 12 hours it will evaporate the 10th of an inch: which quantity, he obſerves, will be found abundantly ſufficient to furniſh all the rains, ſprings, dews, &c.

In effect, on this principle, every 10 ſquare inches of the ſurface of the water yield in vapour *per diem* a cubic inch of water; and each ſquare foot half a wine pint; every ſpace of 4 feet ſquare, a gallon; a mile ſquare, 6914 tons; and a ſquare degree of 69 Engliſh miles will evaporate 33 millions of tons a day; and the whole Mediterranean, computed to contain 160 ſquare degrees, at leaſt 5280 millions of tons. Phil. Tranſ. N° 189. or Abridg. vol. ii. p. 108, &c.

2. A ſurface of 8 ſquare inches, evaporated purely by the natural warmth of the weather without either wind or ſun, in the courſe of a whole year, 16292 grains of water, or 64 cubic inches; conſequently, the depth of water thus evaporated in one year amounts to 8 inches. But this being too little to anſwer the experiments of the French, who found that it rained 19 inches of water in one year at Paris; or thoſe of Mr. Townley, who found the annual quantity of rain in Lancaſhire above 40 inches; he concludes, that the ſun and wind contribute more to *evaporation* than any internal heat or agitation of the water.

It has ſince been diſcovered, that there was a ſource of error in Mr. Townley's experiments, with which the world was not at that time acquainted: his rain-gage was fixed 10 yards above the ſurface of the earth; but Dr. Heberden has found, that a rain-gage fixed below the top of a houſe received above a fifth part more rain than another of the ſame ſize above the top of the ſame houſe; and that there fell upon Weſtminſter Abbey not much above one-half of that which fell in the ſame ſpace below the tops of the houſes; and by ſeveral experiments made by Dr. Dobſon of Liverpool, it appears, that the quantity of rain received in a veſſel placed on the ground exceeded that received by another of the ſame dimenſions 18 yards higher more than one-third, and leſs than one-half. Phil. Tranſ. vol. lix. art. 47. and vol. lxvii. art. 13. p. 256.

With regard to the cauſe of this difference, it may be obſerved, that as in chemical precipitations a greater portion of the precipitating ſubſtance will be received on the real bottom of a veſſel containing the ſolution than on a ſuppoſed falſe bottom placed any where above it, and that in proportion to its height above the real bottom; ſo a greater quantity of water, conſidering rain as a precipitation of water before diſſolved in air, ought, on parting with its former ſolvent, to fall on the ſurface of the earth than on an imaginary horizontal plane of the ſame dimenſions above it; and though the caſes are not exactly parallel, yet the drops of rain in their deſcent muſt be ſomewhat increaſed either in number or ſize; partly by ſucceſſively impinging on the aqueous particles contained in the air through which they paſs, and by attracting others in virtue of their being poſſeſſed of a different electricity; and partly by the ſpontaneous ſeparation and precipitation of that moiſture, which is known to be contained in conſiderable quantities in the air at all times, and the appearance of which, dripping down the walls of our houſes, &c. is one of the popular ſigns of approaching rain. Monthly Review, vol. xliv. p. 322. Dr. Dobſon ſtates the annual *evaporation* at Liverpool, taking the medium of 4 years at 36.78 inches. Dr. Halley fixes the annual *evaporation* of London at 48 inches. See Phil. Tranſ. vol. lxvii. part i. p. 252.

3. The effect of the wind is very conſiderable, on a double account; for the ſame obſervations ſhew a very odd quality in the vapours of water, viz. that of adhering and hanging to the ſurface that exhaled them, which they clothe as it were with a fleece of vaporous air; which once inveſting the vapour, it thenceforward riſes in much leſs quantity. Whence, the quantity of water loſt in 24 hours, when the air was very ſtill from wind, was very ſmall, in proportion to what went away when there was a ſtrong gale of wind abroad to diſſipate the fleece, and make room for the emiſſion of vapour; and this, even though the experiment was made in a place as cloſe from the wind as could be contrived.

Add, that this fleece of water hanging on the ſurface of waters in ſtill weather is the occaſion of very ſtrange appearances, by the refraction of the vapour's differing from and exceeding that of common air: whence every thing appears raiſed, as houſes like ſteeples, ſhips as on land above the water, the land raiſed, and as it were lifted from the ſea, &c.

4. The ſame experiments ſhew, that the *evaporation* in May, June, July, and Auguſt, which are nearly equal, are about three times as great as thoſe in the months of November, December, January, and February. Phil. Tranſ. N° 212. or Abr. vol. ii. p. 110, &c.

Dr. Brownrigg, in his Art of making Common Salt, p. 189, fixes the *evaporation* of ſome parts of England at 73.8 inches during the months of May, June, July, and Auguſt; and the *evaporation* of the whole year at more than 140 inches. The *evaporation* of the four ſummer months at Liverpool, on a medium of four years, was found to be only 18.88 inches. Dr. Hales calculates the greateſt annual *evaporation* from the ſurface of the earth in England at 6.66 inches; and therefore the annual *evaporation* from a ſurface of water, is to the annual *evaporation* from the ſurface of the earth in Liverpool as 36 to 6, or as 6 to 1. Phil. Tranſ. vol. lxvii. ubi ſupra.

EVAPORATION, in *Pharmacy*, *Chemiſtry*, &c, denotes an operation by which the more aqueous and volatile parts of fluids are ſpent, or driven away in ſteam, ſo as to leave the remaining part ſtronger, or of a higher conſiſtence than before.

Evaporation is effected by ſetting a liquor over a gentle heat, to carry off the moſt fluid and volatile parts, without leſſening the quantity of the other matters with which the liquor is impregnated.

The veſſels uſed for this purpoſe are baſons, teſts, or crucibles, which are made of glaſs, metal, or earth, according to the nature of the bodies on which the operation is to be performed. They are flat, ſhallow, and wide, ſo that the body from which the *evaporation* is to be made may preſent a large ſurface to the air. In all *evaporations* the degree of heat ought to be proportioned to the volatility of the ſubſtance to be evaporated, and to the degree of fixity of the ſubſtance intended to be left, and of its adheſion to the volatile parts. In ſome caſes, as in obtaining oil from rectified ſpirit of wine and æther, the liquors ought to be evaporated upon the ſurface of water in open air, without any other heat than that of the atmoſphere; in others, when the part to be evaporated is not very volatile, and when the remaining ſubſtance is very fixed, and does not adhere much to the volatile part, as in the purification of gold by antimony, a ſtrong heat may be applied, and a current of air directed upon the ſurface of the body. Macquer.

EVASION, *evaſio*, in *Law*, is uſed for any ſubtile endeavour to ſet aſide truth, or to eſcape the puniſhment of the law, which will not be endured. Thus, if a perſon ſays to another that he will not ſtrike him, but will give

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give him a pot of ale to ſtrike him firſt: and accordingly he ſtrikes, the returning of it is puniſhable; and if the perſon firſt ſtriking be killed, it is murder; for no man ſhall evade the juſtice of the law by ſuch a pretence to cover his malice. 1 Hawk. P. C. 81.

EVATES, a branch or diviſion of the ancient Celtic philoſophers the DRUIDS.

Strabo diſtributes the philoſophers among the Britons and Gauls into three ſects; Βαρδοι, *Bards*; Ουαϛεις, *Evates*, and Δρυιδαι, *Druids*. He adds, that the *Bardi* were poets and muſicians: the *Evates*, prieſts and naturaliſts; and the *Druidi*, moraliſts as well as naturaliſts. But Marcellinus, Voſſius, and Hornius, reduce them all to two ſects, viz. *Bardi* and *Druids*. Laſtly, Cæſar, lib. vi. comprehends them all under the name of *Druids*.

The *Evates* or *Vates* of Strabo might probably be what other authors, and particularly Ammian. Marcellin. calls *Eubages*; but Mr. Bouche, in his Hiſt. de Provence, lib. ii. chap. 2. diſtinguiſhes between them. The *Vates*, he ſays, were ſuch as took care of the ſacrifices and other ceremonies of religion; and the *Eubages*, thoſe who ſpent their time in the ſearch and contemplation of the great myſteries of nature.

EUBAGES, an order of prieſts or philoſophers among the ancient Celtæ or Gauls. Chorier takes the *Eubages* to be the ſame with the *Druids* and *Saronidæ* of Diodorus: others will have the *Eubages* to be thoſe whom Strabo, lib. iv. p. 197. calls Ουαϛεις, *Evates*, or *Vates*, on which principle there is room to conjecture, that the word ſhould be written Ουαγεις, it being eaſy to miſtake a Γ for a Τ.

Be this as it will, the *Eubages* appear to have been a different order from the *Druids*. See DRUID.

EUCHARIST, *Euchariſtia*, the Sacrament of the Supper, or a participation of the body and blood of Chriſt, under the ſpecies or figures of bread and wine. See COMMUNION, SACRAMENT, SPECIES, TRANSUBSTANTIATION, and CONSUBSTANTIATION.

The word in its original Greek, Ευχαριϛια, literally imports *thankſgiving*, being formed of ευ, *bene*, *well*, and χαρις, *gratia*, *thanks*.

EUCHITES, or EUCHITÆ, a ſect of ancient heretics, who were firſt formed into a religious body towards the end of the fourth century, though their doctrine and diſcipline ſubſiſted in Syria, Egypt, and other eaſtern countries before the birth of Chriſt; they were thus called becauſe they prayed without ceaſing, imagining that prayer alone was ſufficient to ſave them.

Their great foundation were thoſe words of St. Paul, Epiſt. i. to the Theſſalonians, cap. v. ver. 17. *pray without ceaſing*.

The word is formed of the Greek, ευχη, *prayer*, whence ευχϛαι, the ſame with the Latin, *precatores*, *prayers*. They were alſo called *Enthuſiaſts* and *Meſſalians*, a term of Hebrew origin, denoting the ſame as *Euchites*.

The *Euchites* were a ſort of myſtics who imagined, according to the oriental notion, that two ſouls reſided in man, the one good, and the other evil; and who were zealous in expelling the evil ſoul or dæmon, and haſtening the return of the good ſpirit of God, by contemplation, prayer, and ſinging of hymns. They alſo embraced the opinions nearly reſembling the Manichean doctrine, and which they derived from the tenets of the oriental philoſophy. The ſame denomination was uſed in the twelfth century, to denote certain fanatics who infeſted the Greek and Eaſtern churches, and who were charged with believing a double Trinity, rejecting wedlock, abſtaining from fleſh, treating with contempt the ſacraments of Baptiſm and the Lord's Supper, and the various branches of external worſhip, and placing the eſſence of religion ſolely in external prayer, and maintaining the efficacy of perpetual ſupplications to the Supreme Being for expelling an evil being or genius, which dwelt in the breaſt of every mortal. This ſect is ſaid to have been founded by a perſon called Lucopetrus, whoſe chief diſciple was named Tychicus. By degrees it became a general and invidious appellation for perſons of eminent piety and zeal for genuine Chriſtianity, who oppoſed the vicious practices and inſolent tyranny of the prieſthood; much in the ſame manner as the Latins comprehended all the adverſaries of the Roman pontiff under the general terms of WALDENSES and ALBIGENSES. Moſh. Eccl. Hiſt. Eng. edit. 8vo. vol. i. p. 350. and vol. ii. p. 441.

St. Cyril of Alexandria, in one of his letters, takes occaſion to cenſure ſeveral monks in Egypt, who, under pretence of reſigning themſelves wholly to prayer, led a lazy, ſcandalous life. A cenſure likewiſe applicable to monaſteries in general.

EUCHOLOGIUM, Ευχολογιον, a Greek term, ſignifying literally, *a diſcourſe on prayer*.

The word is formed of ευχη, *prayer*, and λογος, *diſcourſe*.

The *Euchologium* is properly the Greek RITUAL, wherein are preſcribed the order and manner of every thing relating to the order and adminiſtration of their ceremonies, ſacraments, ordinations, &c.

Fa. Goar has given us an edition of the Greek *Euchologium* in Greek and Latin, with notes, at Paris.

EUCHYMIA, from ευ, *good*, and χυμος, *juice*, in *Medicine*, a good temper of the blood, or other juices and fluids in an animal body.

EUCLABRIS, in *Antiquity*, a table whereon the ſlaughtered victim was ſpread, in order to have its inteſtines carefully inſpected. It was from this table that the veſſels uſed in ſacrifices were called *euclabria*.

EUCRASY, of ευ, *well*, and κρασις, *temperature*, an agreeable, well-proportioned mixture of qualities, whereby a body is ſaid to be in good order, and diſpoſed for a good ſtate of health.

EUDIOMETER, in *Pneumatics*, is an inſtrument lately invented, in conſequence of the experiments and diſcoveries of Dr. Prieſtly, for determining the ſalubrity of different kinds of AIR. The name is formed of ευδια, ſignifying the *good quality of air*, derived from ευ, *good*, and δια, denoting, in compoſition a *medium*, and μετρω, *I meaſure*.

The reader will find under the article AIR, *nitrous*, an account of the principle on which the conſtruction of theſe inſtruments depends. Dr. Prieſtley, having diſcovered that when nitrous air is mixed with any other air, their original bulk is diminiſhed; and that the diminution is nearly, if not exactly, in proportion to its ſalubrity, was led to adopt nitrous air as a true teſt of the purity of reſpirable air; and nothing more ſeemed to be neceſſary than an eaſy, expeditious, and accurate method of eſtimating the degree of diminution in different caſes; and for this purpoſe the *eudiometer* was contrived. The diſcovery of Dr. Prieſtley was announced to the public in the year 1772; and the abbé Fontana and the chevalier Landriani, both of Italy, were the firſt who availed themſelves of this diſcovery in the conſtruction of *eudiometers*. One of theſe inſtruments invented by Landriani, conſiſts of a glaſs tube ground to a cylindrical veſſel, with two glaſs cocks and a ſmall baſon, all fitted in a wooden frame. In this inſtrument quickſilver is uſed inſtead of water; and that part of it which replaces the bulk loſt by the diminution of the two mixed airs, is conducted either through a kind of glaſs ſiphon, or through the capillary holes of a glaſs funnel; ſo that by its fall the whole mixture of the two kinds of air is more readily made. Dr. Falconer of Bath accurately divided a glaſs tube, in order to exhibit the quantity of diminution produced by the mixture of nitrous air with air of another kind, agreeably to the method uſed by Dr. Prieſtley in the purſuit of this curious diſcovery. See EFFLUVIA. Mr. J. H. de Magellan, F. R. S. has deſcribed three different *eudiometers* of his own contrivance. One of theſe conſiſts of the following parts, viz. a glaſs tube *m n e d*, (ſee *Tab.* IX. *Pneumatics*, *fig.* 8.) about 12 or 15 inches long, and of an equal diameter, with a ground glaſs ſtopple *m*; a veſſel *c*, the neck of which is ground air-tight to the lower end *d* of the tube; and two equal phials, *a* and *b*, whoſe necks are alſo ground air-tight to the reſpective mouths of the veſſel *c*: both theſe veſſels contain nearly as much as the whole tube *m n e d*. There is alſo a ſliding braſs ring *z*, which ſlides in the tube *n d*, and may be made tight at pleaſure by a finger ſcrew; and laſtly, a ruler *q*, either of braſs or of wood, repreſented *fig.* 9. which is divided into equal parts, and indicates the contents of both the phials *a* and *b* when thrown into the tube, by the number of parts which is engraved or ſtamped about the middle of it. The two bent pieces of braſs *z*, *t*, ſerve to hold it eaſily by the ſide of the tube *n d*, (*fig.* 10. and *fig.* 11.) keeping it cloſe to its neck *n* by the notch *i*. In uſing this inſtrument, it will be convenient to have a tall glaſs receiver like that repreſented *fig.* 10. or a tube or trough *fig.* 11. made with ſtrait boards of elm-wood one inch thick; the inſide dimenſions are 25 inches long, 13½ wide, and 11 deep: the two end boards, *c d* and *e f*, are fitted into a groove cut in the other three boards: it ſhould be daubed with thick white paint as a cement, for retaining the water, and the whole faſtened with nails from the outſide. The ſhelf *w a n o* is 8 inches wide, and 2 inches thick, in which are 3 holes of 3 tenths of an inch diameter, with as many ſeparate cavities underneath, ſo as to ſerve like ſo many funnels; or a glaſs funnel *t* cemented to the middle hole *n* is equally convenient. This ſhelf is ſupported by 4 metallic hooks *V w z z*, which may be raiſed or lowered at pleaſure by means of wooden wedges. A trough of this kind is the moſt commodious for experiments on different kinds of air.

Let ſuch a trough or tub be nearly filled with water, take out the ſtopple *m* of the *eudiometer* and fill it with water in the poſition exhibited *fig.* 8. or *fig.* 11. then cloſe

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close it with the stopple *m*, without leaving any air in the inside; and put the lower part *c* under the surface of the water in the tub, *fig.* 11. in the position there represented. Let the phial *a*, filled with water, be kept with its mouth downwards under the surface of the water, and filled with that air, the salubrity of which it is required to ascertain. This is done either by putting the phial *a* on the shelf *n o* of the tub, *fig.* 11. and throwing the air into the glass funnel *t*, which is there cemented to the shelf; or by holding in the left hand the same phial *a*, together with a glass funnel without a pipe applied to the mouth of the phial, whilst the air is poured with the right hand into it. But lest the heat of the hand should produce any considerable expansion in the air, the glass funnel may be held close to the mouth of the phials by wooden tongs with bent wires *x x*, *fig.* 12. unless they are made with a solid lump at their bottoms as they are here represented. If a glass bottle with a ground glass stopple be filled with water or mercury, and emptied in the place whose atmospherical air is to be tried, it will be filled with that air; and being closed with the glass stopple, may be carried to any distant place, in order to determine its comparative salubrity. When the phial *a* is filled with air in the manner already described, it is put moderately tight into the mouth of the vessel *c*; and for greater security against accidents, the necks of the phials *a*, *b*, and of the vessel *c*, as well as the glass stopple *m*, are always rubbed with tallow previously to every experiment. Then take the phial *b* filled with water, and by the same process fill it with nitrous air, and replace this phial *b* in the other mouth of the vessel *c*. Let the *eudiometer* be carefully inverted, so that the two phials may be downwards, as exhibited in *fig.* 10. by this operation the two kinds of air come up to *x* from the phials *a*, *b*, and thus are mixed together: when this is done, dip the *eudiometer* in the water of the trough, *fig.* 11. leaving the mouth of the instrument above its surface; so that no more water may enter into it than it had at first. Then attentively observe the moment when the mixture *x*, (*fig.* 10.) of the two kinds of air comes to its greatest diminution; after which, as Mr. Magellan has observed, its bulk will begin to increase again: for this purpose slide down the brass ring *z* of the instrument as the surface of the water in the tube falls; and when this becomes stationary, which it will do in a few minutes, if the nitrous air has a proper strength, we shall have the greatest diminution. Then fill up the whole tube of the *eudiometer* with water, shut it up with the stopple *m*, and incline the top of the instrument forwards till the air comes from *x* up to the top *n* of the tube: keep the lower part of the instrument dipped in the water; take off the glass vessel *c* with the two phials *a*, *b*, and raise or lower the tube of the *eudiometer* so as to see the surface of the water in the inside even with that on the outside, which mark by sliding to it the brass ring *z*. Or apply the ruler (*fig.* 9.) to the side of the *eudiometer* whilst it is immersed in the water of the trough, and thus you will see the true dimension of the remaining bulk of the two kinds of air already diminished. The number marked about the middle of this ruler, e. g. ** = 96, denotes that the contents of both phials *a* and *b* are equal to 96 divisions of the ruler when put into the tube of that *eudiometer*; or they are equal to a solid cylinder, as thick as the inside of the glass tube, and whose length is 96 divisions of the ruler divided into tenths of an inch. When e. g. the remaining bulk of mixed air corresponds to the 56th division of the ruler, it shews, that out of 96 parts only 40 (=96−56) have been lost or contracted; and in this case the wholesomeness of that air called A will be $\frac{40}{96}$. If another equal quantity of different air called B, be tried by the same *eudiometer*, and its residuum be equal to 60 parts of the same ruler, the relative salubrity of the air B will be to that of A, as 36 (=96−60) to 40: But if the air B had been tried by another *eudiometer*, whose proportional dimensions, marked about the middle of its ruler, were **=108, then the comparative salubrity of these two kinds of air A and B would be in the compound ratio of $\frac{36}{108}$ to $\frac{40}{96} = \frac{36 \times 96 \text{ to } 40 \times 108}{108 \times 96} =$ 3456 to 4320=54 to 67.5; or the wholesomeness of the air B would be to that of A as 54 to $67\frac{1}{2}$. If the operator be provided with a tall glass receiver, as *fig.* 10. he need only dip the *eudiometer* inverted into the water contained in the vessel *V S q l*; put the two kinds of air into the phials *a* and *b* in the manner already directed; turn the instrument upright as in *fig.* 10. and finish the process in the method just described: but he should take care that every part of the process be conducted in the same temperature, since air is apt to expand or contract by heat and cold; and therefore, he should keep a good thermometer as *K*, suspended by the wire *y r*, and immersed in the water of the glass vessel *fig.* 10. or in the trough *fig.* 11. during the progress of these experiments.

Another *eudiometer* of a more simple kind consists of a strait glass tube *e n* (*fig.* 13.) of an uniform diameter, about two or three feet long, with a large ball *s*, and a glass stopple *m* fitted air-tight to the mouth *n*, which should be wide open in the shape of a funnel. There is also a small siphon *k l*, *fig.* 14. with a brass ring *x*; a small phial *z*, *fig.* 15. the contents of which may occupy a third part of the ball *s*, or half the length of the glass tube *n s*: to this instrument also belongs a ruler divided and stamped, like that already described. When this instrument is used it is filled with water, and placed in a vertical position with the mouth *n* under the surface of the water in a tub or trough: the phial *z* (*fig.* 15.) is filled first with nitrous air, which is thrown into the tube either by a glass funnel applied to its mouth, or when its mouth is wide enough, without any funnel: the phial is next filled with the air to be tried, which is thrown into the same tube. Then the siphon (*fig.* 13.) is immediately applied to the mouth of the *eudiometer* under the surface of the water; some of which is to be poured into it. Having watched the stationary moment of the greatest diminution of the mixed air at *s* by means of the ring *x*, at that moment remove the siphon *k l*, and lay the *eudiometer* for some minutes under water in an horizontal position, or nearly so, that no part of the included air may escape; shut the mouth *n* with the glass stopple *m*, and invert the instrument with the mouth *n* upwards. Lastly, measure the space occupied by the residuum of the diminished air by applying to its side the divided ruler or scale, and estimate the result as before. *Eudiometers* are used with water or with quicksilver; but the latter suffering a sensible action from the contact with nitrous air, and being both heavier and dearer than water, is less eligible than the former. An instrument of this kind is capable of being applied to important and useful purposes in determining the comparative salubrity of the air in different climates and situations. See Magellan's Letter to Dr. Priestley, containing the Description of a Glass Apparatus, &c. and of New *Eudiometers*, &c. 1777, p. 15—47. and Priestley's Exp. and Obs. on Air, vol. iii. Preface and Appendix. See also an account of easy methods of measuring the diminution of bulk, occasioned by the mixture of common and nitrous air, by Dr. Ingenhousz, in the Phil. Transf. vol. lxvi. part i. art. 15. See EFFLUVIA.

EUDOXIANS, a party or sect of heretics in the fourth century, so denominated from their leader Eudoxius, patriarch of Antioch and Constantinople, a great defender of the Arian doctrine.

The *Eudoxians* adhered to the errors of the Arians and Eunomians, maintaining that the Son was created out of nothing; that he had a will distinct and different from that of the Father, &c.

EVE. See VIGIL.

EVECTION, is used by some astronomers for the libration of the moon. See LIBRATION.

The term *evection* is used by some astronomers to denote that equation of the moon's motion, which is proportional to the sine of double the distance of the moon from the sun, diminished by the moon's anomaly: this equation is not yet accurately determined; some state it at 1° 30′, others at 1° 16′, &c. It is the greatest of all the moon's equations except the EQUATION *of the center*.

EVEN *foot*, in *Poetry*. See FOOT.

EVEN *number*, is that which may be divided into two equal parts or moieties. See NUMBER.

EVENING *star*. See VESPER.

EVENLY *even number*, is that which is exactly divisible by an even number taken an even number of times; such is 32, since divisible by 8, taken four times.

EVENLY *odd number*, is that which an even number measures by an odd one; as 30, which is measured by 6, taken five times.

EVERARD'S *sliding rule*. See SLIDING.

EVERGETES, Ευεργετης, a Greek term, signifying *benefactor*, being formed of ευ, *bene*, *well*, and εργον, *opus*, *work*. It is still retained in our language by way of addition or epithet given to two princes or kings of Syria and Egypt who succeeded Alexander. Thus we say Ptolemy *Evergetes* king of Egypt, Antiochus *Evergetes* king of Syria.

EVER-GREENS, a class of perennials, which continue their verdure, leaves, &c. all the year.

Of these our gardeners reckon twelve, which are peculiarly fit for English air, viz. the alternus, arbutus, bay-tree, box-tree, holly, juniper, laurustinus, phyllirea, pyracantha, or *ever-green* thorn, Italian green privet, and the yew-tree.

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EVERLASTING *flower*. See ETERNAL *flower*.

EVERLASTING *pea*. See *Chichling* VETCH.

EVERRIATOR, derived from *ex* and *verro*, *I cleanse*, in *Antiquity*, an officer who was obliged in a solemn manner to cleanse such houses as were defiled by dead bodies, called *domus funestæ*.

EVERRICULUM, in *Surgery*, the name given by Paré to a sort of specillum or spoon, used to clear the bladder of gravel and grumes of blood left in it after the operation of lithotomy.

EVES-DROPPERS, in *Law*. See EAVES-*droppers*.

EUEXIA, from *ev*, *well*, and ἕξις, *habit*, in *Medicine*, a good sound habit of body.

EUGENIA, in *Botany*, the name given by Micheli and Linnæus to a genus of plants of the *icosandria monogynia* class, described in the Hortus Malabaricus. The characters are these: the perianthium consists of one leaf divided into four, oblong, obtuse, concave, and permanent segments. The flower is composed of four oblong and hollow obtuse petals twice as large as the segments of the cup; the stamina are a great number of slender filaments inserted in the cup, and reaching the length of the flower; the antheræ are small. The germen is of a turbinated form, and is placed below the cup. The style is simple, and of the length of the stamina; the stigma is simple; the fruit is a coronated drupe of a quadrangular figure, containing only one cell, in which is contained a large roundish and smooth nut.

EVICTION, from *evinco*, *I overcome*, in *Law*, signifies a RECOVERY of lands or tenements by law.

EVIDENCE, a quality in things whereby they become visible and apparent to the eyes, either of the body or the mind.

The schoolmen distinguish *evidence* into *formal* and *objective*.

EVIDENCE, *formal*, is the act of the intellect, considered as clear and distinct.

EVIDENCE, *objective*, consists in the clearness and perspicuity of the object; or it is the object itself so constituted as that it may be clearly and distinctly known.

Others divide *evidence* into *moral*, *physical*, and *metaphysical*. A thing is said to be *morally evident*, so far as we have a distinct notion or knowledge thereof, by unexceptionable witnesses; *physically*, so far as natural sense and reason, pointing out any thing, convinces us thereof; *metaphysically*, when we enter fully and clearly into the essence of any thing.

Evidence is the essential and infallible character or criterion of truth, and is that in effect which with us constitutes truth.

If *evidence* should be found in propositions that are false, we should be compelled into error, since the assent we give to *evidence* is necessary: whence would follow this impious position, that God who made us is the author of our errors, as he has constituted us so as to put us under a necessity of falling into them.

It may be added, that as we necessarily love truth and hate error, it seems inconsistent with the nature of a beneficent being to form us with a love of what we could not obtain, or not know whether we did obtain it or not; besides, that if we should err in things that are evident, as well as in those that are not so, we should sometimes find contradictions in *evident* propositions, as we commonly do in things that are obscure.

Evidence, therefore, must be allowed the mark of truth; and those things must be allowed true which carry with them such a degree of *evidence* as obliges us to assent to them. Whatever we see *evidently* agreeable to things whereof we speak, that we must acknowledge to be true.

The Epicureans allow of no other *evidence* but that of sense, or that arising from sense, it being a fundamental principle with them, that sense is the first and primary criterion of all truth.

By *evidence* of sense, they mean that species or image exhibited by the sense or phantasy; which, when all impediments to a just judging, as distance, motion, medium, &c. are removed, cannot be contradicted or gainsaid; wherefore, the question being put, whether or no a thing be such as it appears; the answer is not to be given, till it has been tried and examined in all the ways, and by all the senses, that it can be an object of. See ERROR.

There are certainly other superior and less fallible sources or grounds of *evidence* than sense: such is that inward consciousness by which we learn what belongs to the mind, or that which Mr. Locke calls reflection; of which such are intelligence, intuition, and common sense, principally relating to those abstracted, or other propositions that carry their own *evidence* with them, and admit no doubt about them; whence we derive our assent to propositions called axioms and maxims: such is also reasoning, whereby we infer one truth from others by natural and just methods of argument, whence results science: such is likewise the testimony of others, on which we found the *evidence* of FAITH; to which we may also add inspiration, or that impression made on the mind by God himself, which gives a convincing and indubitable *evidence* of the truth of any proposition, and attested to others either by prophecy or miracles. Watts's Logick, part ii. chap. ii. § 9.

By thus considering the various sources whence our perception and belief of any truth are derived, we may be led to distinguish *evidence* into INTUITIVE and DEDUCTIVE, and that founded on TESTIMONY. See Campbell's Phil. of Rhet. book i. chap. 5.

The *evidences* of the Christian religion are distinguished into two kinds, the direct and collateral: the direct *evidences* are external and internal; the external are MIRACLES and PROPHECY; the internal *evidence* is deduced from its excellence, considered in reference to the main and principal end of CHRISTIANITY. Whatever does not either belong to its excellence considered in this light, or fall under the head of miracles wrought on purpose to attest it, or of prophecies fulfilled, and yet affords a proof or any real presumption of its truth and divinity, is a collateral *evidence* for it. All the collateral evidences of the truth of Christianity are in one sense internal *evidences*, because they all arise from some particulars in the nature of this religion, from some circumstances which have attended its reception or sprung from it, or from some remarkable facts connected with it, and related in the Gospel history. Of this kind is the argument deduced from its great efficacy at its first appearance, in banishing polytheism, idolatry, superstition, and the arts of magic; in softening the rigour of despotism, introducing moderation into government, excluding many inconvenient civil laws once generally prevalent, giving rise to others of a very happy tendency, refining the laws of war, humanizing the manners and improving the customs of nations, and reforming the temper and conduct of those who embraced it.

Another class of collateral arguments for the truth of the Christian religion, arises from particulars in its nature or effects produced by it, or from facts in the Gospel history, which cannot be at all accounted for but on the supposition of a Divine original; or which are, at least, most naturally explicable on that supposition. To this class may be referred those presumptive arguments deduced from the character of Jesus, so exalted, and yet so uniformly supported; the nature of his last discourses with his disciples; the character of some of his apostles; that of Judas the traitor; the controversies among Christians in the Apostolic age; and the method used by Christ and his apostles, of referring their claims to the impartial inquiries of men. Other collateral arguments have an affinity to the external *evidences* of Christianity: such are those derived from the miraculous conversion of the apostle Paul and his subsequent conduct; from the character of the man of sin foretold by Paul; from the quick and extensive propagation of the Gospel; from the continuance and present state of the nation of the Jews. Some of these arguments have an immediate relation to the proof of Christianity from prophecies; others are related to the proof from miracles. Other arguments have an equal relation to the internal and external *evidence* of Christianity; such is that deduced from the manner in which Christ and his apostles proposed the *evidences* of their mission, and the advantage they have gained in consequence of the opposition and scrutiny of unbelievers. See on this subject Lord Lyttelton's Observations on the Conversion and Apostleship of St. Paul, Duchal's Presumptive Arguments for the Truth of the Christian Religion, and Gerard's Dissertation on the Genius and *Evidences* of Christianity.

EVIDENCE, in *Law*, is any proof, whether by testimony of men on oath, or by writings and records; the former called *parol evidence*, and the latter *written evidence*.

It is thus called because the point in issue is hereby made *evident* to the jury.

With regard to parol *evidence* or witnesses, we may observe in general, that a party interested in a suit, or a wife for or against her husband, a husband against his wife, except in cases of treason, an alien, infidel, persons *non sanæ memoriæ*, those that are attainted of conspiracy, or in a præmunire upon stat. 5 Eliz. cap. 1. Popish recusants convict on stat. 3 Jac. I. cap. 5. persons convicted of felony, perjury, &c. those who by judgment have stood on the pillory, or been whipped, whilst the judgment is in force, are disabled from giving *evidence*: but kinsmen, though ever so near, tenants, servants, masters, attornies for their clients, one of the jurors upon trial, and all others that are not infamous, who want not understanding, or are no parties in interest, may give *evidence* in a cause; though the credit of servants is left to the jury. If an action is brought against

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againſt many perſons for taking of goods, one of them may be admitted as an *evidence* againſt the reſt.

And in criminal caſes, as of robbery on the highway, in an action againſt the hundred, and rapes of women, &c. a man or woman may be an *evidence* in their own cauſe: ſo likewiſe in private notorious cheats, where none elſe can be witneſs of the circumſtances of the fact but he who ſuffers. When perſons that are competent witneſſes are ſerved with a writ of *ſubpœnâ ad teſtificandum*, they are bound to appear at the trial on pain of 100*l.* to be forfeited to the king, to which the ſtat. 5 Eliz. cap. 9. has added a penalty of 100*l.* to the party aggrieved, and damages equivalent to the loſs ſuſtained by want of their *evidence:* but no witneſs, unleſs his reaſonable expences be tendered him, is bound to appear at all; nor if he appears, is he bound to give *evidence* till ſuch charges are actually paid him, except he reſides within the bills of mortality, and is ſummoned to give *evidence* within the ſame.

One credible witneſs is ſufficient *evidence* to a jury of any ſingle fact in all civil actions; but in caſes of high treaſon, petit treaſon, and miſpriſion of treaſon, by ſtatutes 1 Edw. VI. cap. 12. 5, and 6. Edw. VI. cap. 11. and 1 and 2 Ph. and Mar. cap. 10. *two* lawful witneſſes are required to convict a priſoner, except in caſes of coining and counterfeiting the ſeals, or unleſs the party ſhall willingly and without violence confeſs the ſame: and by ſtat. 7 W. III. cap. 3. the confeſſion of the priſoner muſt be in open court; and both witneſſes muſt be to the ſame overt act of treaſon, or one to one overt act and the other to another overt act of the ſame ſpecies of treaſon. Baron Monteſquieu, indeed, lays it down for a rule, Spirit of Laws, book xii. cap. 3. that thoſe laws which condemn a man to death *in any caſe* on the depoſition of a ſingle witneſs, are fatal to liberty.

All *evidence* is to be given in open court, in the preſence of the parties, their attornies, the counſel, and all byſtanders, and before the judge and jury: many advantages attend this way of giving teſtimony, *ore tenus*, a method familiar among the ancient Romans, as may be collected from Quintilian, Inſt. Orat. lib. v. cap. 7. and it was continued as low as the time of Hadrian; but the civil law, as it is now modelled, rejects all public examination of witneſſes. Poſitive proof is always required whenever the nature of the caſe poſſibly admits of it.

Sometimes violent preſumption will be admitted for *evidence* without witneſſes; as where a perſon is run through the body in a houſe, and one is ſeen to come out of the houſe with a bloody ſword, &c but on this the court ought not to judge haſtily, 1 Inſt. 6. 673; and though preſumptive and CIRCUMSTANTIAL *evidence* may be ſufficient in felony, it is not ſo in treaſon. State Trials.

Though all preſumptive *evidence* of felony ſhould be admitted cautiouſly, for the law holds, that it is better that ten guilty perſons eſcape than that one innocent ſuffer.

Evidence by writings and records, is where acts of parliament, ſtatutes, judgments, fines and recoveries, proceedings of court, and deeds, &c. are admitted as *evidence.* The printed Statute Book is good *evidence* upon a general act of parliament, which need not be pleaded; but in the caſe of a private act, it is otherwiſe; for there it muſt be pleaded and examined by the records of parliament before it can be admitted in *evidence.* Records and enrolments prove themſelves; and a copy of a record ſworn to may be given as an *evidence.* A record of an inferior court has been rejected in *evidence*; and the proceedings in county-courts, courts baron, &c. may be denied, and then tried by a jury. A copy of copyhold lands ſhall be an *evidence* where the rolls are loſt. An ancient deed of thirty years ſtanding proves itſelf; but modern deeds, and other writings, muſt be atteſted and verified by parol *evidence* of witneſſes. The counterpart of a deed is no *evidence*, when the original is in being, and can be procured. Although a witneſs ſwear to the hand and contents of a letter, if he never ſaw the party write, it will not be good *evidence.* And a ſhop-book may not be given in *evidence* for goods ſold, &c. by 7 Jac. I. cap. 12. after one year, before the action brought, except there be a bill, &c. for the debt; unleſs between merchant and merchant in the uſual intercourſe of trade. In order to make books *evidences*, if the ſervant who was accuſtomed to make entries in it be dead, his hand muſt be proved; and this, when accompanied with other collateral proofs of fairneſs and regularity, is the beſt *evidence* that can then be produced. In debt, a releaſe may be given in *evidence*; ſo may any matters of fact, tampering with witneſſes or fraud. See Baron Gilbert's Treatiſe of *Evidence*, or the Introduction to the Law of *Niſi Prius*, 4to. 1767.

Sir Thomas Smith reſtrains *evidence* to authentic writings of contracts, written, ſealed, and delivered. De Rep. Angl. lib. ii.

EVIDENCE, *demurrer to.* See DEMURRER.

EVIDENCE, *exception to.* See EXCEPTION.

EVIL, *malum*, in *Ethics*, a privation or abſence of ſome proper or neceſſary good, or of ſome meaſure or degree thereof.

Evil is either *natural* or *moral*; between which there is this relation, that moral *evil* produces natural.

EVIL, *moral*, is defined a deviation from right reaſon; a diſcernment of right from wrong, being given us as a guide of our actions; or it is the diſagreement between the actions of a moral agent and the rule of thoſe actions, whenceſoever it is derived and howſoever made known; and no action can be morally evil unleſs the agent be properly ſuch, intelligent and free, and capable of diſtinguiſhing, chooſing, and acting for himſelf. This the philoſophers call *inhoneſtum*, and *turpe*, as ſtaining the image of God, and ſullying our original beauty, likewiſe *malum culpæ.*

EVIL, *natural*, is a want of ſomething neceſſary to the *bene eſſe*, or perfection of a thing, or to its anſwering all its purpoſes: ſuch are defects of the body, blindneſs, lameneſs, hunger, diſeaſes, death. This ſpecies is denominated *triſte*, *injucundum*, *noxium*, and *malum pœnæ.*

Again, *evil* is either *abſolute*, as envy, impiety, &c. or *relative*, as meat, which in itſelf being good, may be *evil* to a man on account of ſome diſeaſe; as wine to a feveriſh perſon, &c.

A late ingenious author ſets the thing in another light, and furniſhes a theory of moral good and *evil*, in his Enquiry into the Origin of our Ideas of Beauty and Virtue.

Moral evil, according to this philoſopher, denotes our idea of a quality apprehended in actions which excites averſion and diſlike towards the actor, even from perſons who receive no diſadvantage thereby; as moral goodneſs denotes our idea of a contrary quality which procures approbation and love towards the actor, even in perſons unconcerned in its natural tendency. This notion ſuppoſes an univerſally acknowledged difference of good and *evil* from natural. Moral good, we all know, procures love towards thoſe we apprehend poſſeſſed of it; whereas natural good does not. How differently, for inſtance, are we affected towards thoſe we ſuppoſe poſſeſſed of honeſty, faith, generoſity, &c. when we expect no benefit from thoſe qualities, and thoſe poſſeſſed of the natural goods, as houſes, lands, gardens, health, ſtrength, &c. So whatever quality we apprehend morally *evil*, raiſes our hatred towards the perſon in whom we obſerve it; as treachery, cruelty, ingratitude, &c. whereas we love and pity many expoſed to natural *evils*, as pain, hunger, ſickneſs, &c.

The origin of theſe different ideas of actions has greatly puzzled the moraliſts: ſome make ſelf-intereſt, or ſelf-love, the ſource of them all; we approve the virtue of others as it has ſome ſmall tendency to our happineſs, either from its own nature or from this general conſideration, that a conformity to nature and reaſon is in the general advantageous to the whole, and to us in particular; and on the contrary, diſapprove the vice of others, as tending at the long run to our particular detriment.

Others ſuppoſe an immediate *natural evil* in the actions called *vicious*; that is, that we are determined to perceive ſome deformity or diſpleaſure in ſuch actions, without reflecting on any diſadvantage that may any way redound to us from the action; and that we have a ſecret ſenſe of pleaſure accompanying ſuch of our own actions as are called *virtuous*, when we expect no farther advantage from them; but then they add, that we are excited to perform thoſe actions, even as we purſue or purchaſe pictures, ſtatues, landſcapes, &c. from ſelf-intereſt, to obtain the pleaſure which accompanies the action.

But the author juſt mentioned has ſhewn the miſtake: ſome actions, he proves, have to men an immediate goodneſs, and others an immediate *evil*, i. e. we perceive pleaſure in ſome and pain in others, and are determined to love or hate the doers, without any view of natural advantage, without any view to future rewards or puniſhments, or even without any intention to obtain the ſenſible pleaſure of the good, but from a very different principle, viz. an internal moral ſenſe, or a natural determination of the mind to receive amiable or diſagreeable ideas of actions, when they ſhall occur to our obſervation, antecedently to any opinion of advantage or loſs to redound to ourſelves from them, even as we are pleaſed with a regular form or an harmonious compoſition, without any knowledge of the mathematics, or ſeeing any advantage in that form or compoſition different from the immediate pleaſure. But according to this account of Dr. Hutcheſon, however plauſible, *moral good* and *evil* ſignify nothing in the objects themſelves, to which they are applied, any more than agreeable and harſh, ſweet and bitter, &c. but only certain effects in us;

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us; and virtue is a mere affair of taſte; whereas it is much more juſt to conclude, that right and wrong, or good and *evil*, are real qualities of actions, and not merely of our minds; and that the power whereby we perceive theſe qualities is not any arbitrary ſenſe but the underſtanding. Price's Original of our Ideas, &c. p. 13. and p. 59, &c. See farther under DEFORMITY, SENSE, GOOD, VIRTUE, and VICE.

EVIL, or *King's* EVIL, in *Medicine*, a diſeaſe by the phyſicians, called *ſtrumæ* and *ſcrophulæ*, conſiſting in ſchirrhous tumours, ariſing moſt commonly about the neck; but ſome alſo on the other glandulous parts, as the breaſt, arm-pits, groin, &c.

The kings of England and France have for a long time pretended to the privilege of curing the *king's-evil* by *touching*. The right or faculty, it is ſaid by ſome, was originally inherent in the French kings; and thoſe of England only claimed it as an appendage or appurtenant to that crown, to which they had a claim.

Stephen de Conti, a religious of Corbie, who lived in the year 1400, and wrote a Hiſtory of France, ſtill preſerved in MS. in the library of St. Germains des Prez, deſcribes the practice of *touching* for the *evil:* after the king had heard maſs a veſſel of water was brought him, and his majeſty having put up his prayers before the altar, *touched* the diſeaſed part with his hand, and waſhed it with water.

Matthew Paris will have St. Louis the firſt who practiſed it; others contend, that king Robert was the firſt who was gifted this way. It is certain, we find no mention of any ſuch prerogative before the kings of the eleventh century when that prince reigned. Fa. Daniel, Hiſt. de France, tom. i. p. 1032. Polydore Virgil endeavours to prove the ſame virtue in the kings of England. Favyn. Hiſt. de Navarre, 1062.

The author of a late treatiſe tells the following ſtory, which may, perhaps, in ſome degree, account for the miraculous cures ſuppoſed to have been performed by the royal touch. "An old man who was witneſs in a cauſe, had by his evidence fixed the time of a fact by Queen Anne having been at Oxford, and touched him whilſt a child, for the cure of the *evil*. When he had finiſhed his evidence, the relator had an opportunity of aſking him whether he was really cured. Upon which he anſwered with a ſignificant ſmile, that he believed himſelf never to have had a complaint that deſerved to be conſidered as the *evil*; but that his parents were poor, *and had no objection to the bit of gold.*" Obſerv. on the Statutes. 4to. Lond. 1776, p. 65. n.

The ſame virtue, we know not on what grounds, is commonly attributed to a ſeventh ſon, born without any daughter between; as alſo to the chiefs of certain particular families, particularly, to the eldeſt perſon of the houſe of Aumont in Burgundy.

The glands are the moſt remarkable ſeat of this diſtemper; and whenever the outward glands appear ſwelled, thoſe of the meſentery may be concluded to be ſo too, the meſentery being uſually the part firſt attacked by this malady.

The particulars to be conſidered in the prognoſtics, are, whether the tumours be many or few; in cluſters, or more diſtinct, great or ſmall, deep or ſuperficial, moveable or immoveable, benign or malignant, ſoft or hard; the ſituation, whether near great veſſels, joints, nerves, tendons, or bones; alſo the habit of the body, and age of the patient.

If the habit of body be tolerable, the patient young, the ſtrumæ recent, and but moderately hard, the reſolution and ſuppuration may be eaſily effected; but if they have been of long continuance, are hard, and lie deep among the veſſels, the cure becomes difficult; yet in both caſes it is promoted by accidental ferments, which often either reſolve or ſuppurate them. If the ſtrumæ be moveable, and free from remarkable veſſels, the extirpation is not difficult; but if the habit of body be bad, and the ſtrumæ immoveable, they are not to be meddled with: if they are moveable, and yet lie deep among the great veſſels, the extirpation is dangerous: beſides, in the beſt habits of body, new ſtrumæ are ready to riſe, while the old ones are extirpating.

Method of cure. In the cure three things are required: 1. A regimen of diet, and the other non-naturals. 2. Pharmacy, or internal preſcriptions. 3. The application of externals, either to diſcuſs, ſuppurate, or extirpate the glands.

With reſpect to regimen of diet, regard ought to be had to the conſtitution of the patient, whether it be hot or cold, dry or moiſt, old or young, robuſt or delicate. If the body be cold or moiſt, we generally ſuppoſe a ſurfeit preceded, and crudity to abound; in which caſe, abſtinence from meat and drink, or at leaſt great moderation is requiſite. Their diet ought to be moderately heating and drying, as mutton, kid, rabbit, pullet, chicken, partridge, pheaſant, and other poultry, roaſted, avoiding all aliments which yield groſs phlegmatic nouriſhment, ſuch as water-fowl, fiſh, eſpecially thoſe of ſtanding-waters, herbage, cheeſe; all ſmoaked, ſeaſoned, or dried meats. Their bread ought to be of wheat, well baked, and their drink medicated ale or beer. Wine is allowable, but water prohibited.

In hot and dry conſtitutions, tending to a hectic, diet of a more humid nature may be allowed; meat boiled with lettuce, ſpinnage, purſlain, wood-ſorrel, and the like; to ſome of theſe the eating of any fleſh is ſcarcely to be allowed, but rather a milk diet; though where milk is not found agreeable, medicated broths are to be preſcribed. Pork is by ſome prohibited to ſtrumous people. Air is a great help to the cure, which ought to be mild and gentle; in cold weather, heating and attenuating; and in the hot, cooling. Exerciſe ought to be enjoined, it being neceſſary to waſte ſuperfluities. Sleep in the day is forbidden, unleſs where the caſe is painful, to which it is an anodyne. The paſſions of the mind ought alſo to be moderated.

The internal preſcriptions muſt be qualified according to the habit of the body. If cold and phlegmatic, abounding with cold viſcous humours, the preſcriptions ought to be heating and attenuating; in plethoric conſtitutions, the ſtronger cathartics ought to be exhibited, or the milder often repeated. The purgatives are, the ſpecies hieræ with agaric, diaturbeth, pulvis cornachini, pillulæ cochiæ, e duobus, Rudii, de hermodactylis, aloc-phanginæ, imperiales, e ſuccino, trochiſci, alhandal, diagrydium, reſina jalapii, and mercurius dulcis, with all thoſe medicines preſcribed in the lues venerea.

Alteratives are alſo uſually taken on thoſe days in which the patient does not purge. Among theſe, a decoction of the woods claims a preference; to which are added one or other of the ſpecifics ſo called; ſuch as the roots of figwort, dropwort, devil's bit, ſoapwort, burdock, the bark of the walnut-tree; the herbs ragwort, crane's bill, herb Robert, the greater celadine, hound's tongue, white horehound, fox glove, and the like. In theſe decoctions it is very common alſo to put a lump of crude antimony of four ounces or half a pound weight, groſly powdered, and tied up in a rag; a ſpecimen of which is in Dr. Fuller's Decoctio Liberans, and his Decoctum Edulcorans; of diet, in his Cereiſiæ ad Scrophulas, and his Decoctum ad Scrophulas.

Such as are not able to be at the expence of theſe, or unwilling to be at the trouble of preparing them, which muſt be continued for a long time, may take a ſolution of quick-lime, one pound to a gallon of ſpring-water; which being decanted, two or three ounces of the ſhavings of ſaſſafras wood, with half an ounce or an ounce of liquorice wood, ſliced, may be ſteeped therein: theſe not only taking off the brackiſh taſte, and changing it for one more pleaſant, but communicating likewiſe a very agreeable colour and ſmell to the ſolution.

The *lapis ſpongiæ*, or *ſponge-ſtone*, with ſponge itſelf calcined, Dr. Turner ſays, he has often experienced to be ſucceſsful. James Med. Dict. See LANCARIM *ſpring*.

A courſe of bathing in ſalt-water in the warm ſeaſon, and drinking it in ſuch quantities as to keep the body gently open, have in ſome inſtances effected a cure. The patient may be bathed in freſh water where ſalt-water cannot be obtained, and his body kept open by any mild purgative. Next to cold bathing and drinking the ſalt-water, the uſe of the bark has been recommended; the cold bathing to be uſed in ſummer, and the bark in winter. The Moffat and Harrowgate waters uſed for a conſiderable time, are likewiſe very proper medicines for the ſcrophula. The extract of freſh juice of hemlock may alſo be adminiſtered with advantage. External applications are of little uſe. The beſt dreſſing for the ſores is yellow baſilicon, mixed with about a ſixth or eighth part of its weight of red precipitate of mercury, applied twice a day. Buchan's Dom. Med. p. 436, &c.

EVIL, *falling*, in *Horſes*. See FALLING-*evil*.

EVIL, *hungry*. See HUNGRY and BULIMY.

EULOGY, EULOGIA, in *Church Hiſtory*. When the Greeks have cut a loaf, or piece of bread, to conſecrate it, they break the reſt into little bits, and diſtribute it among the perſons who have not yet communicated, or ſend it to perſons that are abſent; and theſe pieces of bread are what they call *eulogies*.

The word is Greek, ευλογια, formed of ευ, *bene, well*, and λεγω, *dico, I ſay, ſpeak*; q. d. *benedictum, bleſſed*.

The Latin church has had ſomething like *eulogies* for a great many ages; and thence aroſe the uſe of their holy bread.

The name *eulogy* was likewiſe given to loaves or cakes brought to church by the faithful to have them bleſſed.

Laſtly, the uſe of the term paſſed hence to mere preſents made

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made a perſon, without any benediction. See the Jeſuit Gretſer, in his Treatiſe de Benedictionibus & Maledictionibus, lib. ii. cap. 22, 24, &c. where he treats of *eulogies* thoroughly.

From a paſſage in Bollandus, on the Life of S. Melaine, cap. 4. it appears, that *eulogies* were not only of bread, but any kind of meat bleſſed and hallowed for that purpoſe. Add, that almoſt every body bleſſed and diſtributed *eulogies*; not only biſhops and prieſts, but even hermits, though laymen, made a practice of it. Women alſo would ſometimes ſend *eulogies*.

The wine ſent as a preſent was alſo held an *eulogy*. Bollandus remarks farther, that the Euchariſt itſelf was alſo called *eulogy*.

EULOGY, likewiſe means an encomium on any perſon, on account of ſome virtue or good quality.

EUMARIDES, of ευμαρης, *eaſy*, among the *Ancients*, a kind of ſhoes common to men and women.

The *eumarides* were uſed for pomp and delicacy, being neat, and painted with various colours.

EUMECES, in the *Writings of the ancient Naturaliſts*, the name of a ſtone, which Pliny tells us reſembled a flint, and was found in Bactria; the ancients had an idle opinion, that, if laid under the head, it occaſioned true and prophetic dreams, foretelling to the perſon the more remarkable future events of his life. Hiſt. Nat. lib. xxxvii. cap. 10.

EUMENIDES, in *Antiquity*. See FURIES.

EUMENIDEIA, Ευμενιδεια, in *Antiquity*, an annual feſtival obſerved in honour of the Furies. It was otherwiſe called σεμνων εορτη, becauſe the Athenians called the Furies σεμναι θεαι, i. e. *venerable goddeſſes*.

EUMETRES *Beli*, in *Natural Hiſtory*, the name given by the ancients to a gem which the Aſſyrians held ſacred to their god, and which many other nations learned from them to ſuppoſe very powerful againſt magic. Many have ſuppoſed this to be the ſtone we now call oculus Beli; but this is an error, ſince Pliny, in his account of the *eumetres*, ſays, that it was of a very fine green. It was probably a gem of the emerald-kind, that ſtone having ever been in very high eſteem in the eaſtern part of the world, as it is alſo to this day.

EUMOLPIDES, in *Antiquity*, prieſts of Ceres, who had the power among the Athenians of initiating into the myſteries of this goddeſs, or excluding from them.

EUNOFIUS, a name given by ſome authors to the ætites or eagle-ſtone.

EUNOMIANS, a ſect denominated from Eunomius, biſhop of Cyzicus, who, in the fourth century maintained moſt of the errors of Arius, and added others to them.

He rebaptized ſuch as had already been baptized in the name of the Trinity: he had diſſembled his errors for ſome time; but having at length made a diſcovery, he was expelled his ſee.

The Arians endeavoured to have put him into that of Samoſata, but could not effect it; in lieu thereof the emperor Valens reſtored him to Cyzicus.

EUNOMIOEUPSYCHIANS, a ſect of heretics of the fourth century, mentioned by Nicephorus, lib. xii. cap. 30. being the ſame with thoſe called *Eutychians* by Sozomen, lib. vii. cap. 17. See EUTYCHIANS.

EUNUCH, Ευνουχος, a term applied in the general to all who have not the faculty of generating, either through imbecillity or frigidity; but more particularly to ſuch as have been caſtrated, or have loſt ſome of the parts neceſſary for that purpoſe.

The word is formed of ευνην εχει, q. d. *lecti curam habet*, *guardian*, or *keeper of the bed*.

In England, France, &c. *eunuchs* are never made but on occaſion of ſome diſeaſe which renders ſuch an operation neceſſary; but in Italy they make *eunuchs* for the ſake of preſerving the voice; and in the Eaſt they make *eunuchs* to be guards or attendants on their women.

Great numbers of children, from one to three years of age, are yearly caſtrated in Italy to ſupply the operas and theatres, not only of Italy but other parts of Europe with ſingers; though it is not one in three, that after having loſt their virility, have a good voice for a recompence. See CONSERVATORIOS.

Tavernier aſſures us, that in the kingdom of Boutan in the Eaſt Indies, there are every year made twenty thouſand *eunuchs*, and ſold thence into other countries.

The ſeraglios of the eaſtern emperors are chiefly ſerved and guarded by *eunuchs*; and yet we have very good teſtimonies, that the rich *eunuchs* in Perſia and other countries keep ſeraglios for their own uſe. This is a puniſhment of crimes in ſome countries. See ADULTERY.

By an arret of the grand chamber of Paris in 1665, it is adjudged that an *eunuch* could not marry, not even with the conſent of the woman, and all the parties on both ſides.

Claudian has a very ſevere ſatire againſt the *eunuch* Eutropius, who had been elected conſul of Rome. He repreſents him as an old woman; dreſſed up in the honours of the conſulate.

In the council of Nice thoſe were condemned, who, out of an indiſcreet zeal, and to guard themſelves from ſenſual pleaſures, ſhould make themſelves *eunuchs*. Such as thus mutilated their bodies were excluded from holy orders; witneſs Leontius, biſhop of Antioch, who was depoſed for having practiſed this cruelty on himſelf: and the biſhop of Alexandria excommunicated two monks who had followed his example, on pretence of ſecuring themſelves from the impetuous motions of concupiſcence.

Several of the emperors made very ſevere prohibitions againſt the making of *eunuchs*, or people's caſtrating themſelves. See CASTRATION.

EUNUCHS, EUNUCHI, is alſo the denomination of a ſect of heretics in the third century, who had the folly or madneſs to caſtrate not only thoſe of their own perſuaſion, but even all they could lay hands on.

They took their riſe from the example of Origen, who, upon a miſunderſtanding of our Saviour's words in St. Matthew, chap. xix. ver. 12. made himſelf an *eunuch*, by cutting off the offending part, as ſome ſay; or, as others (particularly St. Ephiphanius), by the uſe of certain medicines. Theſe heretics were alſo called VALESIANS.

EVOCATI, among the Romans, ſoldiers, who having ſerved their time in the army, went afterwards volunteers at the requeſt of ſome favourite general.

EVOCATION, *Evocatio*, among the Romans, a religious ceremony always obſerved by them at undertaking the ſiege of a town, wherein they ſolemnly called upon the gods and goddeſſes of the place to forſake it and come over to them. Without the performance of this ceremony, they either thought that the place could not be taken, or that it would be a ſacrilege to take the gods priſoners.

The form of *evocation* uſed at taking the city of Carthage is related by Macrob. Sat. III. 9.

They always took it for granted that their prayer was heard, and that the gods had deſerted the place and came over to them, provided they were able to make themſelves maſters of it.

EVOCATORIÆ *epiſtolæ*, among the Romans, letters ſent by the emperors to command the attendance of any perſon; or letters granting licence to any one to wait on the emperor; every perſon not being allowed this privilege till they had deſired and obtained the *evocatoriæ epiſtolæ*.

EVOLVENT, in *Geometry*, a term which ſome writers uſe for the curve reſulting from the evolution of a curve; in contradiſtinction to the *evolute*, which is the curve ſuppoſed to be opened or evolved.

The evolute always both touches and cuts the *evolvent* at the ſame time: the reaſon is, that it has two of its infinitely ſmall ſides in common with the *evolvent*; or, rather, exactly placed on two equal ſides thereof; one of them within-ſide that of the *evolvent*, i. e. on the concave ſide thereof; and the other on the convex ſide of its correſpondent ſide; ſo that the evolute touches the *evolvent* in two points; whence, inſtead of being a tangent, it is ſaid to oſculate the *evolvent*; and, hence, it is alſo called *oſculator*, and *circulus oſculator*.

There is one, and but one oſculator, to each point of the *evolvent*; but, to the ſame point, there are an infinity of other circles which only touch, and do not oſculate. The oſculator, and the evolute, make no angle in the place where they touch and cut; nor can any curve line be drawn between, as there may between a tangent and a curve.

EVOLUTE, EVOLUTA, in the *Higher Geometry*, a curve firſt propoſed by Mr. Huygens, and ſince much ſtudied by the later mathematicians.

The *evolute* is a curve, ſuppoſed to be evolved, or opened; and which, in opening, deſcribes other curves.

To conceive its origin and formation, ſuppoſe a flexible thread, wound exactly over the convexity of any curve, as ABCG (*Tab.* II. *Geometry*, *fig.* 34) and ſuppoſe the thread fixed in G, and every where elſe at liberty, to A. Now, beginning to unwind the thread from the point, and continuing it to D, and, throughout, keeping it tight on the curve ſurface ABCG, when the thread is become quite ſtrait, and is only a tangent, FG, to the curve in the point G, it is evident the extremity A, in its progreſs to F, has deſcribed another curve line ADEF.

Here, the firſt curve ABCG, is called the *evolute*; each of its tangents BD, CE, &c. comprehended between it, and the curve ADEF, called the *involute*, is called a *radius of the evolute*, or *radius oſculi*, *radius oſculator*, or radius of curvature, of the curve ADEF, in the reſpective points D, E, &c. And the circles, whereof the oſculators BD, CE, &c. are radii, are called *circuli oſculatores*

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tores of the curve ADEF, in D, E, &c. And, laſtly, the new curve reſulting from the evolution of the firſt curve begun in A, is called the *curve of evolution*, or *curve deſcribed by evolution*.

EVOLUTE, *the radius of the*, then, is the part of the thread compriſed between any point where it is a tangent to the *evolute*, and the correſpondent point where it terminates in the new curve. Which appellation, *radius*, is the more proper, as one may actually conſider this part of the thread, in every ſtep it takes, as if it deſcribed an arc of an infinitely ſmall circle, making a part of the new curve, which thus conſiſts of an infinite number of ſuch arcs, all deſcribed from different centers, and with different radii.

Every curve, therefore, may be conceived as formed by the evolution of another. And we are to find that, whoſe evolution formed it; which amounts to the finding of the radius of the *evolute* in any point; for, as it is always a tangent to the generating curve, it is, properly, no more than one of its infinitely ſmall parts, or ſides, prolonged; and all its ſides, whoſe poſitions are determined of courſe, are no other than the generating curve itſelf.

The ſame thread is alſo called *radius curvedinis*, or *radius oſculi*, becauſe a circle deſcribed hereby, from the center G, is ſaid to oſculate, or kiſs it, as both touching and cutting at the ſame time, i. e. touching both the inſide and the out.

Hence, 1. The *evolute* BCF (*fig.* 35.) is the place of all the centers of the circle that oſculate the curve AM, deſcribed by evolution. 2. When the point B falls on A, the radius of curvature, or radius of the *evolute*, MC, is equal to the arch BC; or to the aggregate of AB, and the arch BC. 3. Since the element of the arch M*m*, in the curve deſcribed by evolution, is an arch of a circle deſcribed by the radius CM; the radius of the *evolute* CM is perpendicular to the curve AM, or to a tangent at the point M. 4. Since the radius of the *evolute*, MC, is always a tangent to the *evolute* BCF, curves by evolution may be deſcribed through innumerable points, if only tangents be produced in the ſeveral points of the *evolute*, till they become equal to their correſpondent arcs.

The finding of the *radii of evolutes*, is a thing of great importance in the higher ſpeculations of geometry; and even, ſometimes, is of uſe in practice; as the inventor of the whole theory, Huygens, has ſhewn, in applying it to the pendulum. Horol. Oſcill. part 3. The doctrine of the *oſcula of evolutes* is owing to M. Leibnitz, who firſt ſhewed the uſe of *evolutes* in the meaſuring of curves.

We ſhall here ſubjoin a brief account of the method of finding the radius of the *evolute* in different kinds of curves and equations expreſſing the nature of *evolutes*:

1. To form a general expreſſion for (BE) the radius of the *evolute*, or of curvature at any point B in the involute curve ABY, whoſe axis is AX, and *evolute* DE. *Tab.* II. *Geometry*, *fig.* 36.

With the radius EB deſcribe the circular arc BK, which will have the ſame CURVATURE with the involute curve AB at the point B. Draw the radius EK parallel to the axis AX, and produce the ordinate BC to L, to which draw AN parallel: let the abſciſs AC be $=x$, the ordinate CB$=y$, radius EB or EK$=r$, KN$=a$, and NA $=b$; then LE$=r-a-x$. If the abſciſs x be ſuppoſed to increaſe uniformly, and B*m* to be a tangent at the point B; and *m n* be drawn parallel to BC, and B*n* parallel to AX; B*n*, *n m*, and *m*B, which are the contemporary increments of the abſciſs, ordinate, and curve, will be as their FLUXIONS reſpectively; or B*n* will be as $\dot{x}$, *n m* as $\dot{y}$, and B*m* $(=\overline{Bn^2+nm^2}^{\frac{1}{2}})$ as $\overline{\dot{x}^2+\dot{y}^2}^{\frac{1}{2}}$. Farther, the triangles B*n m* and BLE are ſimilar; therefore, B*n* : *n m* :: BL : LE, i. e. $\dot{x}:\dot{y}::y+b:r-a-x$; conſequently, $r\dot{x}-a\dot{x}-x\dot{x}=y\dot{y}+b\dot{y}$: the fluxion of which equation (ſuppoſing $\dot{x}$ invariable, and therefore, the direction of the curve AB continually approaching towards a parallelism with its axis, the fluxion of $\dot{y}$ as negative) is $-\dot{x}^2=\dot{y}^2-y\ddot{y}-b\ddot{y}$; and $\dot{x}^2+\dot{y}^2=b+y\times\ddot{y}$. Again, LB : BE :: *n*B : B*m*, i. e. $b+y:r::\dot{x}:\overline{\dot{x}^2+\dot{y}^2}^{\frac{1}{2}}$; therefore $b+y=\frac{r\dot{x}}{\overline{\dot{x}^2+\dot{y}^2}^{\frac{1}{2}}}$, and ſubſtituting this expreſſion for $b+y$, the above equation will become $\dot{x}^2+\dot{y}^2=\frac{r\dot{x}\ddot{y}}{\overline{\dot{x}^2+\dot{y}^2}^{\frac{1}{2}}}$; conſequently, $\overline{\dot{x}^2+\dot{y}^2}\times\overline{\dot{x}^2+\dot{y}^2}^{\frac{1}{2}}=r\dot{x}\ddot{y}$, i. e. $\overline{\dot{x}^2+\dot{y}^2}^{\frac{3}{2}}=r\dot{x}\ddot{y}$, and $\frac{\overline{\dot{x}^2+\dot{y}^2}^{\frac{3}{2}}}{\dot{x}\ddot{y}}=r=$BE. In deducing this expreſſion, the increment of the ordinate y, or the velocity or fluxion with which it flows is ſuppoſed continually to decreaſe, therefore its ſecond fluxion is negative: but when y increaſes with an accelerated motion, its ſecond fluxion will be affirmative; and the above expreſſion will be $\frac{\overline{\dot{x}^2+\dot{y}^2}^{\frac{3}{2}}}{-\dot{x}\ddot{y}}$. By ſubſtituting 1 for $\dot{x}$, which is invariable in theſe expreſſions, they will become $\frac{\overline{1+\dot{y}^2}^{\frac{3}{2}}}{\ddot{y}}$ and $\frac{\overline{1+\dot{y}^2}^{\frac{3}{2}}}{-\ddot{y}}$ reſpectively; the former taking place when the curve is concave, and the latter when it is convex towards the axis, and the ſign of $\ddot{y}$ ſhewing the poſition of the *evolute* and radius of curvature with reſpect to the curve and axis. By reducing theſe expreſſions from the nature and properties of the curve, and always ſubſtituting 1 for $\dot{x}$, we ſhall obtain the value of BE, or the radius required. The vertical diſtance or radius AD may be eaſily obtained by ſubſtituting for $\dot{x}$, 1 and for $\dot{y}$ its proper value in the expreſſion for the ſubnormal CH, which is evidently $\frac{y\dot{y}}{\dot{x}}$. E. gr. 1. To find the radius of curvature at any point B in the PARABOLA AY, *fig.* 37. Let the parameter be $=a$, abſciſs AC$=x$ and ordinate CB$=y$: then, by the nature of the curve $ax=y^2$, and therefore $a\dot{x}=2y\dot{y}$ (ſee FLUXION), and making $\dot{x}=1$, $a=2y\dot{y}$, and $\dot{y}=\frac{a}{2y}=\frac{a}{2\times\overline{ax}^{\frac{1}{2}}}$. But the fluxion of this equation will be $-\ddot{y}=\frac{-a^2}{4\times\overline{ax}^{\frac{3}{2}}}$, or $\ddot{y}=\frac{a^2}{4\times\overline{ax}^{\frac{3}{2}}}$, and $\dot{y}^2$ being equal to $\frac{a^2}{4ax}=\frac{a}{4x}$, we ſhall have, by ſubſtituting theſe values in the expreſſion $\frac{\overline{1+\dot{y}^2}^{\frac{3}{2}}}{\ddot{y}}$ for $\dot{y}^2$ and $\ddot{y}$, $\frac{\overline{1+\frac{a}{4x}}^{\frac{3}{2}}\times 4\cdot\overline{ax}^{\frac{3}{2}}}{a^2}=\frac{4}{a^2}\times\overline{\frac{4x+a}{4x}}^{\frac{3}{2}}\times\overline{ax}^{\frac{3}{2}}=\frac{4}{a^2}\times\overline{\frac{4ax^2+a^2x}{4x}}^{\frac{3}{2}}=\frac{4}{a^2}\times\overline{\frac{1}{4}}^{\frac{3}{2}}\times\overline{4ax+a^2}^{\frac{3}{2}}=\frac{4}{a^2}\times\frac{1}{8}\times\overline{4ax+a^2}^{\frac{3}{2}}=\frac{\overline{4ax+a^2}^{\frac{3}{2}}}{2a^2}$. Then if a ſemicircle be deſcribed through the point B, C*n* be biſected in H, and H*r* be made equal 2AC, and *r*E be a perpendicular at *r*, produced till it meets a line BE, drawn from B through H, this line BE will be the radius of curvature required: for $BC^2=AC\times Cn$ 35 E. 3. or $\frac{BC^2}{AC}=Cn$, i. e. $\frac{ax}{x}=a=Cn$, and $CH=\frac{1}{2}a$, and $Cr=\frac{1}{2}a+2x$; and by 47 E. 1. $\overline{CH^2+CB^2}^{\frac{1}{2}}=BH$, i. e. $\overline{\frac{1}{4}a^2+ax}^{\frac{1}{2}}=BH$; and by 4 E. 6. CH : HB :: Cr : BE; i. e. $\frac{1}{2}a:\overline{\frac{1}{4}a^2+ax}^{\frac{1}{2}}::\frac{1}{2}a+2x:\frac{a+4x}{a}\times\overline{\frac{1}{4}a^2+ax}^{\frac{1}{2}}=\frac{\overline{a^2+4ax}^{\frac{3}{2}}}{2a^2}=$BE as before. AD the vertical diſtance, or $\frac{y\dot{y}}{\dot{x}}$, is in this caſe, putting $\frac{a}{2y}$ for $\dot{y}$, and 1 for $\dot{x}$, equal to $\frac{a}{2}$; and this likewiſe appears, by conſidering, that in the expreſſion for the radius, when the radius becomes equal to the vertical diſtance, the abſciſs x vaniſhes, and it becomes $\frac{\overline{a^2}^{\frac{3}{2}}}{2a^2}=\frac{a^3}{2a^2}=\frac{a}{2}$.

E. gr. 2. To find the radius of curvature at any point B in the cycloid ABD. *fig.* 38.

Put the radius OF or OD $=a$, abſciſs AC $=x$, ordinate CB $=y$, ſine IG $=s$, and arc FG $=z$. Now, by 35 E. 3. $IG=\overline{DI\times IF}^{\frac{1}{2}}$, that is, $s=\overline{2ay-y^2}^{\frac{1}{2}}$; the fluxion of which equation is $\dot{s}=\frac{a\dot{y}-y\dot{y}}{\overline{2ay-y^2}^{\frac{1}{2}}}$; and by the nature of the cycloid, arc DG $=$ GB; and therefore, arc FG $=$ GI $+$ AC, or AC $=$ arc FG $-$ GI, that is, $x=z-s=$ (by ſubſtituting for s its above value,) $z-\overline{2ay-y^2}^{\frac{1}{2}}$; and the fluxion of this equation, making $\dot{x}=1$, is $1=\dot{z}+\frac{y\dot{y}-a\dot{y}}{\overline{2ay-y^2}^{\frac{1}{2}}}$.

But $\dot{z}=\overline{\dot{s}^2+\dot{y}^2}^{\frac{1}{2}}=$ (by writing for s its above value,) $\overline{\frac{a\dot{y}-y\dot{y}}{2ay-y^2}^2+\dot{y}^2}^{\frac{1}{2}}=\frac{a\dot{y}}{\overline{2ay-y^2}^{\frac{1}{2}}}$; which, ſubſtituted

for

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for $\dot{z}$, makes the above equation $1 = \frac{a\dot{y}}{2ay - y^2|^{\frac{1}{2}}} + \frac{y\dot{y} - a\dot{y}}{2ay - y^2|^{\frac{1}{2}}}$; that is, $1 = \frac{y\dot{y}}{2ay - y^2|^{\frac{1}{2}}}$; therefore, $\dot{y} = \frac{2ay - y^2|^{\frac{1}{2}}}{y}$; and the fluxion of this equation (the fluxion of $\dot{y}$ being negative,) is $-\ddot{y} = \frac{\frac{ay\dot{y} - y^2\dot{y}}{2ay - y^2|^{\frac{1}{2}}} - \dot{y} \cdot \overline{2ay - y^2|^{\frac{1}{2}}}}{y^2} = \frac{-a\dot{y}}{y \cdot \overline{2ay - y^2|^{\frac{1}{2}}}} =$ (by writing for $\dot{y}$ its equal,) $-\frac{a}{y^2}$; that is, $\ddot{y} = \frac{a}{y^2}$. Now, by substituting $\frac{2ay - y^2}{y^2}$ for $\dot{y}^2$, and $\frac{a}{y^2}$ for $\ddot{y}$, we have $\frac{\overline{1 + \dot{y}^2|^{\frac{1}{2}}}}{\ddot{y}} = \frac{\overline{1 + \frac{2ay - y^2}{y^2}|^{\frac{3}{2}}} \times y^2}{a} = \frac{\overline{2ay|^{\frac{3}{2}}}}{ay} = \frac{2ay \times \overline{2ay|^{\frac{1}{2}}}}{ay} = 2 \cdot \overline{2ay|^{\frac{1}{2}}} =$ BE, the radius of curvature required.

Construction. Make FH = GB; and through the point H draw the right line BE, making BH = HE = chord FG; then will BE be the radius of curvature at the point B; for a tangent to the point B is parallel to the chord DG, and the radius of curvature is always perpendicular to the tangent; therefore, because by 31 E. 3. the ∠ DGF is right, BE must be parallel to the chord FG. Now, by 4 and 8 E. 6. DF : FG :: GF : FI, or CB, ∴ $GF = \overline{DF \times CB|^{\frac{1}{2}}} = \overline{2a\dot{y}|^{\frac{1}{2}}}$, and 2 $GF = 2 \cdot \overline{2a\dot{y}|^{\frac{1}{2}}} =$ BE.

2. To form a general expression for the radius of curvature in SPIRALS, or curves whose ordinates are referred to a fixed or central point:

Let CBY, *fig.* 39. be the curve, C the central point, or that from which all the ordinates issue; and BE the radius of curvature at the point B, that is, let the point E be supposed in the *evolute* curve: conceive C*b* and E*b* indefinitely near to CB and EB, that is, let the points B and *b* be supposed indefinitely near to each other; and let CF and C*f* be perpendicular to EB and E*b* respectively, then will the points F and *r* be indefinitely near to a coincidence; and therefore B*r* and C*r* may be taken as equal to BF and CF. Now, if with the ordinate CB as a radius, the little circular arc B*n* be described and considered as a little right line perpendicular to C*b*, and the increment B*b* be considered as coinciding with a tangent to the point B, then the little right-angled triangle B*nb* will be similar to the right-angled triangle BFC; (for ∠ CB*n* = ∠ EB*b*; and therefore, ∠ EB*n* being common, the ∠ CBF = ∠ *n*B*b*; and consequently, the angles at F and *n* being right, ∠ BCF = ∠ B*bn*;) therefore, by 4 E. 6. *b*B : B*n* :: CB : BF; that is, (if we put the ordinate CB = *y*, B*n* = *x'*, and *nb* = *y'*, when by 47 E. 1. B*b* will be $= \overline{x'^2 + y'^2|^{\frac{1}{2}}}$,) $\overline{x'^2 + y'^2|^{\frac{1}{2}}} : x' :: y : \frac{x'y}{\overline{x'^2 + y'^2|^{\frac{1}{2}}}}$ = BF or B*r*; and B*b* : *bn* :: BC : CF, that is, $\overline{x'^2 + y'^2|^{\frac{1}{2}}} : y' :: y : \frac{yy'}{\overline{x'^2 + y'^2|^{\frac{1}{2}}}}$ = CF or C*r*; the increment of which is *rf*; that is, (supposing *x'* to be invariable) $\frac{\overline{y'^2 + yy''} \times \overline{x'^2 + y'^2|^{\frac{1}{2}}} - \frac{y'y'' \times yy'}{\overline{x'^2 + y'^2|^{\frac{1}{2}}}}}{x'^2 + y'^2} = \frac{x'^2y'^2 + y'^4 + yx'^2y''}{\overline{x'^2 + y'^2|^{\frac{3}{2}}}} = rf$. Again, the triangles EB*b* and E*rf* being similar, $B\dot{b} - rf : B\dot{b} :: (BE - rE$, or, $rB : BE$; that is, $\overline{(x'^2 + y'^2|^{\frac{1}{2}}} - \frac{x'^2y'^2 + y'^4 + yx'^2y''}{\overline{x'^2 + y'^2|^{\frac{3}{2}}}} =) \frac{x'^4 + x'^2y'^2 - yx'^2y''}{\overline{x'^2 + y'^2|^{\frac{3}{2}}}} : \overline{x'^2 + y'^2|^{\frac{1}{2}}} :: \frac{x'y}{\overline{x'^2 + y'^2|^{\frac{1}{2}}}} : \frac{\overline{y \times x'^2 + y'^2|^{\frac{3}{2}}}}{x'^3 + x'y'^2 - yx'y''}$ = BE, or $BE = \frac{y \times \overline{\dot{x}^2 + \dot{y}^2|^{\frac{3}{2}}}}{\dot{x}^3 + \dot{x}\dot{y}^2 - y\dot{x}\ddot{y}}$; which is a general expression for the radius of curvature of all curves referred to a fixed or central point, when *x'* or $\dot{x}$ is invariable.

Hence, if $\dot{x}$ be made = 1, the general expression for the radius of curvature will be $= \frac{y \times \overline{1 + \dot{y}^2|^{\frac{3}{2}}}}{1 + \dot{y}^2 - y\ddot{y}}$. Wherefore, if we put the equation of the given spiral into fluxions, making $\dot{x} = 1$, and put this fluxional equation into fluxions again; and from thence, or from the nature of the curve, find the values of $\dot{y}^2$ and $\ddot{y}$: then, if for $\dot{y}^2$ and $\ddot{y}$ we substitute these their values, in this general expression, we shall have BE the radius of curvature required.

E. g. To find the radius of curvature at any point B in the spiral of Archimedes, CB, &c. *fig.* 40.

Put the circumference of the generating circle AF, &c. = *a*, and its radius CA = *b*, ordinate CB = *y*, arc AF = *z*. Let C*f* be supposed indefinitely near to CF, that is, let the ∠ FC*f* be supposed indefinitely small; and with the ordinate CB as a radius describe the little circular arc B*n*, which put = *x'*; also put F*f* = *z'*. Now, by the nature of the curve, $a : b :: z : y$, or $z = \frac{ay}{b}$, the fluxion of which equation is $\dot{z} = \frac{a\dot{y}}{b}$; and by the similar sectors CB*n* and CF*f*, $y : x' :: b : z' = \frac{bx'}{y}$, or, $\dot{z} = \frac{b\dot{x}}{y}$. Hence, $\frac{a\dot{y}}{b} = \frac{b\dot{x}}{y}$; that is, (making $\dot{x} = 1$,) $\frac{a\dot{y}}{b} = \frac{b}{y}$; from which equation we have $\dot{y} = \frac{b^2}{ay}$; therefore, $\dot{y}^2 = \frac{b^4}{a^2y^2}$, and $\ddot{y} = \frac{-ab^2\dot{y}}{a^2y^2} =$ (by writing for $\dot{y}$ its value,) $\frac{-b^4}{a^2y^3}$; and if we substitute for $\dot{y}^2$ and $\ddot{y}$ these their values, we shall have $\frac{y \times \overline{1 + \dot{y}^2|^{\frac{3}{2}}}}{1 + \dot{y}^2 - y\ddot{y}} = \frac{y \times \overline{1 + \frac{b^4}{a^2y^2}|^{\frac{3}{2}}}}{1 + \frac{b^4}{a^2y^2} + \frac{b^4}{a^2y^2}} = \frac{\overline{a^2y^2 + b^4|^{\frac{3}{2}}}}{a^3y^2 + 2ab^4} =$ BE, the radius of curvature sought.

Construction. Through the center C draw the indefinite right line H*v* perpendicular to the ordinate CB; draw the tangent TB, perpendicular to which draw BH; produce BC to V, making BR = TH, and RV = CH; with BV and BR as radii, describe the arcs V*v* and R*r*; draw the right line *v*B; and from the intersecting point *r* draw *r*E parallel to *v*H; then will BE be the radius of curvature at the point B: for, $CT = \frac{y\dot{z}}{b}$, that is, by substituting $\frac{ay}{b}$, for *z*, $CT = \frac{ay^2}{b^2}$; and by 8 and 4 E. 6. TC : CB :: CB : CH, that is, $\frac{ay^2}{b^2} : y :: y : \frac{b^2}{a} =$ CH; therefore, $TH = BR = Br = \frac{ay^2}{b^2} + \frac{b^2}{a}$, and $BV = Bv = \frac{ay^2}{b^2} + \frac{2b^2}{a}$; and by 47 E. 1. $HB = \overline{BC^2 + CH^2|^{\frac{1}{2}}} = \overline{y^2 + \frac{b^4}{a^2}|^{\frac{1}{2}}} = \frac{\overline{a^2y^2 + b^4|^{\frac{1}{2}}}}{a}$: again, by 4 E. 6. B*v* : BH :: B*r* : BE, that is, $\frac{ay^2}{b^2} + \frac{2b^2}{a} : \frac{\overline{a^2y^2 + b^4|^{\frac{1}{2}}}}{a} :: \frac{ay^2}{b^2} + \frac{b^2}{a} : \frac{\overline{a^2y^2 + b^4|^{\frac{1}{2}}}}{a} \times \frac{a^2y^2 + b^4}{a^2y^2 + 2b^4} = \frac{\overline{a^2y^2 + b^4|^{\frac{1}{2}}}}{a^3y^2 + 2ab^4}$ = BE.

3. To find an equation that shall express the nature of the *evolute* of a given involute curve.

Let BE be the radius of evolution or curvature at any point B in the involute curve AB, *fig.* 41. whose abscis is AC = *x*, and ordinate CB = *y*. Parallel to HA draw EN; produce BC to L; and equal and parallel to CL, draw DN from the vertex of the *evolute* DE: then will the triangles BHC and BEL be similar; and therefore, by 4 E. 6. BH : HC :: BE : EL, that is, $\frac{y}{\dot{x}} \times \overline{\dot{x}^2 + \dot{y}^2|^{\frac{1}{2}}} : \frac{y\dot{y}}{\dot{x}} :: \frac{\overline{\dot{x}^2 + \dot{y}^2|^{\frac{3}{2}}}}{\dot{x}\ddot{y}} : \dot{y} \times \frac{\dot{x}^2 + \dot{y}^2}{\dot{x}\ddot{y}} =$ EL; and HC : CB :: EL : LB, that is, $\frac{y\dot{y}}{\dot{x}} : y :: \dot{y} + \frac{\dot{x}^2 + \dot{y}^2}{\dot{x}\ddot{y}} : \frac{\dot{x}^2 + \dot{y}^2}{\ddot{y}} =$ LB. Now, these are general expressions for EL and LB when $\dot{x}$ is considered as invariable, and the fluxion of $\dot{y}$ as negative. Hence therefore,

If $\dot{x} = 1$, and the fluxion of $\dot{y}$ be negative, the general expression for BL will be $= \frac{1 + \dot{y}^2}{\ddot{y}}$; and this multiplied

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plied by $\dot{y}$ is $\dot{y} \times \frac{1 + \dot{y}^2}{\ddot{y}}$ = the general expreſſion for LE. Now, by help of the equation of the given involute curve, exterminate $\dot{y}$, $\dot{y}^2$, and $\ddot{y}$, out of theſe expreſſions, and find the vertical diſtance AD. Then, if we put the abſciſs of the *evolute* DN = u, and its ordinate NE = v; by help of theſe two equations, u = BL − BC, and v = AC − AD + LE, we may get the nature of the *evolute* curve DE required.

Note. If the given involute be convex towards its axis, and x and y increaſe together, or the fluxions of x and $\dot{y}$ be both affirmative, then the general expreſſions for BL and LE will be $\frac{1 + \dot{y}^2}{-\ddot{y}}$, and $\dot{y} \times \frac{1 + \dot{y}^2}{-\ddot{y}}$ reſpectively; wherein the negative ſign ſhews, that the points L and E muſt be taken on the concave ſide of the involute curve, that is, on the other ſide of it with regard to x and y.

E. gr. To find the nature of the curve AEP, *fig.* 42. by whoſe evolution the cycloid ABD is deſcribed.

Put AC = x, CB = y, arc FG = z, and OD or OF = a; then by Ex. 2. art. 1. above $\dot{y} = \frac{\overline{2ay - y^2}^{\frac{1}{2}}}{y}$, $\dot{y}^2 = \frac{2ay - y^2}{y^2}$, and $\ddot{y} = \frac{a}{y^2}$; wherefore, BL = $\frac{1 + \dot{y}^2}{\ddot{y}} = \frac{1 + \frac{2ay - y^2}{y^2} \times y^2}{a} = 2y$, and LE = $\dot{y} \times$ BL = $\frac{\overline{2ay - y^2}^{\frac{1}{2}}}{y} \times 2y = 2.\overline{2ay - y^2}^{\frac{1}{2}}$. Hence, if we put the abſciſs AN = u, and ordinate NE = v, we have u (= BL − CB =) $2y - y = y$, and v = (AC + LE =) $x + 2.\overline{2ay - y^2}^{\frac{1}{2}}$, that is, (becauſe $x = z - \overline{2ay - y^2}^{\frac{1}{2}}$,) $v = z + \overline{2ay - y^2}^{\frac{1}{2}}$, or, (writing u for y its equal,) $v = z + \overline{2au - u^2}^{\frac{1}{2}}$. Wherefore, the *evolute* curve AEP is a cycloid, and equal to the given cycloid ABD; for, let AS = SV = a, then (AN being = FI,) AT = FG = z, and NT = $\overline{2au - u^2}^{\frac{1}{2}}$ = IG; and therefore, AT + TN = $z + \overline{2au - u^2}^{\frac{1}{2}}$, that is, AT + TN = NE, which is the property of the cycloid; therefore, the *evolute* AEP is a cycloid; and becauſe AV = FD, therefore the cycloids AEP and ABD are equal. See CYCLOID.

The *evolute* of a ſpiral, or indeed of any other curve, may be deſcribed by finding the radii of curvature at ſeveral points in the involute; for then we ſhall have as many points in the *evolute*, through which if a curve line be drawn, it will be the *evolute* ſought.

Wolf. Elem. Math. tom. i. p. 524, ſeq. or the Infinim Petites of M. le Marquis de l'Hôpital. Simpſon's Fluxions, vol. i. p. 71. &c. And Rowe's Fluxions, edit. 3. 1767, chap. vi and vii. p. 103—132.

Since the radius of an *evolute* is either equal to an arch of the *evolute*, or exceeds it by ſome given quantity, all the arches of *evolutes* may be rectified geometrically, whoſe radii may be exhibited by geometrical conſtructions; whence we ſee why an arch of a cycloid is double its chord; the radius of the *evolute* being double the ſame, and the *evolute* of a cycloid being itſelf a cycloid, equal and ſimilar to the involute.

M. Varignon has applied the doctrine of the radius of the *evolute* to that of central forces; ſo that having the radius of the *evolute* of any curve, one may find the value of the central force of a body; which, moving in that curve, is found in the ſame point where that radius terminates; or reciprocally, having the central force given, the radius of the *evolute* may be determined. Hiſt. de l'Acad. Roy. des Sciences, an. 1706.

The variation of curvature of the line deſcribed by the *evolution* of a curve, is meaſured by the ratio of the radius of curvature of the *evolute*, to the radius of curvature of the line deſcribed by the *evolution*. See Maclaurin's Flux. art. 402. prop. 36.

EVOLUTE, *imperfect*. M. Reaumur has given a new kind of *evolute*, under this denomination. Hitherto the mathematicians had only conſidered the perpendiculars let fall on the points of the convex ſide of the curve: if other lines not perpendicular were drawn upon the ſame points, provided they were all drawn under the ſame angle, the effect would be the ſame; that is, the oblique lines would all interſect within the curve; and, by their interſections, form the infinitely ſmall ſide of a new curve; whereof they would be ſo many tangents.

This curve would be a ſort of *evolute*, and would have its radii; but an imperfect *evolute*, ſince the radii are not perpendicular to the firſt curve. Hiſt. de l'Acad. &c. an. 1709.

EVOLUTION, in *Geometry*, the unfolding, or opening, of a curve, and making it deſcribe an EVOLVENT.

The word *evolutio* is formed of the prepoſition *e*, *out*; and *volvo*, *I roll*; or *wind*; q. d. an *unwinding*, or *unrolling*.

The equable *evolution* of the periphery of a circle, or other curve, is ſuch a gradual approach of the circumference to rectitude, as that its parts do all concur, and equally evolve, or unbend; ſo that the ſame line becomes ſucceſſively a leſs arc, of a reciprocally greater circle; till, at laſt, they change into a ſtrait line. In the Philoſophical Tranſactions, N° 260. a new quadratix to the circle is found by this means, being the curve deſcribed by the equable *evolution* of its periphery.

EVOLUTION, is alſo uſed for the EXTRACTION of roots out of powers.

In which ſenſe it ſtands oppoſed to *involution*.

EVOLUTION, in the *Art of War*, is a term applied to the diverſe figures, turns and motions, made by a body of ſoldiers, either in ranging themſelves in form of battle, or in changing their form; and this, whether in the way of exerciſe, or in the time of an actual engagement. It is by the *evolutions* that the form and poſture of a battalion, ſquadron, &c. are changed, either to make good the ground they are upon, or to poſſeſs themſelves of another, that they may attack the enemy or receive an onſet more advantageouſly.

The *military evolutions* are converſions, countermarches, or wheelings, doublings of rank or file, &c. See EXERCISE.

Fa. Hoſte, a Jeſuit, in 1697, printed a Treatiſe of *Naval Evolutions*, in folio. By *naval evolutions* he means the motions made by a fleet, ſquadron, or naval armament, in order to put themſelves in a proper diſpoſition for attacking the enemy, or defending themſelves with the moſt advantage.

EVOLVULUS, in *Botany*, a genus of the *pentandria tetragynia* claſs, having a five-leaved calyx, a rotated corolla divided into five ſegments, a three-leaved capſule, and a ſingle ſeed.

EUONYMOIDES, in *Botany*. See STAFF-*tree*.

EUONYMUS, in *Botany*. See SPINDLE-*tree*.

EUPATORIUM, in *Botany*. See *Hemp* AGRIMONY.

EUPETALOS, in *Natural Hiſtory*, the name of a gem deſcribed by the ancients as famous for its variety of colours. Pliny, lib. xxxvii. cap. 10. tells us, that it ſhewed at once blue, fire-colour, red-lead colour, and yellow. It ſeems to have been the opal, and that Pliny's deſcription of it in this place was taken from ſome author he did not perfectly underſtand, as is the caſe in many of his accounts from the Greeks.

EUPHEMISMUS, Ευφημισμος, of ευ, *well*, and φημι, *I ſpeak*, in *Rhetoric*, a figure which expreſſes things in themſelves diſagreeable and ſhocking, by terms implying the contrary quality; thus, the Pontus or Black Sea, having the epithet of ἄξενος (i. e. *inhoſpitable*) given it on account of the ſavage cruelty of thoſe who inhabited the neighbouring countries; this name, by *Euphemiſm*, was changed into that of *Euxinus*. Thus Ovid. Triſt. lib. iii. eleg. 13.

Dum me terrarum pars pene noviſſima Ponti
Euxinus falſo nomine dictus habet.

In which ſenſe it only makes a ſpecies of irony. But every *euphemiſm* is not irony; for we ſometimes uſe improper and ſoft terms in the ſame ſenſe with the proper and harſh. See Voſſ. Rhet. lib. iv. cap. 186, ſeq.

EUPHONIC *accent*. See ACCENT.

EUPHONY, Ευφωνια, in *Grammar*, an eaſineſs, ſmoothneſs, and elegancy of pronunciation.

The word is formed of ευ, *bene*, *well*, and φωνη, *vox*, *voice*. Quintillian calls *euphonia*, *vocalitas*; Scaglier, *facilis pronuntiatio*.

Euphonia is properly a kind of figure whereby we ſuppreſs a too harſh letter, or convert it into a ſmoother, contrary to the ordinary rules. There are examples enough in all languages.

EUPHORBIA, in *Botany*. See SPURGE.

EUPHORBIUM, Ευφορβιον, in *Pharmacy*, a gum brought from Africa, in little roundiſh pieces, whitiſh when new, and yellowiſh when old; very pungent to the taſte, and void of ſmell.

The principal uſe of *euphorbium* is external; it is a great ingredient in divers reſolutive plaſters as well as in tincture and powder for ſtopping of gangrenes, cleanſing of foul ulcers, and exfoliating carious bones.

Internally taken, it is a purgative; but ſo violent a one, that it is almoſt out of uſe, as tearing off the neceſſary mucus, or covering of the ſtomach or bowels, and occaſioning dyſenteries. Yet, we are told the Africans uſe

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it very commonly; but they firſt quench its fire in purſlain-water.

Its powder is a violent ſternutatory, and to be uſed very cautiouſly, and never alone, but mixed with a ſmall quantity of ſome other powder, to guard againſt its intolerable acrimony.

The gum we call *euphorbium* is formed of the juice of a plant of the ſame name, pretty frequent in Mauritania, though the ſpecies of the plant has been greatly controverted. The generality of our lateſt botaniſts make it a thorny, ſucculent plant; and Mr. Profeſſor Hermannus calls it the *tithymalus Mauritanus aphyllos anguloſus & ſpinoſus*. Hort. Acad. Lug. Batav. 598.

The plant is the *euphorbia aculeata nuda multangularis, aculeis ſeminatis* of Linnæus.

It has no leaves; but in lieu thereof puts forth along its ſtem a kind of long, prickly eyes, or buds; which buds yield that gummy juice, called *euphorbium officinarum*. See Bradl. Hiſt. of Succul. Plants, dec. ii. p. 4. and dec. v. p. 12.

Some authors will have it, that the gum is drawn from the plant by inciſion; others, on the contrary, ſay it ouſes ſpontaneouſly. The juice, we are told, is ſo very ſubtile and penetrating, that the perſon who taps the plant is forced to ſtand at a good diſtance, and make the inciſion with a long pike; otherwiſe it gets to the brain, and occaſions dangerous inflammations. It ouſes out in great abundance, and is gathered in ſheep's ſkin, wrapped round the plant.

Pliny tells us, that the firſt diſcovery of *euphorbium* is attributed to Juba king of Lybia, who denominated it from Euphorbus his phyſician, brother of Muſa, phyſician to Auguſtus. Etmuller aſſures us, that the plants which yielded the *euphorbium* of the ancients is now unknown to us; but if we follow Pliny's deſcription, the plant called *ſchadida calli*, in the Hortus Malabaricus, muſt be the ancient *euphorbium*. This diſcovery is owing to Commelinus, a burgo-maſter of Amſterdam, and profeſſor of botany.

EUPHORY, ſignifies the ſame as EUCRACY.

EUPHRASIA, in *Botany*. See EYE-BRIGHT.

EUPHROSYNUM, in *Botany*, a name uſed by Pliny and ſome others, for the common borage. See BORRAGE.

EUPNŒA, of ευ, *well*, and πνεω, *I breathe*, in *Medicine*, is a right and natural reſpiration.

EUPORIA, of ευ and πορος, *paſſage*, in *Medicine*, is an eaſy preparation of medicines, or the eaſineſs of their operation.

EUPSYCHIANS. See EUNOMIOEUPSYCHIANS.

EUREOS, in *Natural Hiſtory*, the name of a ſtone, deſcribed by Pliny, and ſeeming plainly to be the ſame with the tecolithus, which he mentions in another place, and to be the ſtone now called *lapis Judaicus*, and known at this time to be the petrified ſpine of a ſort of echinus marinus, or ſea urchin.

EURIPUS, Ευριπος, in *Hydrography*, properly ſignifies a certain ſtreight of the ſea between Bœotia and Eubœa, where the currents are ſo ſtrong, that the ſea is ſaid to ebb and flow ſeven times a day; in which place, as the ſtory commonly goes, Ariſtotle drowned himſelf out of chagrin, for not being able to account for ſo unuſual a motion.

EURIPUS has ſince become a general name for all ſtreights, where the water is in great motion and agitation.

The ancient circuſes had their *Euripi*, which were no other than pits or ditches, on each ſide of the courſe, into which it was very dangerous falling with their horſes and chariots as they ran races. The term *Euripus* was more particularly applied by the Romans to three canals or ditches which encompaſſed the circus on three ſides, and which were filled occaſionally, to repreſent naumachiæ or ſea-battles.

The ſame people called their ſmaller fountains or canals in their gardens *Euripuſes*; and their largeſt, as caſcades, &c. *Niles*.

EUROCLYDON, of Ευρος, *eaſt-wind*, and κλυδων, *wave*, is a ſpecies of wind, of which we have an account only in Acts xvii. 14. and concerning the nature of which critics have been much divided. Bochart, Grotius, Bentley, and others, ſubſtitute another reading, ſupported by the Alexandrian MS. and the Vulgate, viz. Ευραχυλων, or *Euroaquilo*; but Mr. Bryant defends the common reading, and conſiders the *Euroclydon*, i. e. Ευρος κλυζων, as an eaſt-wind that cauſes a deep ſea or vaſt inundation. He maintains, in oppoſition to Dr. Bentley's reaſoning, who ſuppoſes that the mariners in the ſhip, the voyage of which is recited in this paſſage, were Romans, that they were Greeks of Alexandria, and that the ſhip was an Alexandrine ſhip, employed in the traffic of carrying corn to Italy; and therefore, that the mariners had a name in their own language for the particular typhonic or ſtormy wind here mentioned. He alſo ſhews from the paſſage itſelf, that the tempeſtuous wind called *Euroclydon*, beat (κατ' αυτης) upon the iſland of Crete; and therefore, as this is a relative expreſſion, referring to the ſituation of the perſon who ſpeaks of it; who was at that time to the windward or ſouth of it, the wind blew upon ſhore, and muſt have come from the ſouth or ſouth-eaſt; which, he adds, is fully warranted from the point where the ſhip was, and the direction it ran in afterwards, which was towards the north and north-weſt. Bryant's Obſervations, &c. 1767, p. 1, &c.

EURO-*Auſter*.
EURO-*Notus*. } See WINDS.
EURUS.

EUROPEAN *Hours*. See HOUR.

EUROPEAN *Ocean*. See OCEAN.

EURYALE, in *Mythology*, one of the Gorgons, daughter of Phorcys, and ſiſter of Meduſa: ſhe was ſubject neither to old age nor death.

EURYDICE, in *Mythology*, the wife of Orpheus, who, flying from Ariſtæus that endeavoured to raviſh her, was ſlain by a ſerpent. Her huſband went down to the ſhades, and by the force of his muſic perſuaded Pluto and Proſperine to give him leave to carry back his wife; which they granted, provided he did not look on her till he came to the light; but he breaking the condition, was forced to leave her behind him.

EURYNOMIA, Ευρυνομεια, in *Antiquity*, an anniverſary ſolemnity in honour of Eurynome, by ſome thought to be the ſame with Diana, by others one of Oceanus's daughters.

EURYTHMY, Ευρυθμια, in *Architecture*, *Painting*, and *Sculpture*, a certain majeſty, elegance, and eaſineſs, appearing in the compoſition of divers members, or parts of a body, building, or painting, and reſulting from the fine proportions thereof.

The word is Greek, and ſignifies literally a *conſonance*, or *fine agreement*, or, as we may call it, a *harmony of all the parts*, being compounded of ευ, *well*, and ρυθμος, *rythmus*, *cadence*, or *agreement of numbers*, *ſounds*, or the like things.

Vitruvius ranks *eurythmia* among the eſſential parts of architecture: he deſcribes it as conſiſting in the beauty of the conſtruction or aſſemblage of the ſeveral parts of the work, which renders its aſpect or whole appearance graceful; e. gr. when the height correſponds to the breadth, and the breadth to the length, &c.

"From theſe three ideas or deſigns, viz. orthography, "ſcenography, and profile, it is that *eurythmy*, *majeſtica*, "and *venuſta ſpecies ædificii*, do reſult, which creates that "agreeable harmony between the ſeveral dimenſions, ſo "as nothing ſeems diſproportionate, too long for this, "or too broad for that, but correſponds in a juſt and "regular ſymmetry, and conſent of all the parts with "the whole." Evelyn's Account of Archit. &c.

EUSEBES, the name of a ſpecies of marble mentioned by Pliny: he has given us no deſcription of it, but only tells us, that there was a ſeat made of it in the temple of Hercules at Tyre, from which the prieſts pretended that the gods uſed to ariſe.

EUSEBIANS, a denomination given to the ſect of Arians, on account of the favour and countenance which Euſebius, biſhop of Cæſarea, ſhewed and procured for them at their firſt riſe. See ARIANS.

EUSTATHIANS, a name given to the Catholics of Antioch in the fourth century, on occaſion of their refuſal to acknowlege any other biſhop beſide St. Euſtathius, biſhop of Sebaſtia in Armenia, depoſed by the Arians.

The denomination was given them during the epiſcopate of Paulinus, whom the Arians ſubſtituted for St. Euſtathius, about the year 330, when they began to hold their aſſemblies apart. About the year 350, Leontius of Phrygia, called the Eunuch, who was an Arian, and was put in the ſee of Antioch, deſired the *Euſtathians* to perform their ſervice in his church; which they accepted; and the church of Antioch ſerved indifferently thus both for the Arians and Catholics.

This, we are told, gave occaſion to two inſtitutions, which have ſubſiſted in the church ever ſince: the firſt was pſalmody in two choirs; though Mr. Baillet thinks, that if they inſtituted an alternate pſalmody between two choirs, it was between two Catholic choirs, and not by way of reſponſe to an Arian choir. The ſecond was the doxology, *Glory be to the Father, and the Son, and the Holy Ghoſt*.

This conduct, which ſeemed to imply a kind of communion with the Arians, gave great offence to abundance of Catholics, who began to hold ſeparate meetings, and thus formed the ſchiſm of Antioch. Upon this the reſt, who continued to meet in the church, ceaſed to be called *Euſtathians*; and that appellation became reſtrained to the diſſenting-party.

St. Flavianus, biſhop of Antioch, in 381, and one of his ſucceſſors, Alexander, in 482, brought to paſs a coali-

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tion or re-union between the *Euſtathians* and the body of the church of Antioch, deſcribed with much ſolemnity by Theodoret, Eccl. lib. iii. cap. 2.

EUSTATHIANS were alſo a ſect of heretics in the fourth century, denominated from their founder Euſtathius, a monk ſo fooliſhly fond of his own profeſſion, that he condemned all other conditions of life. Whether this Euſtathius was the ſame with the biſhop of Sebaſtia and chief of the Semi-arians, is not eaſy to determine.

He excluded married people from ſalvation; prohibited his followers from praying in their houſes, and obliged them to quit all they had, as incompatible with the hopes of heaven.

He drew them out of the other aſſemblies of Chriſtians to hold ſecret ones with him, and made them wear a particular habit: he appointed them to faſt on Sundays; and taught them, that the ordinary faſts of the church were needleſs, after they had attained to a certain degree of purity which he pretended to. He ſhewed great horror for chapels built in honour of martyrs, and the aſſemblies held therein.

Several women, ſeduced by his reaſons, forſook their huſbands, and abundance of ſlaves deſerted their maſters houſes.

He was condemned at the council of Gangra, in Paphlagonia, held between the years 326 and 341. Socr. lib. ii. cap. 43. and Sozom. lib. iv. cap. 24. Hard. Concil. Coll. tom. i. p. 530.

EUSTYLE, formed of ευ, *bene, well*, and στυλος, *column*, in *Architecture*, a kind of edifice, where the columns are placed at a moſt convenient diſtance one from another, the intercolumniations being all juſt two diameters and a quarter of the column, except thoſe in the middle of the fronts, before and behind, which are three diameters diſtant. See *Tab. Archit. fig.* 40. C.

The *euſtyle* is a medium between the pycnoſtyle, and areoſtyle.

Vitruvius, lib. iii. cap. 2. obſerves, that the *euſtyle* is the moſt approved of all the manners of intercolumniation, and that it ſurpaſſes all the reſt in conveniency, beauty, and ſtrength.

EUTERPE, of ευ, *well*, and τερπω, *I delight*, in *Mythology*, one of the nine Muſes, which preſided over wind-inſtruments: ſhe is repreſented with a crown of flowers, playing on a double flute, with Cupid at her knees. To her the invention of tragedy is aſcribed.

EUTHYMIA, Ευθυμια, among the Greeks, ſignified ſuch a diſpoſition, or ſtate of the mind, as could not be ruffled either by good or bad fortune, by ſickneſs or health, good or evil. Mem. Acad. Inſcript. vol. xiv. p. 131.

EUTYCHIANS, ancient heretics, who denied the duplicity of natures in Chriſt; thus denominated from Eutyches, the archimandrite, or abbot of a monaſtery at Conſtantinople, who began to propagate his opinion A. D. 448.

The averſion Eutyches bore to the hereſy of Neſtorius, threw him into another extreme, not leſs dangerous than that he ſo warmly oppoſed; though ſome paſſages in St. Cyril, which raiſed the unity of the perſon of Jeſus Chriſt very high, contributed, likewiſe, to his deluſion.

At firſt he held, that the *Logos, Word*, brought his body down with him from heaven; which was a near approach to the hereſy of Apollinarius; and, though he afterwards teſtified the contrary, in a ſynod at Conſtantinople, wherein he was condemned, yet he could not be brought to acknowlege, that the body of Jeſus Chriſt was conſubſtantial with ours.

In effect, he did not ſeem quite ſteady and conſiſtent in his ſentiments; for he appeared to allow of two natures, even before the union; which was apparently a conſequence he drew from the principles of the Platonic philoſophy, which ſuppoſes a pre-exiſtence of ſouls; accordingly, he believed that the ſoul of Jeſus Chriſt had been united to the divinity before the incarnation; but then he allowed no diſtinction of natures in Jeſus Chriſt ſince his incarnation.

See the diſſertation of F. Hardouin, De Sacramento Altaris; wherein that Jeſuit endeavours to unfold all the ſentiments of the *Eutychians*.

This hereſy was firſt condemned in a ſynod held at Conſtantinople, by Flavian, in 448, approved by the council of Epheſus, called *Conventus latronum*, in 449, and re-examined, and fulminated, in the general council of Chalcedon, in 451. The legates of pope Leo, who aſſiſted at it, maintained, that it was not enough to define, that there were two natures in Jeſus Chriſt, but inſiſted ſtrenuouſly, that, to remove all equivocations, they muſt add theſe terms, *without being changed, or confounded, or divided.*

The hereſy of the *Eutychians*, which made a very great progreſs throughout the Eaſt, at length became divided into ſeveral branches. Nicephorus makes mention of no ſewer than twelve; ſome called *ſchematici*, or *apparentes*, as only attributing to Jeſus Chriſt, a phantom, or appearance of fleſh, and no real fleſh; others *Theodoſians*, from Theodoſius, biſhop of Alexandria; others *Jacobites*, from one James, *Jacobus*, of Syria; which branch eſtabliſhed itſelf principally in Armenia, where it ſtill ſubſiſts. Others were called *Acephali*, q. d. *without head*; and *Severians*, from a monk called Severus, who ſeized on the ſee of Antioch in 513.

Theſe laſt were ſubdivided into five factions, viz. *Agnoetæ*, who attributed ſome ignorance to Jeſus Chriſt; the followers of Paul; Μελαιται, that is, the *black Angelites*; thus called from the place where they were aſſembled; laſtly, *Adrites*, and *Cononites*.

EUTYCHIANS was alſo the name of another ſect, half Arian, half Eunomian; which aroſe at Conſtantinople, in the fourth century.

It being then a matter of mighty controverſy among the Eunomians at Conſtantinople, whether or no the Son of God knew the laſt day and hour of the world, particularly with regard to that paſſage in the goſpel of St. Matthew, chap. xxiv. ver. 36. or, rather, that in St. Mark, xiii. 32. where it is expreſſed, that *the Son did not know it, but the Father only*; Eutychius made no ſcruple to maintain, even in writing, that the Son did not know it; which ſentiment diſpleaſing the leaders of the Eunomian party, he ſeparated from them, and made a journey to Eunomius, who was then in exile.

That heretic acquieſced fully in Eutychius's doctrine, and admitted him to his communion; Eunomius dying ſoon after, the chief of the Eunomians at Conſtantinople refuſed to admit Eutychius; who, upon this, formed a particular ſect of ſuch as adhered to him, called *Eutychians*.

This ſame Eutychius, with one Theophronius, as was ſaid in Sozomen's time, were the occaſions of all the changes made by the Eunomians in the adminiſtration of baptiſm; which conſiſted, according to Nicephorus, in only uſing one immerſion, and not doing it in the name of the Trinity, but in memory of the death of Jeſus Chriſt.

Nicephorus calls the chief of that ſect, not Eutychius, but Eupſychius, and his followers Eunomioeupſychians.

EWAGE, *Exagium*, in our *Old Writers*, the ſame with *aquage*, which is toll paid for water-paſſage. It is derived from the French *eau, water*.

EWE, the Engliſh name for a female SHEEP.

EWRY, an office in the king's houſhold, where they take care of the linen for the king's table; lay the cloth, and ſerve up water in ſilver *ewers* after dinner; whence the office takes its name.

EXACERBATION, the ſame as PAROXYSM.

EXACHORD. See HEXACHORD.

EXACTION, in *Law*, a wrong done by an officer, or one pretending to have authority; in taking a reward, or fee, for that in which the law allows not of any.

The difference between *exaction* and extortion, conſiſts in this; that extortion is, where the officer takes more than his due; and *exaction*, where he wreſts a fee, or reward, where none is due.

EXACTIS, in *Natural Hiſtory*, a name given by Linkius, and ſome other authors, to a ſpecies of ſtar-fiſh, of the more branched kind, whoſe rays are ſix in number, when they firſt part from the body, but very ſoon branch out into a great number more. See STAR-*fiſh*.

EXACTOR *regis*, in *Law*, the king's exactor, or collector.

Sometimes it is taken for the ſheriff. But generally, *quicunque publicas pecunias, tributa, victigalia & res fiſco debitas exigit, proprie nominatur exactor regis.*

EXACUM, in *Botany*, a genus of the *tetrandria monogynia* claſs: the calyx has four leaves; the corolla is divided into four ſegments, and has a globoſe tube; the capſule is bilocular, marked with two furrows, opens at the top, and contains many ſeeds.

EXAGON. See HEXAGON.

EXÆRESIS, Εξαιρεσις, of εξαιρεω, *I take off*, in *Surgery*, an operation, whereby ſomething foreign, uſeleſs, and even pernicious, is taken from the human body.

The *exæreſis* is performed two ways; by extraction, when ſomething formed in the body is drawn out of the ſame; and by detraction, when ſomething is taken away, that had been introduced into the body, from without. See LITHOTOMY, &c.

EXAGGERATION, in *Rhetoric*, a figure, whereby we enlarge, or heighten things; making them appear more than they really are, whether as to goodneſs, badneſs, or other qualities.

The word is formed of the Latin *exaggero, I exaggerate*; which is a compound of *ex*, and *agger*, a *mound*, or *elevation of earth*. See HYPERBOLE.

EXAGGERATION, in *Painting*, is a method of repreſenting things, wherein they are loaded too much, or marked too

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too ſtrongly; whether in reſpect of the deſign, or the colouring, or the poſition of the object.

Exaggerating differs from caricaturing; in that the latter perverts, or gives a turn to the features, &c. of a face, which they had not; whereas the former only improves, or heightens, what they had.

The latter is a kind of burleſque on the object, and is generally meant to ridicule: the former is uſually an exalting or enlivening of the beauties of the object, beyond what nature allows. The painter is obliged to have recourſe to an *exaggeration* of colours, both on account of the ſurface of his ground, the diſtance of his work, and of time, and the air, which diminiſh and weaken the force of the colours; but this *exaggeration* muſt be conducted in ſuch manner, as not to put the objects out of their natural characters.

EXALTATION, *Elevation*, is chiefly uſed in a figurative ſenſe, for the raiſing or advancing a perſon to ſome eccleſiaſtical dignity; and, particularly, to the papacy.

The term *exaltation* is, in ſome meaſure, appropriated to the pope; and expreſſes his INAUGURATION, coronation, taking poſſeſſion, and the beginning of his pontificate.

EXALTATION *of the Croſs*, EXALTATIO CRUCIS, is a feaſt of the Romiſh church, held on the fourteenth of September; in memory, as is generally ſuppoſed, of this, that the emperor Heraclius brought back the true croſs of Jeſus Chriſt on his ſhoulders, to the place on mount Calvary, from which it had been carried away fourteen years before, by Coſroes, king of Perſia, at his taking of Jeruſalem, under the reign of the emperor Phocas. See CROSS.

The croſs was delivered up by a treaty of peace made with Siroe, Coſroes' ſon. The inſtitution of this treaty is commonly ſaid to have been ſignalized by a miracle; in that Heraclius could not ſtir out of Jeruſalem with the croſs, while he had the imperial veſtments on, enriched with gold, and precious ſtones; but bore it, with eaſe, in a common dreſs.

But, long before the empire of Heraclius, there had been a feaſt of the ſame denomination obſerved both in the Greek and Latin churches, on occaſion of what our Saviour ſaid in St. John xii. 32. *And I, if I be* exalted, *or lifted up, will draw all men unto me.* And again, in ch. viii. ver. 28. *When ye have* exalted, *or lifted up, the Son of man, then ſhall ye know that I am he.* F. Du Soulier aſſures us, that M. Chaſtelain was of opinion, this feaſt had been inſtituted, at leaſt at Jeruſalem, two hundred and forty years before Heraclius.

The feaſt of the dedication of the temple built by Conſtantine was held, ſays Nicephorus, on the fourteenth of September, the day on which the temple had been conſecrated, in the year 335; and this feaſt was alſo called the *exaltation of the croſs*, becauſe it was a ceremony therein, for the biſhop of Jeruſalem to aſcend a high place, built by Conſtantine for that purpoſe, in manner of a pulpit, called by the Greeks, the *ſacred myſteries of God*, or *the holineſs of God*, and there hoiſt up the croſs, for all the people to ſee it.

EXALTATION, in *Phyſics*, denotes the act, or operation, of elevating, purifying, ſubtilizing, or perfecting, any natural body, its principles and parts; alſo the quality, or diſpoſition, which bodies acquire by ſuch operation.

The term *exaltation* has been peculiarly affected by the chemiſts and alchemiſts; who, imagining it to have ſome extraordinary emphaſis, are employing it on every occaſion.

EXALTATION, in *Aſtrology*, is a dignity which a planet acquires in certain ſigns, or parts, of the zodiac; which dignity is ſuppoſed to give it an extraordinary virtue, efficacy, and influence. The oppoſite ſign, or part of the zodiac, is called the dejection of the planet.

Thus, the 15th degree of Cancer, is the *exaltation* of Jupiter, according to Albumazar, becauſe it was the aſcendant of that planet at the time of the creation; that of the ſun is in the 19th degree of Aries; and its dejection in Libra; that of the moon is in Taurus, &c. Ptolemy gives the reaſon of this in his firſt book De Quadrup.

EXAMEN, or EXAMINATION, an exact and careful ſearch, or inquiry, in order to diſcover the truth, or falſhood, of a thing.

Self-EXAMINATION is a point much inſiſted on by divines, and particularly the ancient fathers, by way of preparation to repentance. St. Ignatius reduces it to five points; viz. 1. A returning of thanks to God for his benefits. 2. A begging of grace and light, to know and diſtinguiſh our ſins. 3. A running over all our actions, occupations, thoughts, and words, in order to learn what has been offenſive to God. 4. A begging of pardon, and conceiving a ſincere ſorrow for having diſpleaſed him. And, 5. Making a firm reſolution not to offend him any more; and taking the neceſſary precautions to preſerve ourſelves from it.

EXAMILION, &c. See HEXAMILION, &c.

EXAMINERS, in *Chancery*, are two officers, whoſe buſineſs is to *examine*, on oath, the witneſſes produced on both ſides, upon ſuch interrogatories as the parties to the ſuit do exhibit for the purpoſe.

EXAMPLE, in *Rhetoric*, denotes an imperfect kind of induction, or argumentation; whereby it is proved, that a thing which has happened on ſome other occaſion, will happen again, on the preſent one, from the ſimilitude of the caſes.

EXANNUAL *Roll*. In the old way of exhibiting ſheriff's accounts, the illeviable fines and deſperate debts were tranſcribed into a roll, under this name; which was yearly read, to ſee what might be gotten by it.

EXANTHEMA, formed of ἐξανθέω, *I flower*, in *Medicine*, a preternatural eruption, or effloreſcence, on the ſkin.

Exanthemata are of two kinds; the one only a diſcolouring of the ſkin; ſuch are the meaſles, the purple ſpots in malignant fevers, &c. The other are little eminences, or papillæ, ſtanding out from the ſkin; ſuch are puſtules, ſmall-pox, &c.

EXARCH, Ἔξαρχος, in *Antiquity*, an appellation given, by the emperors of the Eaſt, to certain officers ſent into Italy, in quality of vicars, or rather prefects, to defend that part of Italy which was yet under their obedience; particularly the city of Ravenna, againſt the Lombards, who had made themſelves maſters of the greateſt part of the reſt.

The reſidence of the *exarch* was at Ravenna; which city, with that of Rome, were all that was left the emperors.

The firſt *exarch* was the patrician Boetius, famous for his treatiſe, De Conſolatione Philoſophiæ; appointed in 568, by the younger Juſtin. The *exarchs* ſubſiſted about a hundred and eighty-five years, and ended in Eutychius; under whoſe *exarchate* the city of Ravenna was taken by the Lombard king Aſtulphus, or Aſtolphus.

F. Papebroch, in his Propylæum ad Acta Sanct. Maii, has a diſſertation on the power and office of the *exarch* of Italy, in the election and ordination of the pope.

The emperor Frederic created Heraclius, archbiſhop of Lyons; a deſcendant of the illuſtrious houſe of Montboiſſier, *exarch* of the whole kingdom of Burgundy; a dignity, till that time unknown any where but in Italy, particularly in the city of Ravenna. Meneſtrier. Hiſt. de Lyons.

Homer, Philo, and other ancient authors, give, likewiſe, the name *exarchus* to the choragus, or maſter of the ſingers, in the ancient choruſes, or him who ſung firſt: the word ἀρχω, or ἀρχομαι, ſignifying equally *to begin*, and *to command*.

EXARCH *of a dioceſe* was, anciently, the ſame with *primate*. This dignity was inferior to the patriarchal, yet greater than the metropolitan.

EXARCH alſo denotes an officer, ſtill ſubſiſting in the Greek church; being a kind of deputy, or legate *a latere* of the patriarch, whoſe office it is to viſit the provinces allotted him, in order to inform himſelf of the lives and manners of the clergy; take cognizance of eccleſiaſtical cauſes; the manner of celebrating divine ſervice; the adminiſtration of the ſacraments, particularly confeſſion; the obſervance of the canons; monaſtic diſcipline; affairs of marriages, divorces, &c. but, above all, to take an account of the ſeveral revenues which the patriarch receives from ſeveral churches; and, particularly, as to what regards the collecting the ſame.

The *exarch*, after having greatly enriched himſelf in his poſt, frequently riſes to the patriarchate itſelf.

EXARCH is alſo uſed, in the *Eaſtern Church Antiquity*, for a general, or ſuperior over ſeveral monaſteries; the ſame that we otherwiſe call archimandrite; being exempted, by the patriarch of Conſtantinople, from the juriſdiction of the biſhops; as are now the generals of the Romiſh monaſtic orders.

In 493, Sebas was eſtabliſhed *exarch*, or chief, of all the anchorets within the territory of Jeruſalem. Du Bois.

EXARTICULATION, a DISLOCATION of ſome of the jointed bones; or a breach of articulation. See LUXATION.

EXAUCTORATIO, among the Romans, differed from *miſſio*, or a diſcharge. In the latter, the ſoldiers were quite diſmiſſed from the ſervice; and this was done after they had ſerved twenty years; but in the former caſe, they only loſt their pay, being ſtill kept under their colours or *vexilla*, though not under the eagle, *aquila*, which was the ſtandard of the legion. Whence, inſtead of *legionarii*, they were called *ſubſignani*, and were ſtill retained till they had either ſerved out their time, or had lands aſſigned them. The *exauctoratio* commonly took place after they had ſerved ſeventeen years.

EXCALCEATION, *ex*, *off*, and *calcus*, *ſhoe*, *diſcalceation*, or the act of putting off the ſhoes.

Among the Hebrews there was a particular law, whereby a wi-

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a widow, whom her husband's brother refused to marry, had a right to summon him into a court of justice; and, upon his refusal, might *excalceate* him, i. e. pull off one of his shoes, and spit in his face; which were both actions of great ignominy among that people.

The house of the person who had undergone them, was, thenceforward, called the house of the *excalceated*.

EXCAMBIATOR. See ESCAMBIO, and EXCHANGE.

EXCAVATION, formed of *ex*, and *cavus*, *hollow*, or *cave*, a *pit*, &c. the act of hollowing, or digging a cavity, particularly in the ground.

The *excavation* of the FOUNDATIONS of a building, by the Italians called *cavatione*, is settled, by Palladio, at a sixth part of the height of the whole building; unless there be cellars under-ground, in which case he would have it somewhat more.

EXCELLENCY, a quality, or title of honour, given to embassadors, and other persons, who are not qualified for that of highness, as not being princes; and yet are to be elevated above the other inferior dignities.

In England, and France, the title is now peculiar to embassadors; but it is very common in Germany and Italy. Those to whom it was first appropriated were the princes of the blood, of the several royal houses; but they quitted it for that of highness, upon several great lords assuming *excellency*.

The embassadors have only borne it since the year 1593, when Henry IV. of France, sent the duke de Nevers embassador to the pope, where he was first complimented with *excellency*. After that, the same appellation was given to all the other embassadors residing at that court; from whence the practice spread through the other courts.

The embassadors of Venice have only had it since the year 1636, when the emperor and king of Spain consented to allow it them.

The embassadors of the crowned heads dispute the giving that title to the embassadors from the princes of Italy; where the practice is not established.

The court of Rome never allows the quality of *excellency* to any embassador who is a churchman, as judging it a secular title. The common rules and measures of *excellency* are a little variable, with respect to the court of Rome. The embassadors of France, at Rome, anciently gave the title of *excellency* to all the relations of the pope then reigning; to the constable Colonna; to the duke de Bracciano, and the eldest sons of all those lords; as also the dukes Savelli, Cesarini, &c. But they are now more reserved in this respect; though they still honour all the Roman princesses with *excellency*.

The court of Rome, in their turn, and the Roman princes, bestow the same title on the chancellor, ministers, and secretaries of state, and presidents of the sovereign courts of France; the presidents of the councils in Spain; the chancellor of Poland; and those of the first dignities of other states, if they be not ecclesiastics.

The word *excellency* was, anciently, a title of kings and emperors; accordingly Anastasius the library-keeper calls Charlemagne his *excellency*. The same title is still given to the senate of Venice; where, after saluting the doge under the title of *sereniſſimo*, the senators are addressed under those of your *excellencies*. The Liber. Diurnis Pontif. Rom. gives the title *excellency* to the exarchs and patricians.

The Italians and French have improved on simple *excellency*; and made *excellentiſſimo*, and *excellentiſſime*; which have been bestowed on certain popes, kings, &c.

EXCELSIS. See GLORIA *in excelſis*.

EXCENTRIC, in *Geometry*, is applied where two circles, or spheres, though contained, in some measure, within each other, yet have not the same center; and, consequently, are not parallel; in opposition to *concentric*, where they are parallel, having one and the same common center.

The sun's orbit is *excentric*, with regard to the globe of our earth: Mars is very *excentric*, with regard to the sun; that is, his motion is about a very different center.

EXCENTRIC, in the *New Astronomy*, or *excentric circle*, is a circle; as PDAE (*Tab. Astronom. fig.* 1.) described from the center of the orbit of the planet C, with half the axis CE, as a radius.

EXCENTRIC, or *excentric circle*, in the ancient Ptolemaic *Astronomy*, was the very orbit of the planet itself, which it was supposed to describe about the earth, and which was conceived *excentric* thereto; called also the DEFERENT.

In lieu of *excentric circles* round the earth, the moderns make the planets describe elliptic orbits round the sun; which accounts for all the irregularities of their motions, and their different distances from the earth, &c. more justly and naturally.

EXCENTRIC, *anomaly of the*, is an arch of the *excentric circle*; as AK, intercepted between the aphelion A, and the right line KL, which, passing through the center of the planet K, is drawn perpendicularly to the line of the apsides AP.

EXCENTRIC *equation*, in the *Old Astronomy*, is an angle made by a line drawn from the center of the earth, with another drawn from the center of the *excentric*, to the body, or place, of any planet; the same with the prosthaphæresis, and equal to the difference (accounted in an arch of the ecliptic) between the sun's, or a planet's, real, and apparent place. See EQUATION *of the center*.

EXCENTRIC *place of a planet*, in its orbit, is the PLACE wherein the planet is seen from the sun.

EXCENTRIC *place*, in the ecliptic, is the point of the ecliptic to which the planet, viewed from the sun, is referred. This coincides with the heliocentric place.

EXCENTRICITY, the distance between the centers of two circles, or spheres, which have not the same center.

EXCENTRICITY, in the *Old Astronomy*, is the distance of the center of the orbit of a planet from the center of the earth.

That the five planets have such an *excentricity*, is allowed on all sides, and may be evinced from several considerations; chiefly this, that Saturn, Jupiter, Mars, Venus, and Mercury, at sometimes appear larger, and at others less; which can only proceed from hence, that their orbits being *excentric* to the earth, in some parts thereof they are nearer us, and in others more remote: but as to the *excentricities* of the sun and moon, some dispute has been made.

Many of the moderns hold, that the sun and moon appear sometimes larger, and sometimes less; not that they are nearer us at one time than another, but because they are viewed through different columns of air, which, producing a difference in the refraction of their light, may occasion those different appearances. Accordingly, we find very sudden alterations of the apparent magnitude of the moon, where nothing but a change in the air can take place.

Thus Kepler, on the 2d of March, in the year 1588, found the moon's apparent diameter 31 minutes, presently after 32′ 2″, then 30′ 3″; and the preceding day it had been 33′. And again, on the 22d of February, 1591, he observed the moon's diameter twice 31′, six times 32′, seven times 33′, and six times 34′.

They add, that when the sun and moon are in the southern signs, and consequently lower, being then seen through a longer column of dense air, they must appear bigger; consequently, in the winter-time, when the sun is in Capricorn, being seen through a greater quantity of air, he must appear larger than in summer, when, being nearer our zenith, the quantity of air he is seen through is lesser. And the like may be said of the moon.

But others take the *excentricities* of the sun and moon to be sufficiently proved, from eclipses; from the moon's greater and less parallax, at the same distance from the zenith; and from the sun's being observed to continue longer in the northern hemisphere than in the southern; viz. 186 or 187 days in the first, and only 178 or 179 days in the latter.

If we suppose the mean distance of every planet from the sun to be divided into 1000 equal parts, the *excentricities* of their orbits, both in such parts, and in English miles, will be as follow: Mercury's 210 parts, or 7,730,000 miles; Venus's 7 parts, or 482,000 miles; the earth's 17 parts, or 1,618,000 miles; Mars's 93 parts, or 13,486,000 miles; Jupiter's 48 parts, or 23,760,000 miles; Saturn's 55 parts, or 49,940,000 miles.

EXCENTRICITY, in the *New Astronomy*, is the distance of the center of the orbit of a planet, as C, from the center of the sun S, i. e. the distance between the center of the ellipsis and the focus thereof; called also *simple* or *single excentricity*.

If the greatest EQUATION *of the center* be given, the *excentricity* of the earth's orbit may be found by the following proportion: as the diameter of a circle in degrees is to the diameter in equal parts, so is the greatest equation of the center in degrees to the *excentricity* in equal parts: thus circumference 3.1415926 : 1 its diameter :: 360° : 114°,591599, the diameter in degrees; and if the greatest equation of the center be 1°55′33″ = 1°,9268166, &c. we shall have 114°.591599 : 1.00, &c. :: 1,9268166 : 0,168061, the *excentricity*.

Hence 1,016806 (= 1,000000 + 0,016806) = the aphelion distance:

And 0,983194 (= 1,000000 − 0,016806) = the perihelion distance. Robertson's Elem. of Navig. book v. p. 286.

EXCENTRICITY, *double*, is the distance between the two foci in the ellipsis; which is equal to twice the *single excentricity*.

To find the *excentricity* of the sun: since the sun's greatest apparent semidiameter is to his least, as 32′ 43″ to 31′ 38″,

or

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or as 1963″ to 1898″; the ſun's greateſt diſtance from the earth will be to his leaſt as 1963 to 1898. Since then PS+SA = PA = 3861 (*Tab. Aſtron. fig.* 1.); the radius of the *excentric* CP will be found 1930; and conſequently SC = PC − PS = 32. Wherefore CP being 10000, CS will be found = 165,8.

Hence, as the earth's *excentricity* SC is ſo ſmall a part of the radius of the *excentric* CP, the earth's elliptic orbit does not deviate much from a circular one; ſo that it is no wonder a calculus, made on the ſuppoſition of an *excentric* circle, ſhould anſwer near enough to obſervation.

EXCEPTION, ſomething reſerved, or ſet aſide, and not included in a rule.

It is become proverbial, that there is no rule without an *exception*; intimating, that it is impoſſible to comprehend all the particular caſes under one and the ſame maxim. But it is dangerous following the *exception* preferably to the rule.

EXCEPTION, in *Law*, is a ſtop or ſtay to an action.

The term is uſed indifferently both in the civil and common law; and in each, *exceptions* are divided into *dilatory* and *peremptory*.

In law proceedings, *exception* is a denial of a matter alleged in bar to the action; and in chancery it is that which is alleged againſt the ſufficiency of an anſwer, &c. *Exception*, in a general ſenſe, includes all the kinds of defence, or vindication, which a perſon, againſt whom a proceſs is brought, makes uſe of to prevent or retard its effect.

The civilians reckon three kinds of *exceptions*; viz. *declinatory*, whereby the authority of the judge, or court, is diſallowed; *dilatory*, intended to defer, or prevent the thing from coming to an iſſue; and *peremptory*, which are proper and pertinent allegations, founded on ſome preſcription that ſtands for the defendant; as want of age, or other quality, in the party; or other matter, that may be decided without entering into a full diſcuſſion of the merits of the cauſe.

EXCEPTION *to evidence*, in *Law*, is where a demurrer is offered in any civil cauſe, on account of the inſufficiency of the evidence given, and the court does not agree to it; in which caſe the court or judge are required to ſeal a *bill of exceptions*, by ſtat. Weſtm. 2. 13. Edw. I. cap. 31. which is in the nature of an appeal, examinable in the next immediate ſuperior court, upon a writ of error, after judgment given in the court below. See DEMURRER.

EXCEPTION *in deeds and writings*, is the ſaving of a particular thing out of a general one granted by deed, as a room, ſhop, or cellar, out of a houſe; a field, or timber trees out of land, &c. *Exceptions* of this kind muſt not croſs the grant, nor be repugnant to it, or elſe they are void of courſe; yet there may be a kind of *exception*, or ſaving out of an *exception*, ſo as to make a thing as if never excepted; as where a leaſe is made of a rectory, excepting the parſonage houſe, ſaving to the leſſee a chamber, this ſhall paſs by the leaſe.

EXCEPTIVE *conjunctions*. See CONJUNCTION.

EXCEPTIVE *propoſitions*, are thoſe wherein ſomething is affirmed of a whole ſubject, abating ſome one of the parts thereof, which is *excepted* by a particle, thence called an *exceptive* particle, or particle of *exception*.

Thus, "All the ſects of the ancient philoſophers, except the Platoniſts, held God to be corporeal. Covetouſneſs is inexcuſable in reſpect of every thing, but time."

EXCESS is diſtinguiſhed into *natural* and *moral*: the *firſt*, is a part whereby one quantity is greater than another.—Thus, we ſay, this line is longer than that; but the *exceſs* is inconſiderable.

The *latter*, is an intemperance, or going beyond the juſt bounds and meaſures preſcribed for any thing. Thus, we ſay, *exceſs* in wine, women, &c. is prejudicial to the health.

EXCHANGE, in *Arithmetic*, is the reduction of different coins, or any denominations of money, whether there be real coins anſwering to them, or no, from one to another; or the method of finding how many of one ſpecies, or denomination, are equal in value to a given number of another; in order to which it is neceſſary to know the value of the coins and monies of account of different countries, and their proportion to each other, according to the ſettled rate of *exchange*. See COIN. The ſeveral operations in this caſe are only different applications of the RULE *of three*.

Ex. 1. England *exchanges* with France on the crown or *ecu* of three livres Tournois, allowing a certain number of pence ſterling, more or leſs, according to the rate of *exchange*, for this crown. Accounts are kept in France in livres, ſols, and deniers. See COIN. Suppoſe then that a remittance is made from Paris to London of 1006 livres 14 ſols, at 29*d.* ſterling *exchange*, what is the amount in pounds, &c.? Divide the livres, ſols, and deniers by 3, in order to reduce them into French crowns; then multiply the crowns by 29, the number of pence in a crown, and take the aliquot parts for the fractional parts, according to the ſubdenominations of the integers, or reduce them into decimals, and reduce the pence into ſhillings and pounds, as below:

Divide by 3. 1006 . 14

Cr. 335 . 11.4

Mult. by 8. 29

3015
670
14½
1½
½

12|9732

20|811

40*l.* 11*s.*

When ſterling money is to be reduced into French *exchange* crowns, reduce the ſum given, and price of *exchange*, into the ſame denomination, and divide the former by the latter; and the crowns may be reduced to livres by multiplying the quotient by 3. The rate of *exchange* may be had by dividing the number of pence ſterling by the number of French crowns, &c. in the given ſum.

Ex. 2. England exchanges with Holland, Antwerp, and Hamburgh, at ſo many ſchellings or ſcalins and groots Flemiſh per pound ſterling. See *Dutch* COINS.

If London draws on, or remits to Amſterdam 852*l.* 12*s.* 6*d.* ſterling, at 34 *ſc.* 4½ *gr.* Flemiſh per £. ſterling, how many guilders, ſtivers, and pennings, muſt be paid or received in bank money in Amſterdam? i. e. if 1*l.* ſterling gives 34 *ſc.* 4½ *gr.* what will 852*l.* 12*s.* 6*d.* give? Reduce the price of *exchange* to ½ groots, which, multiplied by the pounds ſterling, gives the half groots contained in that ſum; and, for the 12*s.* 6*d.* take 10*s.* as the half of 825, and 2*s.* 6*d.* as the fourth of that quotient; add the whole together, and the ſum total is the number of half Flemiſh groots contained in the ſterling money; which, being divided by 80, the half groots in a guilder gives the anſwer in guilders; and the remaining half groots muſt be reduced to ſtivers and pennings. The operation is as follows:

£.	s.	d.		Sc.	gr.
852	12	6	at	34	4½
825				12	
4260				412	
1704				2	
6816			half gr.	825	= 1*l.* ſterling.

10*s.* = 412½
2*s.* 6*d.* = 103⅛

8 | 0) 70341 | 5⅝

8792 guilders, 55 half groots ⅝. But 55 half groots are = 27½ groots = 13 ſtivers 12 pennings and ⅝ of the half groot = 2½ pennings; therefore the whole ſum will be 8792 guilders 13 ſtivers 14½ pennings bank money.

This example may be eaſily reverſed, by reducing the Dutch money, and price of *exchange*, into one denomination, and dividing the ſum by the price; the quotient will give the anſwer in pounds ſterling.

Ex. 3. England *exchanges* with Spain upon the piaſtre, or dollar of 8 rials, for an uncertain number of pence ſterling. See *Spaniſh* COINS.

Suppoſe Cadiz remits to London 3537 dollars, 6 rials, at 40⅞ per dollar, what will this remittance amount to in England? Multiply the dollars by 40⅞; take the half of 40⅞ for 4 rials, and the fourth for 2 rials; add the whole, which will give the ſum in pence: thus,

3537 : 6
40⅞

141480
30947/8
20 1/2
10 3/4

12 | 1446052½

2|0(1205|0.5½

602*l.* 10*s.* 5*d.*½ ſterling.

Ex. 4. England *exchanges* with Portugal on the milreis, and gives pence, more or leſs, for it. See *Portugueſe* COINS.

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Suppoſe that Liſbon, or Oporto, remits to London 4366 milreas, 183 reas, at 5*s.* 5*d.* $\frac{5}{8}$ *exchange*, how much ſterling muſt be paid in London for this remittance? The milrea, containing 1000 reas, theſe may be conſidered as decimals; then 5*s.* being $\frac{1}{4}$ of a pound, 5*d.* $\frac{1}{12}$ of 5*s.* and $\frac{5}{8}$ the $\frac{1}{8}$ of 5*d.* divide accordingly, and ſum up the whole; then reduce decimals of a pound into ſhillings, &c. The operation is as follows:

		4366,183
5*s.* = $\frac{1}{4}$	-	1091,54575
5*d.* = $\frac{1}{12}$	-	90,962145, &c.
$\frac{5}{8}$ = $\frac{1}{8}$	-	11,370265, &c.
		*£.*1193,87815, &c.
		20
		17,563
		12
		6,756
		4
		3,024

The anſwer is 1193*l.* 17*s.* 6*d.* $\frac{3}{4}$ ſterling.

The foregoing examples illuſtrate the general method of ſettling the *exchange* between England and any other countries to which its commerce extends. But as conſiderable advantages may often be made by arbitrating the *exchanges* between different countries with accuracy, the following examples will explain the method of doing this in all common caſes.

Ex. 5. Suppoſe London *exchanges* on Amſterdam at 35—2$\frac{1}{2}$.
And on Paris at 32 $\frac{1}{8}$.
What is the proportional arbitrated price between Amſterdam and Paris?

1 Paris crown = 32$\frac{1}{8}$*d.* London.
240*d.* London = 422$\frac{1}{2}$ groots Amſterdam = 35×12+2$\frac{1}{2}$. See COINS.

Then if 240*d.* gives 422$\frac{1}{2}$ groots, what will 32$\frac{1}{8}$*d.* give? But as the multiplication and diviſion of quantities, partly integral and partly fractional, requires a knowlege of vulgar and decimal fractions, which ſome men of buſineſs are not poſſeſſed of, there are methods which may be recurred to in practice, that will obviate ſuch difficulties. It is well known, that if equal quantities are multiplied and divided by equal quantities, the numbers reſulting from ſuch operations will bear the ſame proportion to each other with the numbers firſt given.

Thus, in the preceding example, $\frac{422\frac{1}{2}\ gr. \times 32\frac{1}{8}d.}{240d.} =$

$\frac{2\times422\frac{1}{2}\times32\frac{1}{8}\times8}{2\times240\times8} = \frac{845\times257}{240\times2\times8} = \frac{\frac{845}{5}\times257}{\frac{240}{5}\times2\times8} = \frac{169\times257}{48\times2\times8}$

= 56 grots Amſterdam $\frac{425}{768}$.

Ex. 6. Let Paris *exchange* on London at 32$\frac{1}{8}$.
On Amſterdam at $56\frac{425}{768}$.
What is the proportional arbitrated price between London and Amſterdam?

1*l.* ſterling = 240*d.*
32$\frac{1}{8}$*d.* = $56\frac{425}{768}$ groots.

32$\frac{1}{8}$*d.* : $56\frac{425}{768}$ :: 240 : $\frac{240\times56\frac{425}{768}}{32\frac{1}{8}}$ = (multiplying numerator and denominator by 768 and 8) $\frac{240\times8\times43433}{257\times768}$

= (dividing both by 8 and 48) $\frac{43433\times5}{257\times2}$ = 422$\frac{1}{2}$ groots = 35—2$\frac{1}{2}$.

Ex. 7. Let Amſterdam *exchange* on Paris at $56\frac{425}{768}$.
On London at 35—2$\frac{1}{2}$.
What is the proportional arbitrated price between London and Paris?

1 Paris crown = $56\frac{425}{768}$ groots.
422$\frac{1}{2}$ groots = 240*d.* ſterling.

422$\frac{1}{2}$ *gr.* : 240*d.* :: $56\frac{425}{768}$ *gr.* $\frac{240\times56\frac{425}{768}}{422\frac{1}{2}} =$

$\frac{\frac{240}{5}\times56\frac{425}{768}\times768\times2}{\frac{422\frac{1}{2}\times2}{5}\times768} = \frac{96\times43433}{169\times768} = \frac{\frac{96}{96}\times43433}{169\times\frac{768}{96}} =$

$\frac{43433}{169\times8}$ = 32$\frac{1}{8}$*d.* ſterling.

Ex. 8. Suppoſe that 100*l.* ſterling is circulated from London to Amſterdam at the price of *exchange* in the preceding examples, viz. at 35—2$\frac{1}{2}$, how many guilders of Holland will this ſum produce? 100*l.* ſterling, at 422$\frac{1}{2}$ groots Amſt. per *£.* ſterling, will produce 1056—10 guilders of Amſterdam, by Ex. 2. Theſe 1056—10 guilders, circulated from Amſterdam to Paris, will produce at the arbitrated price of *exchange*, viz. $56\frac{425}{768}$ groots per French crown, 747 crowns—1—7$\frac{1}{2}$ of France; and theſe crowns drawn home to London, at the above *exchange* of 32$\frac{1}{8}$*d.* ſterling, per French crown, will produce the ſame 100*l.* ſterling. Whence it follows, that if the real price of *exchange*, at the time when theſe computations are made, is more or leſs between Amſterdam and Paris than the exact arbitrated price, in example 5, you may draw home more or leſs than your 100*l.* ſterling.

In all tranſactions of this kind, the ſkilful merchant will watch the occaſion to buy bills of *exchange* when they are cheapeſt, in order to diſpoſe of them at ſuch places, where, at the ſame time, they are deareſt. See next article.

EXCHANGE, *Permutation*, in *Commerce*, an agreement, whereby one thing is trucked, or given for another.

The firſt commerce carried on among men, was by *exchange*; people furniſhing each other mutually with what things they wanted; but ſuch *exchanges* were clogged with two conſiderable difficulties. 1. On account of the unequal values of commodities; and, 2. Becauſe every body had not juſt what might accommodate the perſon with whom he would *exchange*.

To remove theſe inconveniencies, money was invented for a common medium; and inſtead of *exchanging*, buying and ſelling were introduced.

Yet there are nations among whom the primitive way of *exchange* ſtill obtains; and even among the moſt civilized people, there are frequent occaſions, in which they have recourſe to this method. Such, for inſtance, is the trade of ſeveral cities of the North, and Baltic Sea, where the French *exchange* their wines and brandies for woods, metals, hemps, and furs.

The commerce of bills of *exchange* is, itſelf, a mere trading by *exchange*; a truck of money for money.

Exchange, therefore, properly denotes the buſineſs, or trade of money, as carried on between one place and another, by means of bills of *exchange*, i. e. by giving money in one city, and receiving a bill to intitle the giver to receive the value in another city. See BILL *of Exchange*.

There is alſo another ſpecies called *dry exchange*, *cambium ſiccum*, or *uſurer's exchange*, which conſiſts in giving money at one place, to be repaid it, after a certain time, in the ſame place, with a certain ſum over, which is uſually more than common intereſt.

The ceremony of a real *exchange* is obſerved in this fictitious kind, which is only a method of borrowing money. The borrower draws a bill of *exchange* on any imaginary perſon, perhaps at Amſterdam, at the price the *exchange* then goes at, and delivers it to the lender. After the time affixed comes a proteſt from Amſterdam for non-payment, with the *re-exchange* of the money from thence to London; all which, with coſts, beſides a deduction perhaps at the making of the bargain, the borrower muſt pay.

EXCHANGE is alſo uſed for the profit which a merchant, negociant, or broker, makes of a ſum of money received, and for which a bill of *exchange* is drawn, payable in ſome other place, and by ſome other perſon, for the intereſt of his money, or the ſalary and reward of his negociation. This profit is exceedingly various; being ſometimes 2, ſometimes 3, 4, or even 10 and 15 per cent. according as the alloy of the ſpecies differs, or as money is more or leſs plentiful, or bills of *exchange* more or leſs ſcarce, in the places. This kind is ordinarily called *real exchange*, and ſometimes *mercantile* and *mixed exchange*.

The price of *exchange* is regulated according to the courſe of the place where the bill is drawn, or that of the place where the remittance is to be made: ſome pretend that it is the city of Lyons gives the law, or rule, for the price of *exchange*, to moſt of the other cities of Europe.

The word *exchange*, according to ſome, is derived from that perpetual alteration obſerved in the price of this *exchange*, which is ſometimes higher, and ſometimes lower; there being ſometimes ſomewhat to get, and ſometimes to loſe, thereby; and ſometimes nothing to be either got or loſt; as is the caſe when the *exchange* is at par.

From this diverſity in the price of *exchange*, ariſes that common proverb, *The* exchange, *and the wind, are often varying*. But the more natural way of deriving the word *exchange* is from this, that a man here *exchanges* his money for a bill; or that he changes preſent money for abſent money; or changes his debtor.

Exchange is not to be looked on as a loan, from which it differs; becauſe in the one, the riſque, or danger, lies on the perſon who borrows; and in the other, on him who lends. It likewiſe differs from intereſt, becauſe *exchange* is not paid in proportion to the time, as INTEREST is.

EXCHANGE is alſo uſed in diverſe places for the profit allowed for exchanging one ſort, or ſpecies, of money for another.

This is particularly called *ſmall exchange*, *natural exchange*, *pure exchange*, &c.

Ex-

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EXCHANGE is ſometimes alſo uſed for the AGIO, or profit allowed for the monies advanced in any one's behalf.

Exchange is a fixing the actual and momentary value of money. Silver as a metal has a value like all other merchandiſe; and an additional value, as it is capable of becoming the ſign of other merchandiſe. If it was no more than a mere merchandiſe, it would perhaps loſe much of its nominal value. As a money, ſilver has a value which the prince in ſome reſpects can fix, but in others he cannot.

The prince eſtabliſhes a proportion between a quantity of ſilver, as metal, and the ſame quantity, as money. He fixes the proportion between the ſeveral metals made uſe of as money; he eſtabliſhes the weight and ſtandard of every piece of money; in fine, he gives to every piece that ideal value already ſpoken of. We ſhall call the value of money in theſe four reſpects, its poſitive value, becauſe it may be fixed by law.

The coin of every ſtate has, beſide this, a relative value, as it is compared with the money of other countries. This relative value is eſtabliſhed by the *exchange*, and greatly depends on its poſitive value. It is fixed by the current courſe of commerce, and by the general opinion and conſent of merchants, but never by the decrees of the prince, becauſe it is liable to inceſſant variations, depending on the accidental circumſtances of trade, the money tranſactions between nations, and the ſtate of public credit, &c.

The ſeveral nations in fixing this relative value, are chiefly guided by that which poſſeſſes the greateſt quantity of ſpecie. If ſhe has as much ſpecie as all the others together, it is then moſt proper for the others to regulate their's by her ſtandard; and this regulation between all the others, will nearly agree with the regulation made with this principal nation.

The relative abundance or ſcarcity of ſpecie in different countries, forms what is called the courſe of *exchange*; and this plenty or ſcarcity, on which the mutability of the courſe of *exchange* depends, is not real but relative: e. gr. when France has greater occaſion for funds in Holland than the Dutch of having funds in France, ſpecie is ſaid to be common in France, and ſcarce in Holland; and *vice verſâ*. See BALANCE *of Trade*.

We may obſerve, in general, that there is much ſpecie in a place, when there is more ſpecie than paper; there is little, when there is more paper than ſpecie; and in order to judge of the ſcarcity or plenty of ſpecie, we muſt know, for example, that if there are more bills from Holland than there are from France, then ſpecie is ſcarce in France, and common in Holland; and therefore it becomes neceſſary that the *exchange* ſhould riſe, and the Dutch give more for ſpecie of the ſame value in France, than the French for that of an equivalent value in Holland. When money of the ſame ſtandard and weight in France yields money of the ſame ſtandard and weight in Holland, the *exchange* is then ſaid to be at PAR. Thus in the year 1744, the par was nearly at 54 gros to the French crown of three livres; when the *exchange* is above 54 gros, the French would ſay it is high; when below 54 gros, they ſay it is low. When the *exchange* is below par between one country and another, the former loſes as debtor and buyer, and gains as creditor and ſeller. Thus if France owes Holland a certain number of gros, the more of theſe there are in a crown, the more crowns ſhe has to pay; and as there muſt be the ſame number of gros to buy the ſame quantity of merchandiſe, while the *exchange* is low, every French crown is worth fewer gros. On the contrary, if France is creditor for a certain number of gros, the leſs of them there are in a crown, the more crowns ſhe will receive; and if France ſells her merchandiſe in Holland for a certain number of gros, the more crowns will ſhe receive, in proportion as each crown contains fewer of theſe gros. The ſame reaſoning will apply, *mutatis mutandis*, to the commercial intercourſe of other countries, and to any par of *exchange*.

It is evident, that a merchant may ſend his ſtock into a foreign country, when the *exchange* is below par, without injuring his fortune; becauſe when it returns, he recovers what he had loſt; but a prince, who ſends only ſpecie into a foreign country, which can never return, is always a loſer. When merchants have great dealings in any country, the *exchange* there infallibly riſes, on account of their numerous engagements, buying great quantities of merchandiſe, and drawing on foreign countries to pay for them. The arbitration of *exchanges* is an article of great importance in the diſcuſſion of this ſubject: this is a kind of truck, which two bankers or merchants mutually make of their bills upon different parts, at a conditional price and courſe of *exchange*.

In order to underſtand this branch of commerce, it is neceſſary to know how to reduce the ſterling money of England into the foreign monies of *exchange* and of account of all places through Europe, according to the direct courſes of *exchange* eſtabliſhed for theſe purpoſes, and *vice verſâ*; and alſo thoſe of other places, with which England has no direct eſtabliſhed courſes of *exchange*, but is under the neceſſity of making uſe of the intermediate changes of other places. The nature of the AGIOS, and the manner of converting bank monies into current, and the reverſe, ſhould likewiſe be well underſtood. The method of reducing the foreign monies of Europe into thoſe of every other diſtant country, according to the direct or intermediate *exchange*, ſhould be thoroughly known: beſides, it is neceſſary to know the intrinſic value of foreign monies, according to the moſt accurate aſſays that have been made for that purpoſe; and alſo the general natural cauſes of the riſe and fall of the courſes of *exchange* between one nation and one city, and another; which depend on the balance of trade being either in favour of or againſt ſuch trading nation or city.

By an accurate obſervation and compariſon of the courſes of *exchange* between various countries and cities, the merchant will have an opportunity of profit, which ſhould not eſcape his cognizance. He will find that they ſeldom ebb and flow in an exact equality of proportion, ſince the balance of trade differs between different nations. The greateſt profit may be made by ſeizing the opportunity of drawing and remitting to certain places preferably to others. Farther, when the *exchange* is lower than the ſpecie of a country, a profit may be made by ſending it abroad; when it is higher, there is a profit in cauſing it to return; but there is a caſe in which profit may be made, by ſending the ſpecie out of the kingdom, when the *exchange* is at par; that is, by ſending it into a foreign country, to be received; when it returns, an advantage may be made of it, whether it be circulated in the country, or paid for foreign bills. See farther on this ſubject, Poſt. Dict. Com. articles *Arbitration* and *Exchange*.

EXCHANGE alſo denotes a public place, in moſt conſiderable cities, wherein the merchants, negociants, agents, bankers, brokers, interpreters, and other perſons concerned in commerce, meet, on certain days, and at certain times thereof; to confer, and treat together of matters relating to *exchanges*, remittances, payments, adventures, aſſurances, freightments, and other mercantile negociations both by land and ſea.

In Flanders, Holland, and ſeveral cities of France, theſe places are called *burſes*; at Paris and Lyons, *places de change*; and in the Hanſe towns, *colleges of merchants*.

Theſe aſſemblies are held with ſo much exactneſs, and merchants and negociants are ſo indiſpenſably required to attend at them, that a perſon's abſence alone makes him be ſuſpected of a failure or bankruptcy.

The moſt conſiderable *exchanges* in Europe, are that of Amſterdam; and that of London, called the Royal *Exchange*. For an account of the latter, ſee ROYAL *Exchange*.

The former is a large building, two hundred and thirty feet long, and a hundred and thirty broad, round which runs a periſtyle or portico, twenty feet wide. The columns of the periſtyle, amounting to forty-ſix, are numbered, for the convenience of finding perſons.

That of Antwerp was little inferior to either of them, till a variety of circumſtances concurred to effect its ruin, and to transfer its trade to Amſterdam; the æra of this important event in commercial hiſtory is about the year 1585.

Even in the time of the ancient Romans, there were places for the merchants to meet, in moſt of the conſiderable cities of the empire. That ſaid by ſome to have been built at Rome, in the year of the city 259, 493 years before our Saviour, under the conſulate of Appius Claudius, and Publius Servilius, was called *collegium mercatorum*; whereof it is pretended there are ſtill ſome remains, called by the modern Romans *loggia*, the *lodge*; and now, uſually, the *Place of St. George*.

This notion of a Roman *exchange* is ſuppoſed to be founded on the authority of Livy, whoſe words are as follow; viz. *Certamen conſulibus inciderat, uter dedicaret Mercurii ædem. Senatus a ſe rem ad populum rejecit: utri eorum dedicatio juſſu populi data eſſet, eum præeſſe annonæ, mercatorium collegium inſtituere juſſit.* Liv. lib. ii. But it muſt be here remarked, that *collegium* never ſignified a building for a ſociety in the purer ages of the Latin tongue; ſo that *collegium mercatorum inſtituere* muſt not be rendered to build an *exchange* for the merchants, but to incorporate the merchants into a company. As Mercury was the god of traffick, this *ædes Mercurii* ſeems to have been chiefly deſigned for the devotions of this company or corporation.

EXCHANGE, in *Law*, is a mutual grant of equal intereſt in lands or tenements, the one in *exchange* for the other; and in our common law it more particularly denotes the com-

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compenſation which the warrantor muſt make the warrantee, value for value, if the land warranted be recovered from the warrantee. Bracton. lib. ii. See WARRANTY.

EXCHANGE, *the king's*, is the place appointed by the king for *exchange* of plate, or BULLION for the king's coin.

Theſe places have formerly been diverſe; but now there is only one, viz. that of the Tower of London, joined with the Mint.

EXCHANGE, *bill of*. See BILL *of exchange*.

What we call *re-exchange*, is the due, or premium of a ſecond *exchange*, when a bill is proteſted. See RE-EXCHANGE.

EXCHANGE-*brokers*, are perſons who make it their buſineſs to know the alteration of the courſe of *exchange*, to inform merchants how it goes, and to notify to thoſe who have money to receive or pay beyond ſea, who are proper perſons for executing their orders.

EXCHANGERS are thoſe who return money beyond ſea, by bills of *exchange*, &c. called anciently alſo *excambiators*, and ſince *remitters*.

EXCHEQUER, or ſimply CHEQUER, originally denotes a cheſs-board; or a frame divided into ſixty-four ſquares, of two colours, whereon to play at draughts, cheſs, &c. See CHESS, &c.

The word is formed from the French *eſchequier*, which ſignifies the ſame. Hence, trees are ſaid to be planted *chequer*-wiſe, *in quincuncem*, when diſpoſed ſo as to form diverſe ſquares repreſenting a *chequer*.

EXCHEQUER is more particularly uſed for a chamber, or apartment, in Weſtminſter-hall, conſiſting of two parts; the *court of exchequer*, and the *lower exchequer*. See COURT *of Exchequer*.

EXCHEQUER-*bills* are a ſpecies of paper firſt eſtabliſhed by Mr. Montague, in 1696, to ſupply the want of circulating caſh, during the re-coinage at that period. They were then taken at the *exchequer* for all payments of the revenue, and, when re-iſſued, they were allowed 7*l.* 12*s.* *per cent.* intereſt. They have ſince been iſſued yearly; and the bank of England, ever ſince the year 1706, have been the contractors for their circulation, at a certain premium. The commiſſioners of the treaſury are empowered, by various ſtatutes, to borrow money, within a ſpecific ſum, limited by thoſe ſtatutes, by iſſuing *exchequer* bills on the credit of certain duties; which bills, by 12 Anne, cap. 11. & 12 Geo. I. cap. 11. bear an intereſt of 2*d.* a day *per cent.* payable to the bearers. Theſe bills are numbered arithmetically, and regiſtered accordingly, ſo that the principal ſums may be paid off in courſe, and the intereſt ſhall be payable every three months. The ſaid *exchequer* bills ſhall be current to all receivers and collectors of the cuſtoms, exciſe, or any revenue, and at the receipt of the *exchequer*; and as any of them are paid or lent into the *exchequer*, the officers there ſhall cauſe tallies to be levied and delivered to the payers or lenders, as if they had made ſuch payments or loans in ſpecie. If any *exchequer* bills be loſt, upon affidavit before a baron of the *exchequer*, and certificate from him, and ſecurity given to pay the ſame if found, duplicates are to be made out; and when bills are defaced, new ones ſhall be delivered. Forging of theſe bills, or of the indorſements on them, is felony.

EXCHEQUER, *meſſengers of the*. See MESSENGER.

EXCHEQUER, *Black Book of the*, is a book under the keeping of the two chamberlains of the *exchequer*; ſaid to have been compoſed in 1175, by Gervais of Tilbury, nephew of king Henry II. and divided into ſeveral chapters.

Herein is contained a deſcription of the court of England, as it then ſtood, its officers, their ranks, privileges, wages, perquiſites, power, and juriſdiction; and the revenues of the crown, both in money, grain, and cattle.

Here we find, that for one ſhilling, as much bread might be bought, as would ſerve a hundred men a whole day; that the price of a fat bullock was only twelve ſhillings, and a ſheep, four, &c. Larrey, p. i. p. 394. See alſo DOMESDAY.

EXCIPIENT, in *Pharmacy*, a term uſed to expreſs that ingredient in a compound medicine, the buſineſs of which is to receive all the reſt; ſuch is the conſerve in electaries, the ſyrup in boluſſes, &c.

EXCISE, a duty, or impoſition, charged on beer, ale, cyder, liquors made for ſale, and other commodities, within the kingdom of Great Britain, and town of Berwick upon Tweed.

The duty of *exciſe*, as well as the term, was firſt introduced in 1643, and afterwards granted to king Charles II. by act of parliament, in the year 1660, during the life of that prince: it has ſince been continued and augmented by diverſe parliaments, under the ſeveral ſucceeding princes, and extended to Scotland.

The ſeveral commodities that are liable to the duty of *exciſe*, are ale, beer, cyder, perry, mum, metheglin, mead, ſweets, verjuice, vinegar, candles, coaches, coffee, tea, and chocolate; glaſs, hops, leather, linen-cloth, ſilks, and cottons; malt, paper, plate, ſalt, ſoap, ſpirituous liquors, ſtarch, and hair powder, and wire. See the ſeveral articles.

Beſides the particular duties, there is an addition of 5 *per cent.* on all cuſtomed and exciſed goods, except candles, ſoap, &c. by 19 G. III.

The *exciſe* is one of the moſt conſiderable branches of the king's revenue. The amount of the *exciſe* in England, including the malt-tax, eſtimated at a medium of three years, ending in 1773, was 4,649,892*l.* and the expence of collecting, being the average of the years 1767 and 1768, when their produce was 4,531,075*l.* per ann. 6 *per cent.* of the groſs produce, or 297,887*l.*; and in Scotland, eſtimated in the ſame manner, 95,229*l.* and the expence of collecting, being the medium of 1772 and 1773, and the difference between the groſs and nett produce, 31 *per cent.* of the groſs produce, or 43,254*l.* It was formerly farmed out, but is now managed for the king by nine commiſſioners, in England, who ſit in the *general exciſe-office*, receive the whole product of the *exciſe* of beer, ale, and other liquors, and malt, collected all over England, and pay it into the EXCHEQUER.

Their ſalary is 1000*l.* per annum each, and they are obliged by oath, to take no fee, or reward, but from the king only. From the commiſſioners of *exciſe* there lies an appeal to four others, called *commiſſioners of appeals*. The commiſſioners of *exciſe* in Scotland are five, and each has a ſalary of 500*l.* per annum.

The number of officers employed in this branch of the revenue, is very great. Beſide the commiſſioners abovementioned, and their ſubordinate officers, as regiſters, meſſengers, &c. there is an auditor of the *exciſe*, and an auditor of hides, with their clerks, &c. A comptroller of caſh, and another of accompts, with their clerks; a regiſter; ſecretary; ſolicitor; receiver general, with his clerks; clerk of ſecurities; ſtore-keeper; houſe-keeper; door-keepers; general accompants, with their aſſiſtants; accomptant for fines, and two accomptants for the London brewery; clerk of the bills of exchange; examiners; clerk for ſupervifors diaries; five general ſurveyors; general ſurveyors of diſtillery and brandy; examiners of the diſtillery; of the brewery, and of ſoap and candles; ſurveyors of glaſs, of coaches, and plate licences; inſpector of ſpirituous liquors, licences, and coaches; inſpectors general of coffee, tea, &c. and of brewery through England and Wales. Beſide which, there are in England and Wales, excluſive of the bills of mortality, forty-nine collectors, who go their reſpective rounds once in ſix weeks; the province of a collector comprehends ſeveral diſtricts, within each of which there is a ſupervifor, under the inſpection of the collector; and each diſtrict is parcelled out into out-rides and foot-walks, within each of which there is an inferior officer, conſtituted under the hands and ſeals of the commiſſioners, or ſub-commiſſioners, in their reſpective diviſions, as neceſſity requires, and called gauger, or *exciſeman*, under the inſpection of the ſupervifor, who every ſix weeks draws out a diary of every day's buſineſs, with remarks, and tranſmits it to the chief officer. Every perſon, previous to his appointment to the office of gauger, muſt procure a certificate of his age, which muſt be between twenty-one and thirty; he muſt underſtand the four firſt rules of arithmetic, be of the communion of the church of England, and, if married, not have more than two children; he muſt nominate two able perſons to be his ſureties; and the certificate, containing theſe particulars, and written by himſelf, muſt be ſigned by the ſupervifor of the diſtrict where he lives, and accompanied with an affidavit, that he has uſed no bribes for obtaining this office. He is then ordered for inſtruction, under the care of an experienced officer, and to wait till a vacancy happens. Upon admiſſion of officers of every kind relating to the *exciſe*, the oaths of allegiance and ſupremacy, and an oath of faithfulneſs in the execution of the particular office, muſt be taken, and the declaration againſt tranſubſtantiation muſt be ſubſcribed. Officers of *exciſe*, taking a bribe, are liable to a forfeiture of 10*l.* 15 Car. II. cap. 11. and a perſon liable to *exciſe* duties, offering them a bribe, &c. ſhall forfeit 500*l.* 11 Geo. cap. 30. Officers meddling in elections are ſubject to a penalty of 100*l.* and an incapacity of holding any office under the king. 5 W. cap. 20. The concealment of exciſeable goods is ſubject to a forfeiture of thoſe goods, and treble value. 11 Geo. cap. 30. Any perſon obſtructing an officer in the execution of his duty ſhall forfeit 10*l.* 6 Geo. cap. 21. And an officer, either of the *exciſe* or cuſtoms, dealing in exciſeable liquors, ſhall forfeit 50*l.* and be incapable of any office in the revenue. 12 Geo. cap. 28.

EXCI-

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EXCISION, in *Surgery*, the cutting out, or cutting off any part of the body.

EXCLAMATION, in *Rhetoric*, a figure, wherein, by raiſing the voice, and uſing an interjection either expreſly or underſtood, we teſtify an uncommon warmth, and paſſion of mind; and expreſs the magnitude of the thing, or the importance of the occaſion.

Such is, O heavens! O earth! &c. ſuch alſo is that of Cicero againſt Cataline: O times! O manners! this the ſenate knows, the conſul ſees—and yet he lives! Lives, ſaid I? nay, and comes into the ſenate!

In Engliſh, the interjections O! or oh! alas! or good God! are generally adjoined in an *exclamation*. In Latin they uſe *O! heu! eheu! ah! vah! pro ſuperi! pro ſuperûm atque hominum fidem!* Sometimes, however, the interjection is underſtood, as, Woe is me! *Miſerum me! hoccine ſæculûm!*

EXCLUSION, the act whereby a perſon or thing is excluded, i. e. ſhut out, or ſet aſide. A crown imports an *excluſion* from the papacy: he appointed a ſtranger his heir, in *excluſion* of his own relations.

Great efforts were made towards the cloſe of the reign of king Charles II. to procure a *bill of excluſion*, for ſetting aſide the duke of York, the king's brother, on account of his being a papiſt. See CROWN.

EXCLUSIONS, in *Mathematics*. The *method of excluſions*, is a way of coming at the ſolution of problems (in numerical caſes) by previouſly ejecting, or *excluding* out of conſideration, ſuch numbers, as are of no uſe in ſolving the queſtion; whereby, of conſequence, the proceſs may be regularly, and judiciouſly abbreviated.

EXCLUSIVE, is ſometimes uſed adjectively, for the force, or power, of *excluding*: as, a patent carries with it an *excluſive* privilege.

Sometimes it is alſo uſed adverbially: as, he ſent him all the Gazettes, from N° 195, to N° 300, *excluſive*; i. e. all between thoſe two numbers, which themſelves were excepted.

EXCLUSIVE *propoſitions*, are thoſe wherein the predicate ſo agrees with its ſubject, as to agree with no other. See PROPOSITION. E. gr. Virtue alone makes nobility: nothing elſe renders a man truly noble.

EXCLUSORIUM, in *Medicine*, a name uſed, by ſome, for ſuch drugs, or compoſitions, as are capable of producing abortion.

EXCŒCARIA, in *Botany*, a genus of the *dioecia triandria* claſs, bearing male and female flowers, each of which has a naked catkin, without calyx or corolla; the female flowers have three ſtyles, and a capſule with three cells, and a ſingle ſeed in each cell.

EXCOMMUNICATION, an anathema, or eccleſiaſtical cenſure, and puniſhment; whereby a heretic is cut off from the ſociety of the faithful, or an obſtinate ſinner from the communion of the church, and the participation of the ſacraments.

This cenſure of *excommunication* was originally inſtituted for preſerving the purity of the church; but ambitious eccleſiaſtics converted it by degrees into an engine for promoting their own power, and inflicted it on the moſt frivolous occaſions.

The power of *excommunication* properly belongs to the biſhop; but he may delegate it to any grave prieſt, with the chancellor.

Every *excommunication* ſhould be preceded by three public admonitions, two days, at leaſt, diſtant from each other; but this is to be underſtood of *excommunications* impoſed by the eccleſiaſtical judge; for thoſe impoſed by the law are incurred to all intents and purpoſes the moment the action is committed.

Theſe latter are called *excommunications by the canon*, or *latæ ſententiæ*; and are ſo very numerous, that it would be difficult, even for the beſt canoniſts, to give an exact liſt of them; there are fifty in the Clementines; twenty in the bull *Cœna Domini*, &c. Wilkins's Mag. Conc. vol. iv. p. 664. Rebuffe, on the Concordat, reckons up ſixty penalties accruing upon *excommunication*.

Excommunication is founded on a natural right which all ſocieties have, of excluding out of their body ſuch as violate the laws thereof.

Excommunication is either *major* or *minor*, i. e. *greater* or *leſs*; the firſt, which is that underſtood when we ſay, ſimply, *excommunication*, ſeparates, or cuts off, the delinquent from all communion and fellowſhip with other Chriſtians; diſables him from defending his rights, bringing an action at law, be a witneſs, &c. The ſecond, or leſſer, only excludes from the communion of the Lord's ſupper.

The greater *excommunication*, called alſo *ab homine*, is when a prelate, or his deputy, *excommunicates* any man perſonally, and interdicts him all ſociety with the faithful, all uſe of ſacraments, &c.

In the ancient church, the ſentences of the greater *excommunication* were ſolemnly promulged four times in the year, with candles lighted, bells tolling, the croſs, and other ſolemnities.

The leſſer *excommunication* is incurred *pleno jure*, by having any communication with a perſon *excommunicated* in the greater *excommunication*. And this too imports a privation of communion, but not an interdiction from entering the church, nor having commerce with the faithful.

Anciently, the *excommunicated* were obliged to procure abſolution from their biſhop, and make ſatisfaction to the church, in forty days time; otherwiſe they were compelled to it by the ſecular judge, by a ſeizure of their effects, impriſonment of their perſons, &c. See EXCOMMUNICATO *capiendo*. In France they were allowed a whole year.

By an edict of St. Louis, in the year 1228, vaſſals, tenants, &c. were diſpenſed, or freed from the oath of fidelity, homage, &c. they had taken to their lords, or ſuperiors, when excommunicate, till they had made their ſubmiſſion.

In Spain, to this day, a perſon who is not abſolved from his *excommunication* in a year's time, is deemed a heretic.

There was a time, when the people were fully convinced, that the bodies of *excommunicated* perſons, unleſs they were firſt abſolved, would not rot, but remain entire for ſeveral ages, a horrible ſpectacle to poſterity! as is atteſted by Matthew Paris, and other writers. And the Greeks are ſtill of the opinion; and affirm, they have many proofs thereof, as is ſhewn by Du-Cange, from the teſtimony of a vaſt number of authors.

By the laws, an *excommunicated* perſon was not to be buried, but the body flung into a pit, or covered with a heap of ſtones; which was called *imblocare corpus*. And by the rubric, in the Book of Common Prayer, the burial office ſhall not be read for any that die *excommunicated*. See FUNERAL, &c.

In the ancient church, there were diverſe degrees of *excommunication*. In effect, *excommunication* did not always import an interdiction of the ſacraments; but frequently, a ſeparation, or kind of ſchiſm, between the ſeveral churches, or a ſuſpenſion of ſpiritual communication between the biſhops.

But, afterwards, the occaſions of *excommunications* growing more frequent, they began to uſe it with leſs circumſpection and reſervedneſs.

In the ninth century, the eccleſiaſtics were continually making uſe of this ſpiritual weapon, to repel any violences, or affronts, offered them; and time and familiarity rendering offenders more and more obdurate, they proceeded, by degrees, to rigours unknown to antiquity; as the *excommunicating* of whole families, or provinces; prohibiting the exerciſe of all religion therein; and even accompanying the *excommunications* with horrible ceremonies, and direful imprecations.

In the tenth and eleventh centuries, the ſeverity againſt the *excommunicated* was carried to its higheſt pitch: nobody might come near them, not even their own wives, children, or ſervants; they forfeited all their natural and legal rights and privileges, and were excluded from all kinds of offices. Thus was an *excommunicated* king reduced to the condition of a private man. By thus ſtretching the power of the church to extravagance, they rendered it contemptible. Gregory VII. tempered it a little; exempting the wives and children of *excommunicated* perſons from incurring *excommunication*, by holding converſation with their huſbands and parents.

To render the *excommunicated* ſtill more odious, the prieſt was obliged to ſtop, and break off divine ſervice, if an *excommunicated* perſon entered the church; nothing of which averſion is any where diſcovered in the practice of the primitive church. At preſent we have but little of the terror or reſpect of our forefathers for *excommunication*; and it is even judged, and proclaimed, an abuſe, whenever impertinently employed.

The form of *excommunication* in the Romiſh church, as related by Fevret, is to take lighted torches, throw them on the ground with curſes and anathemas, and trample them out under-foot to the ringing of the bells.

Auctoritate Dei Patris omnipotentis, & Filii, & Spiritus Sancti, & beatæ Dei genetricis Mariæ, omniumque ſanctorum, excommunicamus, *anathematizamus, & a limitibus ſanctæ matris eccleſiæ ſequeſtramus illos malefactores*, N. *conſentaneos quoque & participes*; *& niſi reſipuerint, & ad ſatisfactionem venerint, ſic extinguetur lucerna eorum ante viventem in ſæcula ſæculorum. Fiat: Amen: Amen: Amen.*

Ex Emendat. Leg. Will. Conquæſt.

We have now none of this folly; the ſentence is gravely read, and the perſon remains *excommunicated* without farther ceremony.

See the form of *excommunication* of the Engliſh church in Concilia M. Brit. & Hib. vol. iv. p. 663, &c.

Petrus Bleſenſis aſſures us, that in England it was anci-

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ently the practice only to *excommunicate* such as had killed an ecclesiastic; whereas they were put to death who had killed a layman. But the reason was, they held *excommunication* a greater punishment than death.

The causes with us are contempt of the bishop's court, heresy, neglect of coming to church, and of receiving the sacrament, incontinency, adultery, simony, &c.

We have instances of bishops, who have pronounced formal *excommunications* against caterpillars, and other insects, after a formal juridical process against them, wherein those animals were allowed an advocate, and proctor, to defend their cause. See EXORCISM.

Fevret relates divers instances of such *excommunications* against rats, mice, and other animals, for infesting a country. See the form of these *excommunications* in that author, Traité de l'Albus.

In the ancient church there were two different kinds of *excommunications* in use; the one called *medicinal*, whereby persons convicted of a crime by their own confession, were removed from communion; the other, called *mortal*, was fulminated against rebels, who persisted obstinately in their errors and impieties.

The power of *excommunicating* was lodged in the whole church in general; that is, the bishops and priests had the administration thereof, by and with the consent of the people; which was practised even in St. Cyprian's time. But afterwards they ceased to consult the people about the matter; the bishop and clergy arrogated the whole power to themselves. Recourse, however, might still be had to a synod of the province, to judge of the validity of an *excommunication*.

EXCOMMUNICATION was also practised among the Jews, who used to expel from their synagogue such as had committed any grievous crime. See the Gospel according to St. John, ix. 22. xii. 42. xvi. 2. And Joseph. Antiq. Jud. lib. ix. cap. 22. and lib xvi. cap. 2.

The Esseni, when *excommunicated*, durst not so much as receive food at any person's hand, for fear of violating their oath, but contented themselves to live on herbs; insomuch that they frequently perished, and died for want. See Joseph. de Bell. lib. ii. cap. 12.

Godwyn, in his Moses and Aaron, distinguishes three degrees, or kinds, of *excommunication* among the Jews. The first he finds intimated in St. John ix. 22. The second in St. Paul, Epist. 1 Cor. v. 5. And the third, in the 1st Ep. to Corinth. xvi. 22. See NIDDUI.

The rule of the Benedictines gives the name *excommunication* to the being excluded from the oratory, and the common table of the house, in our inns of court called *discommoning*. This was the punishment of such monks as came too late.

EXCOMMUNICATION, or a being secluded, or cut off from a participation in the mysteries of religion, was also in use under paganism.

Such as were thus *excommunicated* were forbidden to assist or attend at the sacrifices, or to enter within the temples; and were afterwards delivered over to the demons and furies of hell, with certain imprecations; which was called among the Romans, *diris devovere*. See EXECRATION.

The Druids among the ancient Britons and Gauls, likewise, made use of *excommunication* against rebels; and interdicted the communion of their mysteries to such as refused to acquiesce in their decisions. See DRUIDS.

That this is the true origin of the extensive and horrid influence of the European and papal *excommunication*, will appear evident by the following passage of Cæsar, De Bello Gallico, lib. vi. cap. 13. *Si qui aut privatus aut publicus Druidum decreto non stetit, sacrificiis interdicunt. Hæc pœna apud eos est gravissime. Quibus ita est interdictum, ii numero impiorum & sceleratorum habentur, iis omnes decedunt, aditum eorum sermonemque defugiunt, ne quid ex contagione incommodi accipiant; neque iis potentibus jus redditur, neque honos ullus communicatur.*

EXCOMMUNICATO *Capiendo*, or *Significavit*, a writ directed to the sheriff, for the apprehension of one who stands obstinately *excommunicated* the space of forty days.

Such a one, not seeking absolution, hath, or may have, his contempt certified into the chancery; whence this writ issues for laying him up, without bail or mainprize, until he conform himself.

EXCOMMUNICATO *Deliberando*, is a writ directed to the under sheriff, for the delivery of an *excommunicated* person out of prison; upon certificate of the ordinary of his conformity to the ecclesiastical jurisdiction.

EXCOMMUNICATO *Recipiendo*, is a writ whereby persons *excommunicated*, being for their obstinacy committed to prison, and unlawfully delivered from thence before they have given security to obey the authority of the church, are commanded to be sought for, and laid up again.

EXCORIATION, in *Medicine* and *Surgery*, the galling or rubbing off of the cuticle; especially of the parts between the thighs, or about the anus.

In adults, it is occasioned by riding, much walking, or other vehement exercise, and may be cured by vulnerary applications.

In children, there is often an *excoriation* of the parts near the pudenda, chiefly of the groin and scrotum, but likewise in the wrinkles of the neck, under the arms, and in other places, proceeding from the acrimony of the urine and sweat, and occasioning itching pains, crying, watching, and restlessness.

To remedy this, the parts affected may be washed often with warm water, and sprinkled with drying powders, as chalk, hartshorn, but especially tutty, lapis calaminaris, and cerusse; which may be tied loosely in a rag, and the powder shook out on the disordered places. If the parts tend to a real ulceration, it will be proper to add a little sugar of lead to the powder, or to anoint the place with unguent. alb. camphor. Likewise a little vitriol dissolved in spring water, and daubed upon the part, will dry and heal it very powerfully.

We also say, an *excoriation* in the throat, &c. when the membrane that covers it, or lines it, is torn by the acrimony of a humour, a medicine, or the like; which is ordinarily the case in what we call a *sore throat*.

EXCORTICATION, the act of stripping off the cortex, or bark, from any thing; called also DECORTICATION.

EXCREMENT, that which is evacuated, or *excreted*, out of the body of an animal, after digestion; being what in other respects is superfluous and prejudicial thereto. See EXCRETION.

Excrement is all that matter taken in by way of food, which cannot be assimilated; and which, of consequence, not growing or adhering to the body, wanders about through the laxer, and more patent parts thereof, till it be ejected.

The urine and fæces, or fæcal matter, are the *great excrements*, expelled from the bladder, and the intestines, by stool, &c.

The matter of insensible perspiration is also an *excrement*, and a more considerable one than either of the others.

Among *excrements* are likewise ordinarily ranked diverse humours and matters, separated from the blood by the several strainers, or emunctories of the body, though far from being useless, but serving diverse valuable purposes of the œconomy. Such are the cerumen, or ear-wax; the mucus of the nose; lachrymæ, or tears; saliva, bile, lympha, menses, lochia, &c. See CERUMEN, MUCUS, TEARS, SALIVA, BILE, MENSES, &c.

Unless the excretions are regular, health cannot be maintained; and therefore if they are too plentiful, defective, or suppressed, they will occasion various disorders. Hence if a person be costive, it is generally the forerunner of some disease. As a man generally takes more aliment than is necessary to generate blood and serum, and the common excretions are not sufficient to carry off superfluous humours, extraordinary ones sometimes happen at stated times; as the piles, hæmorrhages, &c.

EXCREMENT is also attributed, by way of analogy, to plants. Thus gums, diverse juices, balms, &c. issuing spontaneously from their respective trees, are sometimes called *excrements*.

EXCRESCENCE, in *Surgery*, denotes superfluous, or luxurious flesh, or other matter, growing on certain parts of the bodies of animals, contrary to, or beyond the ordinary structure, and disposition of nature.

The word is formed of the Latin *ex*, and *cresco*, *I grow*; q. d. something that grows from, or out of another.

Such are wens, warts, ficuses, polypuses, &c.

Natural, or customary *excrescences*, as those of bones, &c. are called by physicians *apophyses*.

EXCRETION, formed of *excernere*, *to separate*, in *Medicine*, the act of expelling or ejecting out of the body some humour that is useless, or even hurtful thereto.

Most crises are effected by *excretion*; as fluxes of blood and urine, sweat, vomitings, loosenesses, &c.

EXCRETORY, in *Anatomy*, is applied to certain little ducts, or vessels, in the fabric of the glands.

Excretory ducts are the tubes through which the humours separated in the several glands, are emitted, or discharged out of the gland, into some convenient receptacle, or emunctory.

A capillary artery, to which a capillary vein is joined, with an *excretory* duct, convolved, or wound together, make up the body of the glands, the organs of secretion. The *excretory* ducts spring from the extremities of the arteries and veins, and carry off a liquor separated from the blood. Drake.

The lymphatic glands have either lymphæducts for their *excretory ducts*, or lacteal vessels, as in the mesentery. Idem.

EXCURSION, in *Astronomy*. See ELONGATION.

EXCURSION, *circles of*. See CIRCLES.

EXCUSATI, in *Church History*, a term used to denote slaves, who flying to any church for sanctuary, were ex-

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cuſed and pardoned by their maſters; but theſe were obliged to take an oath to that purpoſe before they could have them again; and, if they broke the oath, they were puniſhed and fined as perſons guilty of perjury.

EXCUTIA *ventriculi*, the *ſtomach-bruſh*, a name given, by modern ſurgeons, to an inſtrument made of ſoft briſtles, formed into a bundle, and fixed upon a flexible braſs wire, for cleanſing the throat, or even the ſtomach.

The *ſtomach-bruſh* is compoſed of ſoft hair, faſtened together into a bundle by a twiſted braſs or ſteel wire, and the handle or ſtem of it is inveſted with ſilk. This has been greatly recommended, by ſome, to remove foreign bodies out of the fauces and œſophagus, and to ſcour the ſtomach. The method of uſing it is this.

The patient is firſt to drink a ſmall draught of warm water, then the bruſh is to be received into the œſophagus, and gently protruded down into the ſtomach, by twiſting round and round its handle, and, when in the ſtomach, it is to be drawn up and down many times, like the ſucker in a ſyringe, and at length wholly extracted. The advantages ſaid to ariſe from this are very great, ſuch as the prolonging life to a great age, and the like; but few people have been willing to try the effects of ſo diſagreeable and troubleſome an operation. Wedelius and Teichmeir have written expreſs treatiſes on this inſtrument; and one of them has attempted to prove it no new contrivance, but a thing very early known, deſcribed, and uſed in phyſic. Heiſter's Surgery, part ii. p. 2.

EXEAT, in *Church Diſcipline*, a Latin term, uſed for a permiſſion, which a biſhop grants a prieſt to go out of his dioceſe; or an abbot, to a religious, to go out of his monaſtery.

The word is alſo uſed in ſeveral great ſchools for leave given a ſcholar, or ſtudent, to go out. His maſter has given him an *exeat*.

EXECRATION, *Execratio*, among the *Ancients*, a kind of puniſhment, conſiſting of direful curſes and marks of infamy. Livy relates an inſtance of it, which was uſed againſt Philip, king of Macedon, by the Athenians. A general aſſembly of the people being called, they made a decree, that all the ſtatues and images of that king, and of all his anceſtors, both of the male and female ſex, ſhould be demoliſhed, and their very names raſed; that all the feſtivals, ſacred rites, prieſts, and whatever elſe had been inſtituted in honour of him, ſhould be profaned; that the very places where there had been any monument or inſcription to his honour, ſhould be deteſtable, and that nothing ſhould be ſet up, or dedicated in them, which could be done in clean places; and, laſtly, that the public prieſts, as often as they prayed for the Athenian people, allies, armies, and fleets, ſhould as many times deteſt and execrate Philip, his children, kingdom, land and ſea forces, and the whole race and name of the Macedonians.

Cornelius Nepos, in his Life of Alcibiades, calls it *devotion*.

At the taking and demoliſhing of a city, it was frequent to pronounce direful curſes and *execrations* upon any perſon who ſhould endeavour to rebuild it; which ſome imagine was the reaſon that Troy could never be raiſed out of its aſhes, though ſeveral perſons attempted it, being devoted to eternal and irreparable ruin by Agamemnon. This ſeems to have been a very ancient cuſtom, and derived from the eaſtern nations; for we find Joſhua, at the deſtruction of Jericho, to have fixed an imprecation upon the perſon who ſhould rebuild it, which was thought to be accompliſhed in Hiel the Bethelite many ages after. Potter, Archæol. tom. ii. p. 97.

EXECUTED *fine*. See FINE.

EXECUTION, the act of executing, i. e. of accompliſhing, finiſhing, or atchieving any thing, to be done.

We ſay, the *execution* of a teſtament; of a law; of a treaty; of a building, or the like.

EXECUTION is particularly uſed, in the French *Muſic*, for the manner of ſinging, or of the performance of a ſong. As to the manner of ſinging, called in France *execution*, no nation may, with any probability, diſpute it with the French. If the French, by their commerce with the Italians, have gained a bolder compoſition, the Italians have made their advantage of the French, in learning of them a more polite, moving, and exquiſite *execution*. St. Evremont.

EXECUTION, in *Common Law*, ſignifies the laſt performance of an act; as of a writ, a judgment, or the like.

EXECUTION *of a judgment*, is the obtaining the poſſeſſion of any thing recovered by judgment of law.

There are two ſorts of *executions*; one *final*, another *with a quouſque*, as only tending to an end.

EXECUTION, *final*, is that which maketh money of the defendant's goods, or extendeth his lands, and delivers them to the plaintiff; for this the party accepts in ſatisfaction; and this is the end of the ſuit, and all that the king's writ commands to be done.

EXECUTION *with a quouſque*, is that which only tends to an end; as in the caſe of a *capias ad ſatisfaciendum*, &c.

This is not final; but the body of the party is to be taken, to the intent and purpoſe to ſatisfy the plaintiff; and his impriſonment is not abſolute, but till he doth ſatisfy; ſo that the body is but a pledge for the debt.

Executions are either in perſonal, real, or mixed actions. In a perſonal action, the *execution* may be made three ways, viz. by the writ of CAPIAS *ad ſatisfaciendum*, againſt the body of the defendant; FIERI *facias*, againſt his goods; or ELEGIT, againſt his lands. In a real and mixed action, the *execution* is by writ of HABERE *facias ſeiſinam*, and *habere facias poſſeſſionem*.

EXECUTION, *tenant by*. See TENANT.

EXECUTION, *military*, is the pillage or plundering of a country by the enemies army.

EXECUTION, *military*, alſo denotes every kind of puniſhment inflicted on an army by ſentence of a court martial. This is of various kinds; as tying up to three halberts, and receiving a number of laſhes with a whip, compoſed of nine cord-laſhes, and each laſh of nine knots, from the drummer; or running the gantlope through the parade at guard-mounting, drawn up in two lines for that purpoſe. On this occaſion the provoſt marches through with twigs or ſwitches, and every ſoldier takes as many as there are criminals to be puniſhed; the criminal then marches through the two lines, and each ſoldier gives him a hard ſtroke, the major riding up and down to ſee that the men lay on properly. When a ſoldier is to be puniſhed with death, a detachment of about two hundred men from the regiment to which he belongs forms the parade, and a file of grenadiers ſhoots the priſoner to death.

EXECUTION *of criminals* muſt be according to judgment; and the king cannot alter a judgment from hanging to beheading, becauſe no *execution* can be warranted, unleſs it be purſuant to the judgment. 3 Inſt. 52. 211. H. P. C. 252. But there are ancient precedents wherein men condemned to be hanged for felony, have been beheaded by force of a ſpecial warrant from the king. Bract. 104. Staundf. 13. And the king may pardon part of the *execution* in judgment for treaſon, viz. all but beheading. The court may command *execution* to be done without any writ; though ſometimes *execution* is commanded by writ. 2 Hawk. P. C. 463. Judgment belongs to the judge; but the *execution* muſt be done by the ſheriff, &c. and an *execution* cannot be lawfully made by any but the proper officer; who may do it by the precept of the judge under his ſeal; and if the ſheriff, or other officer, alters the *execution*, or any other executes the offender, or if he is killed without the authority of law, it is felony. 2 Hawk. ib.

In caſe a man condemned to die, come to life after he is hanged, as the judgment is not executed till he is dead, he ought to be hung up again. Finch, 389. The body of a traitor, or felon, is forfeited to the king by the *execution*.

EXECUTIONE *facienda*, a writ commanding execution of a judgment.

EXECUTIONE *facienda in withernamium*, lies for taking the cattle of one who had formerly conveyed out of the county the cattle of another.

EXECUTIONE *judicii*, in *Law*, a writ directed to the judge of an inferior court, to do *execution* upon a judgment therein, or to return ſome reaſonable cauſe wherefore he delays the *execution*. F. N. B. 20.

If *execution* be not done on the firſt writ, an *alias* ſhall iſſue, and a *pluries*, with this clauſe, *vel cauſam nobis ſignifices quare*, &c. And if, upon this writ, *execution* be not done, or ſome reaſonable cauſe returned why it is delayed, the party ſhall have an attachment againſt him who ought to have done the *execution*, returnable in B. R. or C. B. New Nat. Br. 43.

EXECUTIVE *power*, *ſupreme*, is by the conſtitution of theſe kingdoms lodged in a ſingle perſon, the king or queen, for the time being. See CROWN.

EXECUTOR, a perſon nominated by a teſtator, to take care to ſee his will and teſtament *executed* or performed, and his effects diſpoſed of according to the tenor of the will.

The teſtaments made in Latin in the fourteenth century, call *executors*, *proviſores teſtamentarii*.

All perſons are capable of being *executors*, that are capable of making wills, and others beſides; as feme-coverts and infants, and infants unborn; but no infant can act, as *executor*, till he is ſeventeen years of age. This appointment of an *executor*, either by expreſs words, or by ſuch as ſtrongly imply the ſame, is eſſential to the making of a will; but if the teſtator names no *executors*, or names incapable perſons, or if the *executors* that are named refuſe to act, the ordinary muſt grant letters of adminiſtration. See ADMINISTRATOR.

A perſon appointed to be *executor* is not compellable to execute

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execute the will; he may refuſe the charge, before he has adminiſtred as *executor*, or performed ſuch acts, as paying debts due by the teſtator, or receiving debts due to him, or giving acquittances for the ſame; but if he meddles with the goods of the teſtator, as *executor*, his ſubſequent refuſal is void, and he ſhall be charged as *executor*. A perſon to whom a legacy is left may be compelled either to ſtand the executorſhip, or to reſign his legacy. The refuſal of executorſhip muſt be entered and recorded in court. If ſeveral *executors* are named in a will, and ſome of them refuſe, and others prove the will, they who refuſe may afterwards adminiſter and act; and they muſt be joined in all ſuits, where the *co-executors* are plaintiffs; but not where they are defendants, becauſe the plaintiff in the action is not bound by law to take notice of any beſides thoſe who have proved the will.

As to the office or duty of an *executor*, it is to be obſerved that he may do many things before he proves the will, which an adminiſtrator cannot do; becauſe the former derives his power from the will, and not from the probate, or appointment of the ordinary, as the latter does. He may maintain actions of treſpaſs, replevin, or detinue; releaſe an action, aſſent to a legacy, be ſued, alien, or otherwiſe intermeddle with the goods of the teſtator: by adminiſtering, the *executor* is entitled to receive all debts due to the teſtator, and all payments made to him are good, though he ſhould die, and never prove the will; but he cannot maintain a ſuit or action of debt, or the like, before he has proved the will. The ordinary, &c. may cite the *executor*, either to prove the will, or refuſe the office; and he may ſequeſter the goods of the deceaſed, till the *executor* has proved it; and if he does not appear on the proceſs, the ordinary may excommunicate him. On the other hand, the ordinary is compellable by mandamus to proceed to PROBATE, when the will is not controverted. The *executor* muſt bury the deceaſed in a manner ſuitable to the eſtate he leaves behind him; neceſſary funeral expences are allowed, previous to all other debts and charges; but if he be extravagant, he is chargeable with devaſtation, or waſte of the ſubſtance of the deceaſed, which ſhall be only prejudicial to himſelf, and not to the creditors or legatees of the deceaſed. He is then to make an inventory of all the goods and chattels, whether in poſſeſſion or action of the deceaſed, which he is to deliver in to the ordinary upon oath, if lawfully required, at the time of probate. He is then to collect all the goods and chattels ſo inventoried; for which purpoſe the law confers on him ample powers, as the repreſentative of the deceaſed; and having the ſame property in his goods as the principal had when living, and the ſame remedies to recover them; and if there be two or more *executors*, a ſale or releaſe by one of them ſhall be good againſt all the reſt. The *executor* muſt in the next place pay the debts of the deceaſed, in the order of their priority. See DEBTS, and DEBTEE *executor*.

If no ſuit is commenced againſt him, the *executor* may pay any one creditor in equal degree his whole debt, though he has nothing left for the reſt; for, without a ſuit commenced, the *executor* has no legal notice of the debt. After the debts, the *executor* is to pay the legacies, which he is to pay as far as his aſſets will extend; but he may not give himſelf the preference herein, as in the caſe of debts. In caſe of a deficiency of aſſets, all the *general* legacies muſt abate proportionably, in order to pay the debts; but a *ſpecific* legacy, as of a piece of plate, houſe, &c. is not to abate at all, unleſs there be not ſufficient without it. If the legatees have been paid their legacies, and debts come in more than enough to exhauſt the reſiduum, they are afterwards bound to refund a ratable part. See LEGACY, and DONATION *cauſa mortis*.

When all the debts and legacies are diſcharged, the ſurplus or reſiduum muſt be paid to the *reſiduary* LEGATEE, if any be appointed by the will; if there be none, it was formerly underſtood to belong to the *executor*; but it ſeems to be now the general opinion, that, if there be an expreſs legacy given to an *executor*, and no deviſe of the ſurplus, ſuch ſurplus ſhall not go to the *executor*, but be diſpoſed to the next of kin, according to the ſtatute of diſtributions; the *executor* ſtanding on the ſame footing as an ADMINISTRATOR. See INTESTATE.

Where no expreſs legacy is given to the *executor*, the ſurplus ſhall go to the *executor*, if not otherwiſe diſpoſed of by WILL. When there are ſeveral *executors*, and ſome of them are dead, the legatary muſt ſue the ſurviving *executors*, and not the *executors* or adminiſtrators of thoſe that are dead. And if all the *executors* are dead, he muſt ſue the *executors* or adminiſtrators of thoſe that died laſt, and not thoſe of the reſt.

By the French law, an *executor* ſhould be ſeiſed of all the moveables of the deceaſed during one year; at the end whereof he is to account for them. To the validity of a teſtament, it is not neceſſary there be an *executor* nominated therein.

EXECUTOR *de ſon tort*, or of his own wrong, is he who takes on him the office of an *executor* by intruſion, not being conſtituted thereto by the teſtator, or deceaſed, nor authoriſed by the ordinary to adminiſter.

If an *executor* in his own wrong takes upon himſelf the office of an *executor* without lawful authority, he is chargeable to the rightful *executor*, and to all the creditors of the teſtator, and likewiſe to the legatees, ſo far as the goods amounted to, which he wrongfully poſſeſſed; and ſuch an *executor* is made by any act of acquiſition, transferring, or poſſeſſing himſelf of any of the eſtate or goods of the deceaſed; but not by acts of neceſſity, piety, or charity. 2 Nelſon abr. 793. Such an *executor* cannot bring an action in right of the deceaſed; neither can he retain for his own debt or legacy. In caſe of his death, his *executors* or adminiſtrators are liable to the ſuit of the lawful *executor*, creditors, and legatees, by 30 Car. II. cap. 7.

EXECUTOR, *Debtee*. See DEBTEE.

EXECUTORY, that which has, or carries with it a ſufficient authority for being executed.

A contract is only *executory*, when it is in form, and ſealed: the great ſeal of England is *executory* throughout the whole iſland.

EXECUTORY *deviſe*, is where a future intereſt is deviſed, that veſts not at the death of the teſtator, but depends on ſome contingency which muſt happen before it can veſt. Thus, if a particular eſtate is limited, and the inheritance paſſed out of the donor, this is a CONTINGENT *remainder*; but where the fee by a deviſe is veſted in any perſon, and to be veſted in another upon contingency, this is an *executory* deviſe. And in all caſes of *executory* deviſes, the eſtates deſcend until the contingencies happen.

EXECUTORY *eſtate* is an eſtate in fee, created by deed or FINE, which is to be afterwards executed by entry, livery, writ, or the like; and eſtates executed are thoſe which paſs preſently to the perſon to whom they are conveyed, without any ſubſequent act.

EXECUTORY *fine*. See FINE.

EXEDENS *herpes*. See HERPES.

EXEDRÆ, Ἐξέδραι, among the *Ancients*, were places wherein the philoſophers, ſophiſts, rhetors, &c. uſed to hold their conferences and diſputes.

M. Perrault is of opinion, the *exedræ* were a ſort of little academies, where the men of learning met together. See ACADEMY.

Budæus rather thinks, that what the ancients called *exedræ*, might anſwer to what we call *chapters* in the cloiſters of monks, or collegiate churches.

EXEGESIS, Ἐξήγησις, a term ſometimes uſed by the learned, to ſignify *explication*.

Several interpreters of the Bible are of opinion, that in the paſſages of Scripture, where we meet with Abba Pater, two words, the firſt Syriac, and the ſecond Greek or Latin, but both ſignifying the ſame thing; the ſecond is only an *exegeſis*, or explanation of the firſt.

EXEGESIS is alſo uſed for an entire diſcourſe by way of explication, or comment, on any thing.

EXEGESIS *numeroſa*, or *linealis*, ſignifies the numeral, or lineal ſolution, or extraction of roots, out of adfected equations, firſt invented by Vieta. Ozanam calls it *la rhetique*. See EXTRACTION *of roots*.

EXEGETES, formed of ἐξηγέομαι, *I explain*, among the Athenians, perſons learned in the laws, whom the judges uſed to conſult in capital cauſes.

EXEGETICA, in *Algebra*, the art of finding, either in numbers or lines, the roots of the equation of a problem, according as the problem is either numerical, or geometrical. See ROOT, and EQUATION.

EXEMPLAR, a MODEL, or original, to be imitated, or copied.

EXEMPLAR alſo denotes the idea, or image, conceived, or formed in the mind of the artiſt, whereby he conducts his work. Such is the idea of Cæſar, which a painter has in his mind when he goes to make a picture of Cæſar.

The *exemplar* is ordinarily numbered among the cauſes. See CAUSE.

EXEMPLIFICATION *of letters patent*, denotes an exemplar, or copy of letters patent, made from the inrolment thereof, and ſealed with the great ſeal of England.

Such *exemplifications* are as effectual to be ſhewed, or pleaded, as the letters patent themſelves.

EXEMPLIFICATIONE, in *Law*, is a writ granted for the exemplification of an original record. Reg. Orig. 290.

EXEMPTION, a privilege, or diſpenſation, whereby a perſon is excepted out of ſome general rule.

Exemption

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Exemption is particularly applied to churches, chapels, and monaſteries, which have a privilege given them by the popes, or princes, whereby they are exempted from the juriſdiction of the biſhop, or ordinary.

The council of Conſtance revoked all *exemptions*, to reſtore to the general law, weakened and diminiſhed by a relaxation of ſeveral ages, its ancient force and vigour, and make it every where obtain in all its latitude.

The council of Trent prohibited, and declared them null for the future; confirming only ſuch as were well founded on legal conceſſions from the holy ſee.

EXEMPTION, in *Law*, denotes a privilege to be free from ſervice or appearance; thus, knights, clergymen, &c. are exempted from appearing at the county courts by ſtatute, and peers from ſerving on inqueſts. Perſons ſeventy years of age, apothecaries, &c. are alſo exempted by law from ſerving on juries, and juſtices of peace, attornies, &c. from pariſh offices.

EXERCISE, a repetition of any operation, for the ſtrengthening, or retaining of a habit.

Thus, we uſe *exerciſe* of the body for acquiring, or maintaining of health; as it contributes both to the expulſion of the excrements, and preſerving the tone and ſpring of the ſolids.

People who live a ſedentary life, and do not uſe *exerciſe*, are liable to an univerſal relaxation of the ſolids, which brings on other diſorders, glandular obſtructions, weak nerves, and defect of perſpiration. Games of hazard are to be diſcountenanced, and thoſe of *exerciſe* to be promoted.

Exerciſe and quiet make one of the phyſicians NON-NATURALS. See GYMNASTICS.

Labour, or *exerciſe*, Dr. Cheyne obſerves, is indiſpenſibly neceſſary to preſerve the body any time in due plight. Let any diet be purſued, however adjuſted, both in quantity and quality; let whatever evacuations be uſed to leſſen the malady, or any ſuccedaneum be propoſed to prevent the ill effects, ſtill our bodies are ſo made, and the animal œconomy is ſo contrived, that, without due labour and *exerciſe*, the juices will thicken, the joints will ſtiffen, the nerves will relax; and, from theſe diſorders, chronical diſeaſes, and a crazy old age, muſt enſue. Eſſay on Health, p. 90.

Of all the *exerciſes* that are, or may be, uſed for health, as walking, riding on horſeback, or in a coach, fencing, dancing, bowling, digging, pumping, ringing, &c. walking is the moſt natural, and would be the moſt uſeful, if it did not ſpend too much of the ſpirits of the weakly. But riding is certainly the moſt manly, the moſt healthy, and is leſs laborious and expenſive of ſpirits than any.

It is generally ſaid that riding is a more healthful *exerciſe* than walking; which appears to be an aſſertion a little too general; for walking is much more effectual in promoting an increaſe of muſcular ſtrength, and in imparting to the fibres a due elaſticity, than riding. But where any of the viſcera are much obſtructed, and a patient is too weak to ſupport ſufficient walking *exerciſe*, in ſuch caſe riding may be more beneficial. Upon the whole it may be ſaid, that walking is beſt for the preſervation of health, but riding for the relief of chronical diſtempers; for in thoſe which are acute, neither of them is adviſeable.

Thoſe organs of the body that are moſt uſed, always become ſtrongeſt; ſo that we may ſtrengthen any weak organ by *exerciſe*. Thus, the legs, thighs, and feet of chairmen; the arms and hands of watermen; the backs and ſhoulders of porters, grow thick, ſtrong, and brawny, by time and uſe. It is certain, alſo, that ſpeaking ſtrong and loud will ſtrengthen the voice, and give force to the lungs. To the aſthmatic, therefore, and thoſe of weak lungs, I would recommend, ſays Dr. Cheyne, talking much, and loud; walking up eaſy aſcents, &c. to thoſe of weak nerves, and digeſtion, riding on horſeback; to thoſe troubled with the ſtone, riding over rough cauſeways in a coach; to thoſe troubled with rheumatic pains, playing at billiards, cricket, or tennis; to thoſe of weak arms, or hams, playing at tennis, or foot-ball; to thoſe of weak backs, or breaſts, ringing a bell, or working at the pump. Walking through rough roads, even to laſſitude, will beſt recover the uſe of the limbs to the gouty; though riding will beſt prevent the diſeaſe; but the ſtudious, the contemplative, the valetudinary, and thoſe of weak nerves, muſt make *exerciſe* a part of their religion. A condition neceſſary to render *exerciſe* as beneficial as may be, is, that it be uſed on an empty ſtomach. Under the head of *exerciſe*, cold bathing, and the fleſh-bruſh, come alſo to be recommended. Id. ibid. p. 103, 104, &c.

Proper *exerciſe* conduces much to the health of ſoldiers in camp.

The *exerciſe* of a ſoldier may be conſidered under three heads; the firſt relating to his duty, the ſecond to his living more commodiouſly, and the third to his diverſions.

The firſt, conſiſting chiefly in the *exerciſe* of his arms, will be no leſs the means of preſerving health, than of making him expert in his duty; and frequent returns of this, early and before the ſun grows hot, will be made more advantageous than repeating it ſeldom, and ſtaying too long out at a time; for a camp affording little convenience for refreſhment, all unneceſſary fatigue is to be avoided.

As to the ſecond article, cutting boughs for ſhading the tents, making trenches round them for carrying off the water, airing the ſtraw, cleaning their cloaths and accoutrements, and aſſiſting in the buſineſs of the meſs, ought to be no diſagreeable *exerciſe* to the men for ſome part of the day.

Laſtly, as to diverſions, the men muſt be encouraged to them either by the example of their officers, or by ſmall premiums to thoſe who ſhall excel in any kind of ſports, as ſhall be judged moſt conducive to health; but herein great caution is neceſſary, not to allow them to fatigue themſelves too much, eſpecially in hot weather, or ſickly times; and above all, that their cloaths be kept dry, wet cloaths being the moſt frequent cauſe of camp-diſeaſes.

EXERCISE, in the *Art of War*, denotes the ranging a body of ſoldiers in form of battle, and making them practiſe the ſeveral motions, and military evolutions, with the diverſe management of their arms, &c. to make, or keep them expert therein, againſt occaſion.

This is what Vegetius, and other Latin writers, call *meditatio*.

EXERCISE, *infantry*, or *manual*, conſiſts in the obſervance of certain words of command appointed for this purpoſe. When a regiment is drawn up, or paraded for *exerciſe*, the men are placed three deep, either by companies, or divided into platoons, with the grenadiers on the right. When ſoldiers are drawn up for *exerciſe*, the ranks and files ſhould be exactly even, and each ſoldier ſhould be inſtructed to carry his arms well, to keep his firelock ſteady and even upon his ſhoulder, with the right hand hanging down, and the whole body without conſtraint. The diſtances between the files muſt be equal, and the ranks eight feet diſtant from each other. Every motion ſhould be performed with life, and the greateſt exactneſs obſerved in all firings, wheelings, and marching; and therefore a regiment ſhould never be under arms longer than two hours.

The following is an abſtract of the words of command at the manual *exerciſe*, with their explanations. 1. *Poiſe your firelock*, i. e. ſeize the firelock with your right hand, and turn the lock outwards, keeping the firelock perpendicular; then bring up the firelock with a quick motion from the ſhoulder, and ſeize it with the left hand, juſt above the lock, ſo that the fingers may lie upon the ſtock, with the elbows down, and the thumb upon the ſtock; the firelock muſt not be held too far from the body, and the left hand muſt be of an equal height with the eyes. 2. *Cock your firelock*; i. e. turn the barrel oppoſite to your face, and place your thumb upon the cock, raiſing your elbow ſquare at this motion; then cock your firelock, by drawing your elbow down, placing your right thumb on the breech pin, and the fingers under the guard. 3. *Preſent*; i. e. ſtep back about ſix inches to the rear with the right foot, bringing the left toe to the front; at the ſame time the butt-end of the firelock muſt be brought to an equal height with the ſhoulder, placing the left hand on the ſwell, and the fore-finger of the right hand before the trigger, ſinking the muzzle a little. 4. *Fire*; i. e. pull the trigger briſkly, and immediately after bringing up the right foot to the inſide of the left, come to the priming poſition, with the lock oppoſite to the right breaſt, the muzzle to the height of the hat, keeping it firm and ſteady; and at the ſame time ſeize the cock with the fore-finger and thumb of the right hand, the back of the hand being turned up. 5. *Half-cock your firelock*; i. e. half-bend the cock briſkly with a draw-back of the right elbow, bringing it cloſe to the butt of the fire-lock. 6. *Handle your cartridge*; i. e. bring your right hand with a ſhort round to your pouch, ſlapping it hard; ſeize the cartridge, and bring it with a quick motion to your mouth; bite the top well off, and bring the hand as low as the chin, with the elbow down. 7. *Prime*; i. e. ſhake the powder into the pan, placing the three laſt fingers behind the rammer, with the elbow up. 8. *Shut your pans*; i. e. ſhut your pans briſkly, drawing your right arm at this motion towards your body, holding the cartridge faſt in your hand, as before; then turn the piece nimbly round to the loading poſition, with the lock to the front, and the muzzle to the height of the chin, bringing the right hand behind the muzzle, with both feet kept faſt in this motion. 9. *Charge with cartridge*; i. e. turn up your hand, and put the cartridge

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into the muzzle, ſhaking the powder into the barrel; place your hand, cloſed, with a quick and ſtrong motion, upon the rammer. 10. *Draw your rammer*; i. e. draw the rammer with a quick motion half out, ſeizing it at the muzzle back-handed; draw it quite out, turn it, and enter it into the muzzle. 11. *Ram down your charge*; i. e. ram the cartridge well down in the barrel, inſtantly recovering and ſeizing the rammer back-handed at the center, turning it, and entering it as far as the lower pipe, placing at the ſame time the edge of the hand on the butt-end of the rammer, with fingers extended. 12. *Return your rammer*; i. e. return the rammer, bringing up the piece with the left hand to the ſhoulder, ſeizing it with the right hand under the cock, keeping the left hand faſt at the ſwell, turning the body ſquare to the front. 13. *Shoulder your firelock*; i. e. quit the left hand, and place it ſtrong upon the butt; quit the right hand, and throw it down the right ſide. 14. *Reſt your firelock*; i. e. ſeize the firelock with the right hand, turning the lock outwards; raiſe the firelock from the ſhoulder, and place your left hand with a quick motion above the lock, holding the piece right up and down in both hands before you, and your left hand even with your eyes; ſtep briſkly back with your right foot, placing it a hand's-breadth diſtance from your left heel, and the ſame time bring down your firelock as quick as poſſible to the reſt, ſinking it as far down before your left hand as your right hand will permit without conſtraint; your left hand being at the feather-ſpring, and your right, with fingers extended, held under the guard, taking care to draw in the muzzle well towards your body, and to dreſs in a line with the butt end. 15. *Order your firelock*; i. e. place your firelock nimbly with your left hand againſt your right ſhoulder; quit the firelock with the right hand, ſinking it at the ſame time with your left; ſeize it at the muzzle, which muſt be of an equal height with your chin, and hold it cloſe againſt your right ſide; lift up your right foot, and place it by your left; at the ſame time throw back your left hand by your left ſide, and with your right bring down the butt-end ſtrong upon the ground, placing it even with the toe of your right foot; the thumb of your right hand lying along the barrel, and the muzzle kept at a little diſtance from your body. 16. *Ground your firelock*; i. e. half face to the right upon your heels, and at the ſame time turn the firelock, ſo that the lock may point to the rear, and the flat of the butt-end lie againſt the inſide of your foot; at the ſame time ſlipping the right foot behind the butt of the firelock, the right toe pointing to the right, and the left to the front: ſtep directly forward with your left foot, about as far as the ſwell of the firelock, and lay it upon the ground, your left hand hanging down by your left leg, and your right kept faſt, with the butt-end againſt it; raiſe yourſelf up again nimbly, bringing back your left foot to its former poſition, keeping your body faced to the right; face again to the left upon your heels, and come to your proper front, letting your hands hang down without motion. 17. *Take up your firelock*; i. e. face to the right upon both heels; ſink your body down, and come up to the poſition deſcribed in the ſecond motion of grounding; raiſe yourſelf and firelock, bringing it cloſe to your right right ſide; come to your proper front, ſeizing your firelock at the muzzle, as in *Explanation* 15. 18. *Reſt your firelock*; i. e. bring your right hand as far as the ſwell; raiſe the firelock high up in a perpendicular line from the ground with your right hand, and ſeize it with your left above the ſpring, the cock being at the height of the waiſt-belt; ſtep back with your right foot, placing it behind your left heel, and come to the reſt. 19. *Shoulder your firelock*; i. e. lift up your right foot, and place it by your left; bring the firelock at the ſame time to your left ſhoulder, and ſeize the butt-end with the left hand, keeping it in the ſame poſition as above deſcribed; throw your right hand briſkly back. 20. *Secure your firelock*; i. e. bring the right hand briſkly up, and place it under the cock, keeping the firelock ſteady in the ſame poſition; quit the butt with the left hand, and ſeize the firelock with it at the ſwell, bringing the elbow cloſe down upon the lock; the right hand being kept faſt in this motion, and the piece ſtill upright: quit the right hand, and bring it down your right ſide, bringing the firelock nimbly down to the *ſecure*; the left hand in a line with the waiſt-belt. 21. *Shoulder your firelock*; i. e. bring the firelock up to a perpendicular line, ſeizing it with the right hand under the cock; quit the left hand, and place it ſtrong upon the butt; quit the right hand, and bring it ſmartly down the right ſide. 22. *Fix your bayonet*; i. e. firſt and ſecond motions, as in the two firſt of the *ſecure*; quit the right hand, and bring the firelock ſmartly down to the left ſide with the left hand, as far as it will admit without conſtraint; ſeizing the bayonet at the ſame time with the right hand, and fixing it, placing that hand juſt below the braſs, with the piece kept cloſe to the hollow of the ſhoulder. 23. *Shoulder your firelock*; i. e. quit the right hand, and bring up the firelock with the left; ſeize it again under the cock with your right, as in the ſecond motion of the *ſecure*; quit the left hand, and place it ſtrong upon the butt; quit the right hand, and bring it down the right ſide. 24. *Preſent your arms*; i. e. as explained in the three motions of the fourteenth word of command. 25. *To the right face*; i. e. bring up the firelock with a quick motion high before you, till your left hand comes even with your eyes, with the fingers of that hand extended along the ſtock, juſt above the feather-ſpring; the right foot to be brought cloſe up to the left heel in this motion: face to the right, taking care in facing to hold the firelock right up and down, and ſteady in your hands: ſtep back with your right foot, and come down to your *preſent*, as in the foregoing explanation. 26. *To the right face*; i. e. as in the foregoing explanation, facing to the right. 27. *To the right-about face*; i. e. as in the twenty-fifth explanation, only coming to the right-about inſtead of to the right. 28. *To the left face*; i. e. bring the right foot briſkly to the hollow of your left with the firelock in the ſame poſition as in the firſt motion of *facing to the right*; face to the left; come down to the *preſent*, as before. 29 *To the left face*; i. e. as in the foregoing explanation. 30. *To the left-about face*; i. e. as before, coming to the left-about inſtead of to the left. 31. *Shoulder your firelock*; i. e. as in the two motions of the nineteenth explanation. 32. *Charge your bayonet*; i. e. as in the firſt explanation; bring the ſwell of the firelock down ſtrong upon the palm of the hand, graſping the piece at the ſmall, behind the lock, and as high as the waiſt-belt; the firelock upon a level with the barrel upwards. 33. *Shoulder your firelock*; i. e. bring up the firelock to the ſhoulder, place the left hand upon the butt, bringing the feet ſquare to the front; quit the right hand, and throw it down the right ſide. 34. *Advance your arms*; i. e. firſt and ſecond motions, as in the firſt explanation; bring the firelock down the right ſide, with the right hand, as low as it will admit without conſtraint, ſlipping up the left hand at the ſame time to the ſwell, the guard between the thumb and fore-finger of the right hand, the three laſt fingers under the cock, with the barrel to the rear; quit the left hand. 35. *Shoulder your firelock*; i. e. bring up the left hand, and ſeize it at the ſwell; come ſmartly up to the poiſe; ſhoulder. 36. *Prime and load*; i. e. come ſmartly to the *recover*, by ſpringing the firelock ſtraight up with the left hand, turning the barrel inwards to the proper height of the recover; at the ſame time that the left hand ſprings the firelock, the right hand is raiſed briſkly from the right ſide, and ſeizes the firelock acroſs the breaſt; as it riſes below the cock, the left hand comes with a quick motion from the butt, and ſeizes the firelock ſtrong above the lock, the little finger of the left hand at the ſpring of the lock, the left hand at an equal height with the face, the butt cloſe to the body, but not preſſed, the firelock perpendicular, oppoſite the left ſide of the face: bring the firelock down with a briſk motion to the priming poſition, the left hand holding the firelock, as in priming; the thumb of the right hand placed againſt the face of the ſteel, the fingers clinched, and the elbow a little turned out, that the wriſt may be clear of the cock; open the pan by throwing up the ſteel with a ſtrong motion of the right arm, turning the elbow in, and keeping the firelock ſteady in the left hand: handle your cartridge; prime; ſhut your pan; caſt about; load; draw rammers; ram down the cartridge; return the rammers; ſhoulder. N. B. The motion of recover, and coming down to the priming poſition and opening pans, are to be done in the uſual time. The motions of handling cartridge to ſhutting the pans, are to be done as quick as poſſible: when the pans are ſhut, a ſmall pauſe is to be made, and then caſt about together; then the loading motions are to be done as quick as poſſible; but before the rammer is returned, another ſmall pauſe is to be made, counting 1, 2, between each motion, till the firelock is ſhouldered. *Front rank, make ready*; i. e. ſpring the firelock briſkly to the *recover*, keeping the left foot faſt in this motion; as ſoon as the firelock is at the *recover*, without any ſtop, ſink the body briſkly without ſtooping forward, with a quick motion down upon the right knee; the butt-end of the firelock at the ſame time falls upon the ground; the front part of the butt being in a line with the heel of the left foot. As ſoon as the butt comes to the ground the firelock is to be cocked, immediately ſeizing the cock and ſteel in the right hand; the firelock to be held firm in the left hand, about the middle of that part of the firelock between the lock and the ſwell of the ſtock; the point of the left thumb to be cloſe to the ſwell, pointing upwards. As the body is ſinking, the right knee is to be thrown as far back as the left leg may be

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be right up and down; the right foot to be thrown a little to the right; the body to be kept ſtraight; the head up, looking to the right along the rank, the ſame as if ſhouldered; the firelock to be upright, and the butt about four inches to the right of the inſide of the left foot. *Preſent*; i. e. bring the firelock briſkly down to the *preſent*, by extending the left arm to the full length with a ſtrong motion; at the ſame time ſpring up the butt by the cock with the right hand, and raiſe up the butt ſo high upon the right ſhoulder, that you may not be obliged to ſtoop too much with the head; the right cheek to be cloſe to the butt, and the left eye ſhut, and look along the barrel with the right eye from the breech-pin to the muzzle; keep the left elbow down in an eaſy poſition, and ſtand as ſteady as poſſible; the thumb of the right hand to remain in the poſition as deſcribed in the third explanation of the manual. *Fire*; i. e. pull the trigger as directed in the manual; and as ſoon as the piece is fired, give yourſelf a ſtrong ſpring upon your left leg, raiſing your body briſkly, and ſtraight up, keeping your left foot faſt, and bringing the right heel to the inſide of the left; at the ſame time the firelock is to be brought up to the priming-poſition, and half-cocked immediately; a ſhort pauſe is to be made, then handle cartridge, and go on with the loading motions deſcribed in the explanation of *prime* and *load*. *Centre rank, make ready*; i. e. ſpring the firelock briſkly to the *recover*; ſo ſoon as the left hand ſeizes the firelock above the lock, the right elbow is to be nimbly raiſed a little, placing the thumb of that hand upon the cock; the fingers open by the plate of the lock, and as quick as poſſible force the piece to the cock, by dropping the elbow, and forcing down the cock with the thumb, ſtepping at the ſame time a moderate pace to the right, keeping the left foot faſt; as the firelock is cocked, the thumb is to fall below the cock, the right hand ſeizing the firelock cloſe under the cock, firmly; the fore-finger not to be before the trigger; the piece to be held in this poſition perpendicular, oppoſite the left ſide of the face, the butt cloſe to the left breaſt, but not preſſed; the body to be ſtraight, and as full to the front as poſſible; the head kept up, looking to the right of the rank, that the body and the firelock may not ſtoop forward, nor lean much out of the rank. *Preſent*; i. e. ſpring the firelock from the body to the arm's length with a quick motion, preſſing down the muzzle with the left hand, and ſpring up the butt with the right hand, as in the foregoing explanation of the *front-rank*. *Fire*. As in explanation 4, in the manual, with this difference, that the left foot is to be brought up to the right, at the ſame time that the firelock is brought down to the priming poſition. The loading motions as in the explanations of priming and loading, and at the laſt motion of ſhouldering, to ſpring to the left again, and cover the file-leaders. *Rear rank make ready*; i. e. recover the firelock, and cock as before directed for the centre rank; as the firelock is recovered and cocked, ſtep briſkly ſtraight to the right, with the right foot a full pace; bring the left heel about ſix inches before the right foot; the body ſtraight, and as ſquare to the front as poſſible, as in explanation of the *centre rank*. *Preſent*. As in explanation *preſent*, before. *Fire*. As in explanation of the *centre rank*, and as the firelock is coming down to the priming poſition, the left is to be brought back to the right; and at the laſt motion of ſhouldering, to ſpring to the left again, and cover the file-leader.

There are ſome peculiar words of command at the manual *exerciſe* of the grenadiers, when apart from the battalion; and alſo for the cavalry and artillery.

EXERCISE, *cavalry*, is of two ſorts; on horſeback and on foot. When a regiment is formed into ſquadrons, the ranks are to be arranged at the diſtance of twenty-four feet, and the files muſt keep boot-top to boot-top. In all wheelings, the flank which wheels, muſt come about in full gallop.

EXERCISE, *artillery*, is the method of teaching the regiments of artillery the uſe and practice of all the various machines of war, as of the light field-pieces, of the garriſon and battering artillery, of the mortar and howitz. See Smith's Milit. Dict. art. EXERCISE, and WORDS *of command*. See *Exerciſe of* GUNS.

EXERCISE, in a *Naval Senſe*, is the preparatory practice of managing the artillery and ſmall arms, in order to make the ſhip's crew perfectly ſkilled therein, ſo as to direct its execution ſucceſsfully in time of battle. The words of command introduced, during the late war, for the *exerciſe* of the great guns, are the following: *Silence*; *caſt looſe your guns*; *level your guns*; *take out your tompions*; *run out your guns*; *prime*; *point your guns*; *fire*; *ſponge your guns*; *load with cartridge*; *ſhot your guns*; *put in your tompions*; *houſe your guns*; and *ſecure your guns*. Falconer's Marine Dict. art. EXERCISE.

Exerciſe may alſo denote the execution of the movements, which the different orders and diſpoſitions of fleets occaſionally require, and which the ſeveral ſhips are required to perform, by means of ſignals.

EXERCISES, in the plural, are particularly underſtood of what is taught young gentlemen in the academies, or riding-ſchools, &c. As, riding the great horſe, dancing, fencing, vaulting, drawing fortifications, &c.

EXERGASIA, Ἐξεργασια, *Expoſition*, in *Rhetoric*, a figure, conſiſting of ſeveral equivalent expreſſions, or ſuch as are nearly ſo, in order to repreſent the ſame thing in a ſtronger manner.

EXERGUM, EXERGUE, or EXERGE, among *Medalliſts*, a word, motto, date, or the like, ſometimes found under the ground, whereon the figures are repreſented.

The word is derived from the Greek ἐξ, and ἐργον, *opus*, *work*. Evelyn often writes it *exurge*.

Exergues are moſt commonly placed on the reverſes, though ſometimes, alſo, on the fronts, or face-ſides, of medals.

EXFOLIATION, compounded of *ex*, and *folium*, *leaf*, in *Surgery*, the ſcaling of a bone; or its riſing, and ſeparating in leaves, or laminæ.

Any part of the ſurface of the cranium that has been bared, is liable to *exfoliation*. The wound muſt not be ſtopped too much, but the bone left at liberty to recover itſelf, which it ſometimes does, without *exfoliating*, particularly in children.

EXFOLIATIVE. An *exfoliative* trepan is a trepan proper to ſcrape, and at the ſame time pierce, a bone, and ſo to *exfoliate*, or raiſe, ſeveral leaves, or ſcales, one after another.

The uſe of the *exfoliative* trepan is very dangerous; as being apt to ſhake and diſorder the brain. See RASPATORY, and TREPAN.

EXFREDIARE, in our *Old Writers*, denotes the breaking of the peace, or committing open violence. Leg. Hen. I. cap. 31.

The word is formed from the Saxon *frede*, *peace*.

EX GRAVI QUERELA, in *Law*, a writ that lies for him to whom any lands or tenements in fee are deviſed by will (within any city, town, or borough, wherein lands are deviſable by cuſtom) and the heir of the deviſor enters, and detains them from him. Reg. Orig. 244. Old Nat. Br. 87. And if a man deviſes ſuch lands or tenements unto another in tail, with remainder over in fee, if the tenant in tail enter, and is ſeiſed by force of the intail, and afterwards dieth without iſſue, he in the remainder ſhall have the writ, *ex gravi querela*, to execute that deviſe. New Nat. Br. 441. Alſo where a tenant in tail dies without iſſue of his body, the heir of the donor, or he who hath the reverſion of the land, ſhall have this writ, in the nature of a *formedon* in the reverter. Ibid.

EXHÆREDATIO. See EXHEREDATION.

EXHALATION, a fume, or ſteam, *exhaling*, or iſſuing, from a body, and diffuſing itſelf in the atmoſphere.

The terms *exhalation* and *vapour* are ordinarily uſed indifferently, but the more accurate writers diſtinguiſh them; appropriating the term *vapour* to the moiſt fumes raiſed from water and other liquid bodies; and *exhalation* to the dry ones emitted from ſolid bodies; as earth, fire, minerals, ſulphurs, ſalts, &c.

In this ſenſe, *exhalations* are dry, ſubtil corpuſcles, or effluvia, looſened from hard terreſtrial bodies, either by the heat of the ſun, or the agitation of the air, or ſome other cauſe; and emitted upwards to a certain height of the atmoſphere, where, mixing with the vapours, they help to conſtitute clouds, and return back again in dews, miſts, rains, &c.

Sir Iſaac Newton takes true and permanent air to be formed from the *exhalations* raiſed from the hardeſt and moſt compact bodies. See AIR, DAMP, EVAPORATION, and VAPOUR.

EXHAUSTED *receiver*, a glaſs, or other veſſel, applied on the plate of an air-pump, and having the air extracted out of it by the working of the engine. See AIR-*pump*.

Things placed in an *exhauſted receiver*, are ſaid to be *in vacuo*. See VACUUM.

EXHAUSTIONS, in *Mathematics*. Method of *exhauſtions*, is a way of proving the equality of two magnitudes, by a *reductio ad abſurdum*; ſhewing, that if one be ſuppoſed either greater or leſs than the other, there will ariſe a contradiction.

The *method of exhauſtions* was of frequent uſe among the ancient mathematicians; as Euclid, Archimedes, &c.

It is founded on what Euclid ſays in his tenth book; viz. that thoſe quantities whoſe difference is leſs than any aſſignable quantity, are equal; for if they were unequal, be the difference never ſo ſmall, yet it may be ſo multiplied, as to become greater than either of them; if not ſo, then it is really nothing.

This he aſſumes in the proof of prop. 1. book x. which imports,

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imports, that if, from the greater of two quantities, you take more than its half, and from the remainder more than its half, and ſo continually, there will, at length, remain a quantity leſs than either of thoſe propoſed.

On this foundation it is demonſtrated, that if a regular polygon of infinite ſides be inſcribed in, or circumſcribed about, a circle; the ſpace, which is the difference between the circle and the polygon, will, by degrees, be quite exhauſted, and the circle become equal to the polygon.

EXHEBENUM, in *Natural Hiſtory*, the name of a white and ſmooth ſtone, uſed by the ancient artificers in poliſhing gold. It ſeems to be the ſame with the lapis Samius, a ſmall ſmooth ſtone which they often found in the Samian earth.

EXHEREDATION, EXHÆREDATIO, in the *Civil Law*, with us ordinarily called *diſinheriting*, is the father's excluding his ſon from inheriting his eſtate.

There are fourteen cauſes of *exheredation* expreſſed in Juſtinian's Novel; without ſome one of which cauſes, he decrees the *exheredation* null, and the teſtament inofficious, as the civilians call it.

Indeed, by the ancient Roman law, the father might pronounce *exheredation* without any cauſe; but the rigour of this law was reſtrained, and moderated, by Juſtinian.

EXHIBIT, in *Law*. When a deed, acquittance, or other writing, is, in a chancery ſuit, *exhibited* to be proved by witneſs; and the examiner writes on the back, that it was ſhewed to the witneſs at the time of his examination: this is called an *exhibit*.

EXHIBITION, a producing, or ſhewing, of titles, authorities, and other proofs, of a matter in conteſt.

Anciently, they uſed the phraſe, *exhibition* of a tragedy, comedy, or the like; but now we ſay *repreſentation*, in lieu thereof.

EXHIBITION, *Exhibitio*, in our *Old Writers*, is uſed for an allowance of meat and drink, ſuch as was cuſtomary among the religious appropriators of churches, who uſually made it to the depending vicar. The benefactions ſettled for the maintaining of ſcholars in the univerſities, not depending on the foundation, are alſo called *exhibitions*.

EXHORTATION, *Hortatio*, in *Rhetoric*, differs only from *ſuaſion*, in that the latter principally endeavours to convince the underſtanding, and the former to work on the affections.

EXHUMATION, of *ex*, *out of*, and *humus*, *ground*, the act of digging up a body interred in holy ground, by the authority of the judge.

In France, the *exhumation* of a dead body is ordered, upon proof that he was killed in a duel. By the French laws, a parſon has a right to demand the *exhumation* of the body of one of his pariſhioners, when interred out of the pariſh, without his conſent.

EXIGENCE, or EXIGENCY, that which a thing requires, or which is expedient and ſuitable thereto.

EXIGENT, in *Law*, a writ which lies where the defendant, in a perſonal action, cannot be found, nor any thing of his within the county, whereby to be attached, or diſtrained.

It is directed to the ſheriff, ordering him to proclaim and call the party five county-court days ſucceſſively, and charge him to appear, under pain of outlawry.

The ſame writ alſo lies in an indictment of felony, where the party indicted cannot be found.

It is called an *exigent*, becauſe it *exigit*, i. e. *exacts*, or requires the party to appear, or, by forthcoming, to anſwer the law. If he appear not at the laſt day's proclamation, he is ſaid to be *quinquies exactus*, and then is outlawed. See OUTLAWRY.

EXIGENTERS, four officers of the court of common pleas, who make all *exigents* and proclamations, in all actions where the proceſs of outlawry lies.

Anciently, the making writs of *ſuperſedeas* upon ſuch *exigents* as paſſed in their offices, did likewiſe belong to them; but this branch of buſineſs was taken from them under king James I. and committed to a particular officer in the court of common-pleas, created by patent. See SUPERSEDEAS.

EXILE, *baniſhment*. See BANISHMENT.

Among the Romans, the word *exile*, *exilium*, properly ſignified an interdiction, or excluſion from water and fire; the neceſſary conſequence of which was, that the interdicted perſon muſt betake himſelf into ſome other country, ſince there was no living without fire and water.

Thus, Cicero, Ad Herenn. obſerves, that the form of the ſentence did not expreſs *exile*, but only *aquæ & ignis interdictio*. See INTERDICTION.

The ſame author remarks, that *exile* was not properly a puniſhment, but a voluntary flying, or avoiding the puniſhment decreed: Exilium *non eſſe ſupplicium, ſed perfugium, portuſque ſupplicii*. Pro Cæcina.

He adds, that there was no crime among the Romans, as among other nations, puniſhed with *exile*; but *exile* was a recourſe people flew voluntarily to, in order to avoid chains, ignominy, ſtarving, &c.

The Athenians frequently ſent their generals, and great men, into *exile*, out of envy of their merits, or diſtruſt of their too great authority.

EXILE is ſometimes alſo uſed for the relegating a perſon into a place, whence he is obliged not to ſtir without leave.

The word is derived from the Latin *exilium*, or from *exul*, a baniſhed perſon; and that, probably, from *extra ſolum*, out of his native ſoil.

Figuratively, we uſe the phraſe, *honourable exile*, for an office, or employment, which obliges a man to reſide in ſome remote or diſagreeable place.

Under the reign of Tiberius, remote employments were a kind of myſterious *exiles*. A biſhoprick, or even a lord-lieutenancy, in Ireland, has been ſometimes deemed a kind of *exile*. A reſidence, or embaſſy, in ſome barbarous country, is alſo a ſort of *exile*.

EXILIUM, in *Law*, ſignifies a ſpoiling; and, by the ſtatute of Marlbridge, it ſeems to extend to the injury done to tenants, by altering their tenure, ejecting them, &c. And this is the ſenſe that Fleta determines; who diſtinguiſhes between *vaſtum*, *deſtructio*, and *exilium*. For he tells us, that *vaſtum* and *deſtructio* are almoſt the ſame, and are properly applied to houſes, gardens, or woods; but *exilium* is when ſervants are enfranchiſed, and afterwards unlawfully turned out of their tenements. Flet. lib. i. cap. 11. Stat. Marlb. cap. 25.

EXINANITION, the ſame as EVACUATION.

EXISTENCE, that whereby a thing has an actual eſſence, or is ſaid *to be*, *eſſe*.

The notion of *exiſtence* is applicable not only to a created but an uncreated ſubſtance: but it muſt be added, that the *exiſtence* of created ſubſtances, and eſpecially corporeal ones, implies a reſpect to place, time, and even an efficient cauſe; whence the ſchoolmen generally define it, that whereby a thing is formally and extrinſically without [*extra*] its cauſes, and that here, and now.

Exiſtence and eſſence come very near the nature of each other; in effect, they only differ in that we have different manners of conceiving the ſame thing.

For, 1. Eſſence is uſually explained either by the firſt, nobleſt, and radical attribute of the thing, e. gr. that of body, by extenſion; that of mind, by thinking, &c. or by ſpecifying all the intrinſic attributes; and *exiſtence*, either by ſpecifying all place, and all time, as in that of God; or by ſpecifying ſome definite place, and time, together with the cauſe, as in the creatures.

2. The foundation and occaſion of this diſtinction is this; that eſſence belongs to the queſtion, *What is it? Quid eſt?* but *exiſtence* to the queſtion, *Is it? An eſt?*

3. *Exiſtence* neceſſarily pre-ſuppoſes eſſence, and cannot be conceived without it; but eſſence may be conceived without *exiſtence*; in that eſſence belongs equally to things that are in *potentia*, and in *actu*; but *exiſtence* only to thoſe in *actu*. Note, however, that this does not obtain in God, about whoſe nature and eſſence the mind cannot think without conceiving his *exiſtence*.

We have divers ways of arriving at the knowledge of the *exiſtence* of things. Our own *exiſtence* we know by intuition; the *exiſtence* of a God, by demonſtration; and that of other things, by ſenſation.

As for our own *exiſtence*, we perceive it ſo plainly, that it neither needs, nor is it capable of any proof. In every act of ſenſation, reaſoning, or thinking, we are conſcious to ourſelves of our own being, and in this matter come not ſhort of the higheſt degree of certainty.

As to our knowledge of the *exiſtence* of a god, though he has given us no innate ideas of himſelf, yet, having furniſhed us with faculties of ſenſe, perception, and reaſon, we can never want a clear proof thereof. See GOD.

The knowledge of the *exiſtence* of other things, i. e. of external objects, bodies, a world, &c. we only have by ſenſation; for there being no neceſſary connection of real *exiſtence* with any idea a man hath in his memory, nor of any other *exiſtence* but that of God, with the *exiſtence* of any particular man; no particular man can know the *exiſtence* of any other being, but only when, by actually operating upon him, it makes itſelf be perceived by him. The having the idea of any thing in our mind, no more proves the *exiſtence* of that thing than the picture of a man evidences his being in the world, or the viſions of a dream make a true ſtory. It is, therefore, the actual receiving of ideas from without that gives us notice of the *exiſtence* of other things, and makes us know that ſomething doth *exiſt* at that time without us, which cauſes that idea in us, though we neither know nor conſider how it doth it.

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This notice which we have by our ſenſes, of the *exiſtence* of things without us, though it be not altogether ſo certain as intuition and demonſtration, yet deſerves the name of knowledge, if we perſuade ourſelves, that our faculties act and inform us right concerning the *exiſtence* of thoſe objects that affect them.

Now, beſides the aſſurance of our ſenſes themſelves, that they do not err in the information they give us of the *exiſtence* of things without us, we have other concurrent reaſons; as. 1. It is plain thoſe perceptions are produced in us by exterior cauſes affecting our ſenſes; becauſe thoſe that want the organs of any ſenſe never have the ideas belonging to that ſenſe produced in their minds. 2. Becauſe we find we cannot avoid having thoſe ideas produced in our minds. When our eyes are ſhut, we can at pleaſure recal to our mind the ideas of light or the ſun, which former ſenſations had lodged in our memories; but if we turn our eyes towards the ſun, we cannot avoid the idea which the light or the ſun then produces in us, which ſhews a manifeſt difference between thoſe ideas laid up in the memory, and ſuch as force themſelves upon us, and we cannot avoid having; beſides, there is no one who doth not perceive the difference in himſelf between actually looking upon the ſun, and contemplating the idea he has of it in his memory; and therefore he hath certain knowledge, that they are not both memory or fancy. 3. Add to this, that many ideas are produced in us with pain, which we afterwards remember without the leaſt offence; thus, the pain of heat, or cold, when the idea of it is received in our minds, gives us no diſturbance, which, when felt, was very troubleſome; and we remember the pain of hunger, thirſt, head-ach, &c. without any pain at all, which would either never diſturb us, or elſe conſtantly do it, as often as we thought of it, were there nothing more but ideas floating in our minds, and appearances entertaining our fancies, without the real *exiſtence* of things affecting us from abroad. 4. Our ſenſes, in many caſes, bear witneſs to the truth of each others report concerning the *exiſtence* of ſenſible things without us: he that doubts, when he ſees a fire, whether it be real, may feel it too if he pleaſes; and, by the exquiſite pain, may be convinced, that it is not a bare idea or phantom. Such is Mr. Locke's demonſtration of the *exiſtence* of external bodies.

The ingenious Dr. Berkeley has a different ſyſtem: external bodies, he contends, have no *exiſtence*, but in a mind perceiving them; that is, they only *exiſt*, *quatenus*, they are perceived; and of this he has given us what he and many others account a demonſtration.

In reality, "that neither our thoughts, paſſions, nor "ideas, formed by the imagination, exiſt without the "mind, he obſerves, is allowed; and that the various "ſenſations impreſſed on the mind, whatever objects "they compoſe, cannot exiſt otherwiſe than in a mind "perceiving them, is not leſs evident. This appears "from the meaning of the term *exiſt*, when applied to "ſenſible things. Thus, the table I write on, *exiſts*, i. e. "I ſee and feel it; and were I out of my ſtudy, I ſhould "ſay it *exiſted*; i. e. that were I in my ſtudy I ſhould ſee "and feel it as before. There was an odour; i. e. I "ſmelt it, &c. but the *exiſtence* of unthinking beings, "without any relation to their being perceived, is un-"intelligible, their *eſſe* is *percipi*." The notion of bodies, he endeavours to ſhew, is founded on the doctrine of abſtract ideas: "What are light and colours, heat "and cold, extenſion and figure; in a word, the things "we ſee and feel, but ſo many ſenſations, notions, ideas, "or impreſſions on the ſenſe? And is it poſſible to ſe-"parate, even in thought, any of theſe from perception? "The ſeveral bodies, then, that compoſe the frame of "the world, have not any ſubſiſtence without a mind: "their *eſſe* is to be perceived or known; and as long as "they are not perceived by me, nor any other thinking "being, they have no ſhadow of *exiſtence* at all. The "things we perceive, are colour, figure, motion, &c. "that is, the idea of thoſe things; but has an idea any "*exiſtence* out of the mind? To have an idea is the "ſame thing as to perceive; that, therefore, wherein "colour, figure, &c. exiſt, muſt perceive them. It is "evident, therefore, there can be no unthinking ſub-"ſtance or ſubſtratum of thoſe ideas: but you may argue, "if the ideas themſelves do not exiſt without the mind, "there may be things like them, whereof they are co-"pies or reſemblances which exiſt without the mind; "it is anſwered, an idea can be like nothing but an "idea; a colour or figure can be like nothing elſe but "another figure or colour. It may be farther aſked, "whether thoſe ſuppoſed originals, or external things, "whereof our ideas are the pictures, be themſelves per-"ceivable or not? If they be, they are ideas; if they "be not, I appeal to any one, whether it be ſenſe to "ſay, a colour is like ſomewhat which is inviſible; "hard or ſoft, like ſomewhat intangible, &c. Some "diſtinguiſh between primary and ſecondary qualities; "the former, viz. extenſion, ſolidity, figure, motion, "reſt, and number, they maintain have a real *exiſtence* "out of the mind; as for the latter, under which come "all other ſenſible qualities, as colours, ſounds, taſtes, "&c. they allow the ideas we have of them are not re-"ſemblances of any things exiſting without the mind, "or unperceived, but depend on the ſize, texture, mo-"tion, &c. of the minute particles of matter. Now, "it is certain, that thoſe primary qualities are inſepar-"ably united with the other ſecondary ones, and cannot "even in thought be abſtracted from them, and there-"fore muſt only exiſt in the mind. Can any man con-"ceive the extenſion and motion of a body without its "other ſenſible qualities? For my part, I find it im-"poſſible to frame an idea of a body extended and mov-"ing, without giving it ſome colour, &c. In effect, "extenſion, figure, and motion, abſtracted from all "other qualities, are inconceivable; where the others, "therefore, are, there theſe too muſt be, i. e. in the "mind, and no where elſe. Again, great and ſmall, "ſwift and ſlow, are allowed to exiſt no-where with-"out the mind, being merely relative and changing, as "the frame or poſition of the organ changes: the ex-"tenſion, therefore, that exiſts without the mind, is "neither great nor ſmall, the motion neither ſwift nor "ſlow; i. e. they are nothing. That number is a crea-"ture of the mind, is plain (even though the other "qualities were allowed to exiſt) from this; that the "ſame thing bears a different denomination of number, "as the mind views it with different reſpects; thus, the "ſame extenſion is 1, or 3, or 36, as the mind con-"ſiders it, with reference to a yard, a foot, or an inch. "Nay, many of the modern geometricians hold, that a "finite line may be divided into an infinite number of "parts, and each of thoſe infiniteſimals into an infinity "of others; and ſo on, *in infinitum*; ſo that the ſame "thing is either unity or infinity, either no number or "all number. In effect, after the ſame manner as the "modern philoſophers prove colours, taſtes, &c. to "have no *exiſtence* in matter, or without the mind; the "ſame thing may be proved of all ſenſible qualities "whatſoever: thus, they ſay, heat and cold are only "the affections of the mind, not at all patterns of real "beings exiſting in corporeal ſubſtances; becauſe the "ſame body which ſeems cold to one hand ſeems warm "to another. Now, why may we not as well argue, "that figure and extenſion are not patterns or reſemb-"lances of qualities exiſting in matter; becauſe to the "ſame eye, at different ſtations, or to eyes of different "ſtructure, at the ſame ſtation, they appear various? "Again, ſweetneſs, it is proved, does not exiſt in the "thing ſapid, becauſe the thing remaining unaltered, "the ſweetneſs is changed to bitterneſs, as in a fever, "or by an otherwiſe vitiated palate. Is it not as reaſon-"able to ſay, that motion does not exiſt out of the mind? "ſince, if the ſucceſſion of ideas in the mind become "ſwifter, the motion, it is acknowledged, will appear "ſlower, without any external alteration. Again, were "it poſſible for ſolid figured bodies to exiſt out of the "mind, yet it were impoſſible for us ever to know it: "our ſenſes, indeed, give us ſenſation of ideas, but do "not tell us that any things exiſt without the mind, or "unperceived, like thoſe which are perceived: this the "materialiſts allow. No other way therefore remains, "but that we know them by reaſon's inferring their "*exiſtence* from what is immediately perceived by ſenſe. "But how ſhould reaſon do this, when it is confeſſed, "there is not any neceſſary connection between our ſen-"ſations and theſe bodies? It is evident, from the "phenomena of dreams, phrenſies, &c. that we may be "affected with the ideas we have now, though there "were no bodies exiſting without them; nor does the "ſuppoſition of external bodies at all forward us, in "conceiving how our ideas ſhould come to be produced. "The materialiſts own themſelves unable to conceive in "what manner body can act on ſpirit, or how it ſhould "imprint any idea on the mind. To ſuppoſe, there-"fore, bodies exiſting without the mind, is little elſe "than to ſuppoſe God has created innumerable beings "entirely uſeleſs, and ſerving to no purpoſe at all. On "the whole, it appears, that the *exiſtence* of bodies out "of a mind perceiving them, is not only impoſſible, and "a contradiction in terms; but were it poſſible, nay "real, it were impoſſible we ſhould ever know it. And "again, that ſuppoſing that there are no ſuch things, "yet we ſhould have the very ſame reaſon to ſuppoſe "there were that we now have. Suppoſe, e. gr. an in-"telligence affected with the ſame train of ſenſations, "impreſſed in the ſame order, and with the ſame vivid-"neſs,

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" neſs, would it not have all the reaſon to believe the " *exiſtence* of bodies repreſented by his ideas that we have? " All our ideas and ſenſations are viſibly inactive; nay, " the very being of an idea implies paſſiveneſs and in- " ertneſs; ſo that it is impoſſible for an idea to do any " thing, or, in ſtrictneſs, be the cauſe of any thing; it " cannot, therefore, be the reſemblance or pattern of " any active being, unleſs oppoſites can be ſaid to re- " ſemble one another. Now, we find a continual ſuc- " ceſſion of ideas in the mind; but theſe, it has been " proved, do not depend on any external body as their " cauſe; it remains, therefore, that their cauſe is an in- " corporeal active ſubſtance or ſpirit: for that I am not " the cauſe of my own ideas, is plain from this, that " when I open my eyes in broad day-light, I cannot help " ſeeing various objects. Now, the fixed rules or me- " thods wherein the mind we depend on excites in us " the ideas of ſenſe, are called *laws of nature*; theſe we " learn by experience, which teaches us, that ſuch and " ſuch ideas are attended with ſuch and ſuch other ideas " in the ordinary courſe of things. Ideas are not any " how, and at random, produced; there is a certain " order and connection eſtabliſhed among them like " that of cauſe and effect; and there are ſeveral combi- " nations of them made in a very regular artful manner, " which we call *bodies*; and the ſyſtem of thoſe, *the* " *world*. In ſtrictneſs, however, the connection of ideas " does not imply the relation of cauſe and effect, but " only of a mark or ſign of the thing ſignified: the fire " I ſee is not the cauſe of the pain I feel, but the mark " that forewarns me of it; the noiſe I hear is not the " effect of this or that motion or colliſion of natural bo- " dies, but the ſign thereof. The Carteſians own ſome- " what like this: the action of bodies in our organs, ſay " they, is not the efficient cauſe of our ideas and per- " ceptions, but only the occaſional cauſe, which deter- " mines God to act on the mind, according to the laws " of the union of the ſoul and body." See CAUSE.

Dr. Berkeley, indeed, taking away bodies, takes away what theſe philoſophers account the occaſions of their ideas: " by an occaſion, he ſays, muſt either be meant " the agent that produces an effect, or ſomething ob- " ſerved to accompany or go before it in the ordinary " courſe of things; but matter is allowed to be paſſive " and inert, and cannot therefore be an agent or efficient " cauſe; and this matter primitively, and in itſelf, is al- " lowed imperceivable, and devoid of all particular ſen- " ſible qualities; i. e. it has not this or that particular " colour, this or that particular figure, &c. but has co- " lour in the general, figure in the abſtract, &c. but an " abſtract is no object of ſenſe; matter, therefore, can- " not be the occaſion of our ideas in the latter ſenſe." See Berkel. Princip. of Human Knowl. See ABSTRACTION.

How far the great argument of the maintainers of a material world from the impoſſibility of God's deceiving us, and from the evidence that he does ſo, if there be no ſuch thing, will go againſt this reaſoning, we leave to the reader. See Stanl. Hiſt. Philoſoph. part xii. p. 816. where the objections of the ancient Pyrrhoniſt to the *exiſtence* of bodies are recited.

As to the *exiſtence* of ſpirits, Mr. Locke allows, that our having ideas of them does not make us know that any ſuch things do exiſt without us; or that there are any finite ſpirits, or any other ſpiritual beings, but God. We have ground from revelation, and ſeveral other reaſons, to believe with aſſurance that there are ſuch creatures; but our ſenſes being not able to diſcover them, we want the means of knowing their particular *exiſtence*; for we can no more know that there are finite ſpirits really exiſting by the idea we have of ſuch beings, than by the ideas any one has of fairies or centaurs, he can come to know that things anſwering to thoſe ideas do really exiſt.

EXIT, properly expreſſes the departure of a player from off the ſtage, when he has acted his part.

The word is alſo uſed in a figurative ſenſe, to expreſs any kind of departure, even death.

EXITERIA, Εξίτηρια, in *Antiquity*, oblations or prayers to any of the gods for a proſperous expedition or journey.

There were alſo feaſts under this denomination, which were celebrated by the Greeks with ſacrifices and prayers, when their generals undertook expeditions againſt any enemy.

EXITUS, in *Law*, *iſſues*, the yearly rents or profits of lands or tenements. See ISSUE, &c.

EXLEGALITUS, in *Law*, the ſame with an outlawed perſon. See OUTLAW.

EX MERO MOTU, formal words uſed in the king's charters and letters patent, ſignifying that he does what is contained therein of his own will and motion.

The effect of theſe words is to bar all exceptions that might be taken to the inſtrument, by alledging that the prince in paſſing ſuch charter was abuſed by falſe ſuggeſtion.

EXOCATACŒLUS, in *Antiquity*, a general denomination, under which were included ſeveral grand officers of the church at Conſtantinople; as, the grand œconomus, grand ſacellarius, grand maſter of the chapel, grand ſcevo-phylax or keeper of the veſſels, grand chartophylax, the maſter of the little chapel, and the protecdicus, or firſt advocate of the church.

There are many opinions with reſpect to the etymology of this term. F. Goar apprehends, that all the interior prieſts were called Κατακοιτοι, *catacœli*, q. d. people of a low condition; and that their ſuperiors were called *exocatacœli*, q. d. people out of the number of *catacœli*, or above them. Upon the whole, however, he adheres to the ſentiment of G. Coreſius, who ſays, that the patriarchal palace, and the apartments of the ſyncellus, and of the monks in the patriarch's ſervice, were in a very low part of the city, which, with regard to the reſt, ſeemed a valley or pit; and that the officers above mentioned had their ſeveral houſes or palaces εξω, out of the valley; whence the name *exocatacœli*. M. Du-Cange derives the appellation from their being above the level or rank of the other clerks, and ſeated at church, &c. in more honourable places erected for that purpoſe on either ſide of the patriarch's throne.

The *exocatacœli* were of great authority: in public aſſemblies they had the precedence of biſhops; and in the patriarchate of Conſtantinople did the office of deacons, as the cardinals originally did in the church of Rome. Accordingly, in the letter of John IX. to the emperor Baſilius Leo, they are called *cardinales*.

At firſt they were prieſts; but ſome patriarchs of Conſtantinople, whom Codin does not mention, would have them for the future to be no more than deacons. The reaſon was, that being prieſts, each of them had their ſeveral churches, wherein they were to officiate on all the grand feſtival days; ſo that it unhappily fell out, the patriarch on the moſt ſolemn days was deſerted by all his chief miniſters.

EXOCIONITÆ, EXOCIONITES, in *Church Antiquity*. The Arians were firſt called *Exocionites*; becauſe, when expelled the city by Theodoſius the Great, they retired into a place called *Exocionium*, and there held their aſſemblies. Juſtinian gave the orthodox all the churches of the heretics, excepting that of the *Exocionites*.

The word is derived from Εξακιονιον, or Εξωκιονιον, the name of the place above-mentioned. Codin, in his Origines, ſays, that the *Exocionium* was a place encompaſſed with a wall, built and adorned by Conſtantine; and that without the circumference of the wall there was a column, with a ſtatue of that emperor, whence the place took its name, viz. from εξω, *without*, and κιων, *column*.

EXOCŒTUS, in *Ichthyology*, the name of a genus of fiſhes, of the order of *abdominales* in the Linnæan ſyſtem, and in the Artedian, of the malacopterygious or ſoft finned kind; the characters of which are theſe: the branchioſtege membrane contains ten bones, four of which are broad, and are covered by the opercula of the gills, and all of them are very difficult to be counted. The pectoral fins are very long: there is but one fin on the back, and that is placed toward the lower part of it. The ſcales are large. Artedi and Linnæus enumerates only two ſpecies of this genus. See Tab. Fiſh. No. 41. and art. FLYING-*fiſh*.

EXODIARY, EXODIARIUS, in the *Ancient Roman Tragedy*, was a droll, or mime, who appeared on the ſtage when the tragedy was ended, and performed what they called the *exodium*, or concluſion of the ſhew, to divert the company.

EXODIUM, Εξοδιον, in the *Ancient Greek Drama*, was one of the four parts or diviſions of a tragedy.

The word is formed from the Greek, εξοδος, *going out*, *digreſſion*, of εξ and οδος, *way*, *road*. Feſtus, lib. v. calls it *exitus*.

The *exodium*, according to Ariſtotle, was ſo much as was rehearſed after the chorus had ceaſed to ſing for the laſt time; ſo that *exodium* with them was far from being what the epilogue is with us, as ſeveral people have imagined it was.

The *exodium* was ſo much of the piece as included the cataſtrophe and unravelling of the plot; which cataſtrophe, &c. in pieces regularly compoſed, always began after the laſt ſinging of the chorus, anſwering nearly to our fourth and fifth acts. M. Dacier's Comment. on Ariſtotle's Poetics, chap. 12. See CATASTROPHE and CHORUS.

Among the Romans the *exodium* was a different thing; it was pretty nearly what farces are with us. After the tragedy was over, came a pantomime on the ſtage, call-

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ed the *exodiarius*, who, by his grimace, jesting and buffoonery, diverted the people, composed their minds, and wiped away the tears which the tragic spectacle had occasioned to be shed.

Viginere on T. Livy, says, the *exodium* consisted of certain humorous, drolling verses, rehearsed by the youth at the end of the *fabulæ atellanæ*, and answering to our farces. In another place, the same author says, that the *exodia* were a kind of interludes in the intervals between the acts, partly fable and pleasantry, partly music, &c. to give time both for the spectators and actors to recover breath. The passage in Livy whence he takes the notion is lib. vii. dec. 1. *Ridicula intexta versibus, quæ juventus inter se more antiquo jactare cœpit, eaque conserta sunt fabulis potissimum atellanis.* See also Juvenal:

Urbicus exodio *risum movet atellanæ*
Gestibus Antonoes.

EXODIUM, in the *Septuagint*, signifies the end or conclusion of a feast.

The Hebrew text calls the day עצרת, which the seventy render Εξοδιον.

In particular, *exodion* is used for the eighth day of the feast of tabernacles, which, it is said, had a special view to the commemoration of the Exodus, or departure out of Egypt, though there is nothing of it expressed in scripture.

EXODIUM, was also the name of a song sung at the conclusion of a meal or feast.

EXODUS, the second of the five books of Moses.

The word in its original Greek, Εξοδος, literally imports a *going out*, or *journey*; and was applied to this book, because the history of the Israelites' passage out of Egypt is related therein. Beside this, it contains the story of what was transacted in Egypt from the death of Joseph to the delivery of the Jews; as well as what passed in the wilderness, and particularly at mount Sinai, to the building of the tabernacle.

The Hebrews call it *veelle semoth*, q. d. *hæc nomina*, these are the initial words of the book; for the same reason they call Genesis, *beresith*, q. d. *in principio, in the beginning.*

EX OFFICIO, denotes the power a person has in virtue of his office, to do certain things without being applied to.

By a branch of statute 1 Eliz. the queen, by her letters patent, might authorise any persons exercising ecclesiastical jurisdiction to administer an oath, *ex officio*, whereby supposed offenders were forced to confess, accuse, or clear themselves of any criminal matter, &c. but this branch relating to this oath is repealed by 17 Car. I. cap. 11.

EX OFFICIO *Informations.* See INFORMATIONS.

EXOLICETUS, in *Natural History*, a name used among the writers of the middle ages, to express a small stone which had such a variety of colours that it dazzled, as they say, people's eyes in looking at them. It is said to have been found in Lybia. The name is probably only a corruption of the hexacontalithos of Pliny and the older writers; and this seems to have been no other than a name for the opal.

EXOMIS, of εξ, *out of*, and ωμος, *shoulder*, in *Antiquity*, a strait narrow garment through which the shoulders appeared. It had something in common with the tunic, and something with the pallium. It was worn by slaves, servants, and the lower classes of people among the Romans.

EXOMOLOGESIS, Εξομολογησις, formed of Εξομολογεω, *I confess*, a term little used but in speaking of the ancient ceremonies of repentance, whereof the *exomologesis*, by us called *confession*, was a part.

Some of the ancients, and particularly Tertullian, de Pœnit. cap. 9. use the word in a greater latitude, as comprehending the whole of repentance.

A public *exomologesis* was never commanded by the church for secret sins, as may be seen in the capitulars of Charlemagne, and the canons of divers councils.

EXOMPHALUS, Εξομφαλος, of εξ, *out*, and ομφαλος, *navel*, in *Surgery*, a general name, comprehending all kinds of navel-ruptures. The first are tumours or swellings of the solid parts, whereof there are three varieties, denominated from the several parts affected, as the *enteromphalus, epiplomphalus*, and *entero-epiplomphalus.* The second are tumours formed by collections and gatherings of humours, of which there are four varieties, distinguished by the particular humours they are formed of, as the *hydromphalus, pneumatomphalus, sarcomphalus*, and *varicomphalus.* The third are those compounded of both the other, viz. the *enterohydromphalus* and *epiplosarcomphalus.* See each species under its several head.

In one of those cases which Mr. Mery has given an account of, the infant was born alive, but died after fourteen hours; the tumour was very large; and on opening it the liver, spleen, stomach, and intestines, were found all inclosed in it; yet its aperture at the navel was but little more than an inch in diameter. The most natural conjecture in this case, seemed that the viscera had been forced out of the body by some accident during pregnancy, and that the peritoneum, as they enlarged in growth, had extended itself by degrees to the dimensions of this sack: but, on a strict enquiry, the sack was found to be composed of a double membrane; so that it could not be a production of the peritoneum, which is single, but it must necessarily have been an extension of the membranes of the placenta, which, uniting, form the umbilical cord; and it was not less easy to determine that the viscera could not have been forced out of the body when at any considerable growth, as the aperture was so small, the liver alone being of six times its diameter. It appears, therefore, that in these cases the viscera get out while very small, and grow and enlarge in their unnatural situation. The parent of the infant being asked if she had received any injury during her pregnancy, could not recollect any; but only observed, that while young with child, she had been very strongly affected by the sight of the entrails of an ox hanging out of its belly at a butcher's. Mem. Acad. Par. 1716. See HERNIA.

EXONEIROSIS, from εξ, *out*, and ονειρος, *dream*, a nocturnal pollution or emission of the semen in dreams. This, if it happens but rarely, is usually a sign only of redundant vigour; but if it happens frequently, is a sign of weakness of the seminal vessels, which is most frequently the case.

EXONERATIONE *sectæ*, in *Law*, a writ that lay for the king's ward, to be freed from all suit to the county-court, hundred-court, leet, &c. during the wardship. F. N. B. 158.

EXONYCHOS, of εξω, *without*, ονυξ, and *nail*, in *Botany*, a name given by some of the ancient writers, among whom are Dioscorides and Pliny, to the GROMWELL or lithospermum. See ŒGONYCHUS.

EXOPHTHALMIA, of εξ, *out*, and οφθαλμος, *eye*, in *Surgery*, is a protuberance of the eye out of its natural position.

EXORCISM, Εξορκισμος, prayers or conjurations wherewith to *exorcise*, i. e. drive out devils or demons from persons apprehended to be possessed, or to preserve from danger. The word is derived from the Greek, εξορκιζειν, *adjurare, conjurare, to adjure*, or *conjure.* In most dictionaries, *exorcism* and conjuration are used as synonymous; but, in reality, conjuration is only a part of the *exorcism*; and the *exorcism* the ceremony entire. The conjuration is properly the formula, where the devil is commanded to come forth; &c.

Exorcisms are of great use in the Romish church: their prelates, &c. are frequently exorcising dæmoniacal persons. The priests make holy water by exorcising common water a certain number of times. In reality, the *exorcism* is a part in most of their consecrations.

Exorcisms had anciently another and farther purpose; being applied by way of trial or purgation to extort the truth from the accused.

The *exorcism*, in this sense, was a sort of bread conjured and exorcised for the purpose; and the opinion was, that if the person was criminal he could not swallow the bread.

This, it seems, was a frequent practice in the time of our Edward III. and the bread thus exorcised was said to be CORSNED.

Linderbroeck gives instances of *exorcisms* with barley-bread, and others with cheese; and hence, probably, might arise that popular imprecation, "May this bread "choak me, if I tell a lye." See ORDEAL and JUDICIUM *Dei.*

EXORCIST, in the *Romish Church*, a priest, or tonsured clerk who has received the four lesser orders, one of which is that of *exorcist.*

The term is likewise applied to a prelate, or to a priest delegated by a prelate, who actually exorcises a person possessed.

It is a dispute among divines whether ever the Greeks had any such order as that of *exorcist.* Fa. Goar, in his Notes on the Greek Euchologion, has made it probable they had, from several concurring passages in St. Dionysius and St. Ignatius Martyr.

The ordination of *exorcists* is performed in the time of mass, their principal office being to expel devils. The fourth council of Carthage, can. 7. appoints, that in the ordination of *exorcists*, the bishop, putting the book of exorcisms in their hands, shall say these words: "Re-"ceive it, and keep it in remembrance, and have power "to lay hands on *energumeni*, whether baptised or cate-"chumens;" which form still obtains.

M. Fleury

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M. Fleury mentions certain people among the Jews who travelled round the country, making profeſſion of driving out devils by invocations, which, they pretended, had been taught them by Solomon: theſe were alſo called *exorciſts*. See Joſeph. Antiq. Jud. lib. viii. cap. 2. Origen. Tract. xxxv. in Matt. 35. 63.

EXORDIUM, in *Oratory*, the preamble, or beginning of a diſcourſe or ſpeech, ſerving to prepare the audience, and introduce the matter in hand.

The word is formed from the Latin, *ordiri*, *to begin*, by a metaphor taken from the weavers, who are ſaid, *ordiri telam*, *to begin* or *warp* a web by diſpoſing and ordering the threads in a certain manner for the future work. See WARP.

The *exordium*, on other occaſions, is called the *prologue*, *prælude*, *and proem*.

Cicero defines *exordium*, a part of an oration, whereby the minds of the audience are duly prepared for what remains to be ſaid. The *exordium* is a part of principal importance, and is to be laboured with extraordinary care; whence Tully calls it *difficillima pars orationis*.

Exordiums are of two kinds; either juſt and formal, or vehement and abrupt. In the firſt, the audience is prepared and conducted by due and eaſy ſteps; in the ſecond, the orator, as if ſeized with ſome ſudden paſſion, breaks out upon his audience at once. Such is that *exordium* of Iſaiah; *Hear, Oh heavens! and give ear, Oh earth!* Or that of Cicero againſt Catiline: *Quouſque tandem abutere patientia noſtra, Catilina?* Abrupt *exordiums* are the moſt ſuitable on occaſions of extraordinary joy, indignation, or the like; though we have inſtances of panegyrics of the greateſt orators, begun abruptly, without any ſuch occaſions. Such is that of Gorgias, who began his eloge of the city and people of Elis with Ηλις, πολις ευδαιμων, *Elis beata civitas*. Abrupt, haſty, *exordiums*, were more to the taſte and manner of the Greeks than of the Latins. The objects which the orators ſhould have in view in this part of his diſcourſe are to gain the good opinion of his hearers, to ſecure their attention, and to give them ſome general notion of his ſubject; and therefore, the requiſites in an *exordium* are, 1. *Propriety*, whereby the *exordium* appears eaſy and natural, becomes of a-piece with the whole diſcourſe, and matches it, as a part does the whole; ſo that it could not be accommodated to any other, or, perhaps, a contrary occaſion. The ancient orators were very defective in this point; their *exordiums* had frequently nothing in common with the ſubject.

2. *Modeſty*, or an ingenious baſhfulneſs, which recommends the orator exceedingly to the favour of his audience. This is what Cicero extols ſo much in L. Craſſus, *Fuit enim in L. Craſſo pudor quidnam, qui non modo non obeſſet ejus orationi, ſed etiam probitatis commendatione prodeſſet*. The ſame Tully owns of himſelf, that at the beginning of his oration every limb trembled, and his whole mind was in a flutter. The vain-glory of that author ſhould be carefully avoided, of whom Horace ſpeaks, and who began his poem *Fortunam Priami cantabo & nobile bellum*.

3. *Brevity*, not amplified or ſwelled with a detail of circumſtances, or a long circuit of words; and in this reſpect it ſhould be accommodated to the length of the diſcourſe.

4. The ſtyle of the *exordium* ſhould be juſt, eaſy, and pleaſant. Quintilian facetiouſly compares a faulty *exordium* to a ſcarred face, which is preſently diſcerned, and very diſagreeable. Thus Cicero, *Veſtibula, adituſque ad cauſam facias illuſtres*.

The *exordium* appears an eſſential part of an oration; though anciently, in the Areopagus, Julius Pollux tells us they ſpoke without any *exordium*, and paſſions, and any peroration or epilogue. The like is ſaid to have been done by Xenophon, who began thus: *Darius & Pariſatis duos habuere filios*.

EXORMISTOS, in *Ichthyology*, a name given by ſome of the old writers to that ſpecies of the *petromyzon* which other authors call the *lampetra fluviatilis*, and we in Engliſh the *lampern*. This is diſtinguiſhed by Artedi by the name of the *petromyzon*, with only one ſeries of ſmall teeth in the verge of the mouth, and ſome large ones below. See MUSTELA, LAMPETRA, and PETROMYZON.

EXOS *piſcis*, in *Ichthyology*, a name given by Geſner and Rondeletius to the fiſh which we call the *huſo* or *ichthyocollis piſcis*, from the drug called *ichthyocolla*, or *iſinglaſs*, being procured from it. It is properly a ſpecies of the accipenſer, and is diſtinguiſhed from the common STURGEON by its having no tubercles. See ACCIPENSER.

EXOSTOSIS, from εξ, *out*, and οστεον, *a bone*, in *Anatomy*, is properly an acute eminence or excreſcence, puſhing preternaturally above the bone, but creating ſometimes no diſturbance, pain, or deformity, and unaccompanied with a caries or ſpina ventoſa. When this is the caſe, it is always beſt to let it alone; for the attempt to remedy often proves much worſe than the diſeaſe; and by laying the bone bare, a caries, or other inconvenience is brought on. On the other hand, when this diſorder occaſions pain or deformity, or impedes any action, or produces other miſchief, it may be remedied by taking off the protuberant part of the bone in the ſame manner as in caſes of the SPINA *ventoſa*.

EXOSTRA, in the *Ancient Theatre*, a place where ſuch parts of the play were recited as were ſuppoſed to be acted privately in the houſe.

EXOSTRA, was likewiſe the name of a warlike engine uſed in the ſieges of towns.

EXOTERIC and ESOTERIC, are terms denoting *external* and *internal*, and applied to the double doctrine of the ancient philoſophers: the one was public, or *exoteric*; the other ſecret, or *eſoteric*. The firſt was that which they openly profeſſed and taught to the world; the latter was confined to a ſmall number of choſen diſciples. This method was derived originally from the Egyptians, who, according to the united teſtimony of Herodotus, Diodorus Siculus, Strabo, Plutarch, &c. had a two-fold philoſophy, one ſecret and ſacred, another public and common. The ſame practice alſo obtained among the Perſian Magi, the Druids of the Gauls, and the Brachmans of India. The Egyptian prieſts, with whom it originated, ſuſtained the character of judges and magiſtrates, and probably introduced this diſtinction with a view to the public welfare, and to ſerve the purpoſes of legiſlation and government. Clement of Alexandria informs us, that they communicated their myſteries principally to thoſe who were concerned in the adminiſtration of the ſtate; and Plutarch confirms the ſame declaration. However, others have ſuppoſed that they invented the fables of their gods and heroes, and the other external ceremonies of their religion, to diſguiſe and conceal natural and moral truths; but whatever was the motive of their practice, it was certainly applied to political purpoſes.

EXOTIC, Εξωτικος, a term properly ſignifying *foreign*, or *extraneous*, i. e. brought from a remote or ſtrange country. In which ſenſe we ſometimes ſay, *exotic*, or *barbarous terms* or *words*, &c.

The word is derived from the Greek, εξω, εξωθεν, *extra*, *without*, *on the outſide*.

EXOTIC, is chiefly applied to plants which are natives of foreign countries, particularly thoſe brought from the Eaſt and Weſt Indies, and which do not naturally grow in Europe.

The generality of *exotics*, or *exotic* plants, do not thrive in England without ſome peculiar care and culture; they require the warmth of their own climates; whence the uſe of hot-beds, glaſs-frames, green-houſes, &c. See GREEN-*houſe*, and STOVE.

In ſending plants from one country to another, great cautions are neceſſary. The plants ſent from a hotter country to a colder ſhould be always put on board in the ſpring of the year, that the heat of the ſeaſon may be advancing as they approach the colder climates; and on the contrary, thoſe which are ſent from a colder country to a hotter ſhould be ſent in the beginning of winter.

The beſt way of packing up plants for a voyage, if they be ſuch as will not bear keeping out of the earth, is to have boxes with handles, filling them with earth, and planting the roots as cloſe together as may be; the plants ſhould be ſet in theſe boxes three weeks before they are to be put on board; and in good weather they ſhould be ſet upon the deck, and in bad removed or covered with a tarpaulin.

If they are going from a hotter country to a colder one, they muſt have very little moiſture; if, on the contrary, they are going from a colder to a warmer, they may be allowed water more largely; and being ſhaded from the heat of the ſun, they will come ſafe.

Many plants, however, will live out of the earth a great while; as the ſedums, euphorbiums, ficoides, and other ſucculent ones. Theſe need no other care than the packing them up with moſs in a cloſe box; and there ſhould be a little hay put between them, to prevent them from wounding or bruiſing one another, and holes bored in the boxes to keep them from heating and putrefying. In this manner they will come ſafe from a voyage of two or three, or even four or five months.

Several trees alſo will come ſafely in the ſame manner, taking them up at a ſeaſon when they have done growing, and packing them up with moſs. Of this ſort are oranges, olives, capers, jaſmines, and pomgranate-trees. Theſe, and many others, are annually brought over thus from Italy; and though they are three or four months in the paſſage, ſeldom miſcarry. And the beſt way of ſend-

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ing over ſeeds is in their natural huſks, in a bag, or packed up in a gourd-ſhell, keeping them dry, and out of the way of vermin. Miller.

Dr. Liſter has a diſcourſe in the Philoſoph. Tranſ. on *Exotic Diſeaſes*, i. e. ſuch diſeaſes as are never bred among us, but brought, from time to time, by infection, from other countries. Such, according to this author, are, 1. The *plague*, which is properly a diſeaſe of Aſia, where it is epidemic. 2. The *ſmall pox*, which is an oriental diſeaſe, and not known to Europe, or even Aſia Minor or Africa, till a ſpice-trade was opened to the remoteſt part of the Indies, whence it originally came, and where it ſtill rages more cruelly than among us. 3. The *griping of the guts*, which he takes for a diſeaſe peculiar to the Weſt Indies, and yearly received from thence: for this, he adds, is a quite different diſeaſe from the *tormina ventris* of the ancients, and is ſcarce ever known in the mid-land countries, or far in the North of England.

EXOUCONTII, in *Church Hiſtory*, a kind of Arian heretics, who maintained that the Son of God was made out of nothing: i. e. Ἐκ τῶν ὐκ ὄντων, ſuppoſed by Gothofred to be the ſame with the EXOCIONITÆ; but this opinion is contradicted by the authority of Theodoret.

EXPANSION, in *Metaphyſics*, expreſſes the idea we have of laſting, or preſerving diſtance, i. e. of diſtance, all the parts whereof exiſt together.

EXPANSION, in *Phyſics*, is the dilating, ſtretching, or ſpreading out of a body; whether from any external cauſe as the cauſe of rarefaction, or from an internal cauſe, as elaſticity. Bodies naturally expand by heat beyond their dimenſions when cold, whence their ſpecific gravities are different at the different ſeaſons of the year.

Air compreſſed or condenſed, as ſoon as the compreſſing or condenſing force is removed, expands itſelf by its elaſtic power to its former dimenſions.

Dr. Halley found by experiment, that water expands itſelf by one twenty-ſixth part of its bulk, when made to boil; but a moderate heat does not induce any ſenſible *expanſion* at all. Mercury, with a very gentle heat, expands itſelf one ſeventy-fourth part of its ordinary dimenſions.

Spirit of wine, with a heat leſs than that of boiling water, expanded itſelf by one-twelfth part of its bulk, and then began to boil. The moſt ſenſible *expanſion* of water is in freezing. Mr. Boyle, in his Hiſt. of Cold, aſſures us, that ice takes up one-twelfth part more ſpace than water. Dr. Gregory, in his Aſtrom. p. 407, proves, that a globe of pur air, of an inch diameter, if it were removed to the diſtance of a ſemidiameter of the earth, would expand itſelf ſo as to fill all the planetary region as far as, nay, far beyond the ſphere of Saturn. See AIR. Solid bodies, as well as fluid, eaſily expand with heat. See HEAT, PENDULUM, and PYROMETER.

EXPANSUM *Foliaceum*. See FOLIACEUM.

EX PARTE, i. e. *partly*, or of *one part*. A *commiſſion ex parte* is that taken out and executed by one part only: where both parties join it is called a *joint commiſſion*. See COMMISSION.

EX PARTE TALIS, in *Law*, a writ that lies for a bailiff or receiver, who, having auditors aſſigned to take his account, cannot obtain of them reaſonable allowance, but is caſt into priſon. The courſe in this caſe is to ſue this writ out of chancery, directed to the ſheriff, to take four mainpernors to bring his body before the barons of the exchequer at a certain day, and to warn the lord to appear at the ſame time. F. N. B. 129.

EXPECTANT *Fee*, in *Law*, where lands are given to a man and his wife, and the heirs of their bodies; in which ſenſe it differs from *fee ſimple*, where lands are given to a man and his wife in frank marriage, to hold to them and their heirs.

EXPECTANCY, *eſtates in*, are of two ſorts; one created by act of the parties, called a REMAINDER; the other by act of law, called a REVERSION.

EXPECTATION, in the *Doctrine of Chances*, is applied to any contingent event, and is capable of being reduced to the rules of computation. Thus, a ſum of money in *expectation*, when a particular event happens, has a determinate value before that event happens; ſo that if a perſon is to receive any ſum, e. gr. 10*l.* when an event takes place which has an equal PROBABILITY of happening and failing, the value of the *expectation* is half that ſum or 5*l.* and in all caſes, the *expectation* of obtaining any ſum is eſtimated by multiplying the value of the ſum expected by the fraction, which repreſents the probability of obtaining it. The *expectation* of a perſon who has three chances in five of obtaining 100*l.* is equal to $\frac{3}{5} \times 100$ or 60*l.* and the probability of obtaining 100*l.* in this caſe is equal to $\frac{60}{100} = \frac{3}{5}$.

If the obtaining of any ſum requires the happening of ſeveral events that are independent on each other, the value of the *expectation* of that ſum is found by multiplying together the ſeveral probabilities of happening, and by multiplying the product by the value of the ſum expected. E. gr. Suppoſe, that in order to obtain 90*l.* two events muſt happen, one of which has three chances to happen and two to fail, and the other has four chances to happen, and five to fail; the value of the *expectation* is $= \frac{1}{5} \times \frac{4}{9} \times 90 = \frac{12}{45} \times 90 = \frac{4}{15} \times 90 = \frac{360}{15} = 24$*l.* for if the firſt event had actually happened, the value of the *expectation*, depending ſolely on the ſecond event, would be $\frac{8}{9} \times 90 = 40$*l.* and therefore the happening of the firſt event is the condition of obtaining an *expectation* worth 40*l.* but the probability of the firſt happening is $\frac{3}{5}$, and the *expectation* ſought for is evidently worth $\frac{3}{5} \times 40 = \frac{3}{5} \times \frac{8}{9} \times 90 = 24$*l.* The rule will be the ſame if an *expectation* depends on the happening of one event and the failing of another; and alſo on the failing of two events; and on the happening or failing of any number of events that may be aſſigned. It is here ſuppoſed that the events are independent, or that the happening of one neither forwards nor obſtructs the happening of the other. But if two events are dependent, i. e. if they are ſo connected together as that the probability of either's happening is altered by the happening of the other, the probability of their happening is the product of the probability of the happening of one of them by the probability which the other will have of happening, when the firſt is conſidered as having happened; and the ſame rule will extend to the happening of any aſſigned number of events; thus, in a heap of thirteen cards of the ſame colour, the probability of taking out the ace is $\frac{1}{13}$; and the probability of taking the ace out of another heap of the ſame number is $\frac{1}{13}$; and the probability of both theſe independent events happening will be $\frac{1}{13} \times \frac{1}{13} = \frac{1}{169}$: but the probability of taking the ace firſt out of a ſingle heap of thirteen cards is $\frac{1}{13}$; and that of taking the deux afterwards is $\frac{1}{12}$; and therefore the probability of both happening is $\frac{1}{13} \times \frac{1}{12} = \frac{1}{156}$. If a perſon has ſeveral *expectations* on ſeveral ſums, the value of his *expectation* on the whole is the ſum of his *expectations* on the particulars: thus, let one event be ſuch that the probability of obtaining any ſum, e. gr. 90*l.* in caſe it happens, may be $\frac{3}{5}$; in which caſe the value of the *expectation* is $\frac{3}{5} \times 90 = 54$*l.* Let the probability of another event, on which depends a ſecond ſum of 90*l.* be $\frac{4}{9}$, and the value of the *expectation* in this caſe is $\frac{4}{9} \times 90 = 40$*l.* and the value of the *expectation* on the whole $54 + 40 = 94$*l.* But if a perſon is to receive 90*l.* once for all for the happening of one or other of the two forementioned events, then, the *expectation* of the firſt event being worth 54*l.* as before, yet the *expectation* of the ſecond will be different; becauſe this depends on the happening of the firſt, and takes place only in caſe the firſt happens to fail, the probability of which is $\frac{2}{5}$; and on the ſuppoſition of its having failed the *expectation* of the ſecond will be 40*l.* therefore, $\frac{2}{5}$ is the meaſure of the probability of obtaining an *expectation* worth 40*l.* and conſequently the *expectation* will be worth $\frac{2}{5} \times 40 = 16$*l.* and the value of the *expectation* on the whole will be $54 + 16 = 70$*l.* See the farther illuſtration and application of theſe principles and rules in De Moivre's Doctrine of Chances, edit. 3. 1776. See GAMING.

EXPECTATION *of Life*, in the *Doctrine of Life-annuities*, denotes, according to the moſt obvious ſenſe of the term, that particular number of years which a life of a given age has an equal chance of enjoying, or the time which a perſon of a given age may juſtly expect to continue in being. But Mr. Simpſon has ſhewn, that this period does not coincide with what the writers on annuities call the *expectation of life*, except on the ſuppoſition of an uniform decreaſe in the probabilities of life; and Dr. Price adds, that even on this ſuppoſition, it does not coincide with what is called the *expectation of life*, in any caſe of joint lives: for two lives of 40 have an even chance, according to M. De Moivre's hypotheſis, (ſee COMPLEMENT *of life*) of continuing together only $13\frac{1}{2}$ years. According to that hypotheſis, the *probability* that a life aged 40 will continue $13\frac{1}{2}$ years, will be expreſſed by $\frac{32.5}{46}$; and this fraction multiplied by itſelf is the probability that two lives of this age ſhall both continue $13\frac{1}{2}$ years; i. e. $\frac{32.5}{46} \times \frac{32.5}{46} = \frac{1056,25}{2116} =$ nearly $\frac{1}{2}$, which repreſents an even chance: but the *expectation* of two joint lives being (according to the ſame hypotheſis) always a third of the common complement, will be in this caſe $15\frac{1}{2}$ years. Therefore, the *expectation of life*, or as it may be otherwiſe called, *the ſhare of life due to a perſon*, is uſed to ſignify the mean continuance of any given ſingle, joint, or ſurviving lives, according to any given table of obſervations; or the number of years, which, taking them one with another, they actually enjoy, and

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may be conſidered as ſure of enjoying; ſo that if 46 perſons are alive, all 40 years of age, and one be ſuppoſed to die every year, according to Mr. De Moivre's hypotheſis, till they are all dead in 46 years, half 46 or 23 will be their *expectation of life*; i. e. the number of years enjoyed by them all will be juſt the ſame as if every one of them had lived 23 years, and then died; ſo that ſuppoſing no intereſt of money, there would be no difference in value between annuities payable for life to every ſingle perſon in ſuch a ſet, and equal annuities payable to another equal ſet of perſons of the ſame common age, ſuppoſed to be all ſure of living juſt 23 years, and no more.

In like manner, the third of 46 years, or 15 years and 4 months, is the *expectation* of two joint lives both 40; and this is alſo the *expectation* of the ſurvivor. The *expectation of life*, in this laſt ſenſe of the terms, coincides with the ſums of the preſent probabilities, that any given ſingle or joint lives ſhall attain to the end of the firſt, ſecond, third, &c. moments, from this time to the end of their poſſible exiſtence; or (in the caſe of ſurvivorſhips) with the ſum of the probabilities, that there ſhall be a ſurvivor at the end of the firſt, ſecond, third, &c. moments, from the preſent time to the end of the poſſible exiſtence of ſurvivorſhip. From theſe principles Dr. Price has ſhewn how to deduce the demonſtrations of Mr. De Moivre's rules for finding the *expectations of lives*, which he has omitted: we ſhall here ſubjoin them for the information and amuſement of our mathematical readers.

Let $\dot{x}$ ſtand for a moment of time, and n be the COMPLEMENT of any aſſigned life; then $\frac{n-\dot{x}}{n}$, $\frac{n-2\dot{x}}{n}$, $\frac{n-3\dot{x}}{n}$, &c. will be the preſent probabilities of its continuing to the end of the firſt, ſecond, third, &c. moments; and $\frac{n-x}{n}$ the PROBABILITY of its continuing to the end of x time; therefore, $\frac{n-x}{n}\times\dot{x}$ will be the fluxion of the ſum of the probabilities, or of an area repreſenting this ſum, whoſe ordinates are $\frac{n-x}{n}$, and axis x. The fluent of this expreſſion, or $x-\frac{x^2}{2n}$, is the ſum itſelf for the time x; and this, when $x=n$, becomes $\frac{1}{2}n$, the *expectation* of the aſſigned life, or the ſum of all the probabilities juſt mentioned for its whole poſſible duration. Thus, $\frac{n-x}{n}\times\frac{n-x}{n}$, or $\frac{\overline{n-x}^2}{n^2}$, is the probability that two equal joint lives will continue x time, and $\frac{\overline{n-x}^2}{n^2}\times\dot{x}$ will be the fluxion of the ſum of the probabilities; the fluent of which, or $x-\frac{x^2}{n}+\frac{x^3}{3n^2}$, becomes, when $n=x$, $\frac{n}{3}$, or the *expectation* of two equal joint lives. Again, ſince $\frac{n-x}{n}\times\frac{2x}{n}$ is the probability that there will be a ſurvivor of two equal joint lives at the end of x time, $\frac{n-x}{n}\times\frac{2x}{n}\times\dot{x}$ will be the fluxion of the ſum of the probabilities; and the fluent, or $\frac{x^2}{n}-\frac{2x^3}{3n^2}$ is, when $x=n$, $\frac{1}{3}n$, or the *expectation* of ſurvivorſhip between two equal lives, which appears to be equal to the *expectation* of their joint continuance. The *expectation* of two unequal joint lives found in the ſame way is $\frac{m}{2}-\frac{m^2}{6n}$, m being the complement of the oldeſt life, and n the complement of the youngeſt. The whole *expectation* of ſurvivorſhip is $\frac{n}{2}-\frac{m}{2}+\frac{m^2}{3n}$; and the *expectation* of ſurvivorſhip of the oldeſt will be to that of the youngeſt as $\frac{m^2}{6n}$ to $\frac{n}{2}-\frac{m}{2}+\frac{m^2}{6n}$.

From the definition already given of the *expectation of life*, it follows, that if in a ſociety limited to a fixed number of members, a 28th part of its members dies annually, 28 would appear to be their common *expectation of life* at the time they entered; and if it were found in any town or diſtrict, where the number of births and burials are equal, that a 20th or 30th part of the inhabitants die annually, it would appear that 20 or 30 was the *expectation* of a child juſt born in that town or diſtrict.

Having a table of obſervations, ſhewing the number that die annually at all ages out of a given number alive at thoſe ages, it is eaſy to find the *expectation* for all ſingle lives by the following rule: divide the ſum of all the living in the table at the age whoſe *expectation* is required, and at all greater ages, by the number in the table of the living at that age, and ſubtract half unity from the quotient, the remainder will be the *expectation* required.

The reaſon of this ſubtraction may be underſtood by conceiving the recruit neceſſary to ſupply the waſte of every year to be made always at the end of the year, ſo that the dividend ought to be the medium between the number living at the beginning and the end of the year; and therefore it ſhould be taken leſs than the ſum of the living in the table at and above the given age by half the number that die in the year; but as the diviſor is to the dividend as unit to the quotient, the ſubtraction here directed will have the ſame effect as the afore mentioned diminution. This rule may be illuſtrated by taking the ſum of all the living at 20 and upwards in *Tab.* I. and dividing it by 360, the number living at that age, and the quotient leſs half unity, will be nearly 28.9 the *expectation* of 20 in *Tab.* II.

TABLE I.

Shewing the Probability of the Duration of Life in London, deduced by Mr. Simpſon from Obſervations on the Bills of Mortality in London for ten Years, from 1728 to 1737.

Ages.	Perſons living.	Decr. of life.	Ages.	Perſons living.	Decr. of life.	Ages.	Perſons living.	Decr. of life.
0	1000	320	27	321	6	54	135	6
1	680	133	28	315	7	55	129	6
2	547	51	29	308	7	56	123	6
3	496	27	30	301	7	57	117	5
4	469	17	31	294	7	58	112	5
5	452	12	32	287	7	59	107	5
6	440	10	33	280	7	60	102	5
7	430	8	34	273	7	61	97	5
8	422	7	35	266	7	62	92	5
9	415	5	36	259	7	63	87	5
10	410	5	37	252	7	64	82	5
11	405	5	38	245	8	65	77	5
12	400	5	39	237	8	66	72	5
13	395	5	40	229	7	67	67	5
14	390	5	41	222	8	68	62	4
15	385	5	42	214	8	69	58	4
16	380	5	43	206	7	70	54	4
17	375	5	44	199	7	71	50	4
18	370	5	45	192	7	72	46	4
19	365	5	46	185	7	73	42	3
20	360	5	47	178	7	74	39	3
21	355	5	48	171	6	75	36	3
22	350	5	49	165	6	76	33	3
23	345	6	50	159	6	77	30	3
24	339	6	51	153	6	78	27	2
25	333	6	52	147	6	79	25	
26	327	6	53	141	6			

TABLE II.

Shewing the *Expectations* of Life in London, according to the preceding Table.

Age	Expectation.	Age.	Expectation.	Age.	Expectation.
1	27.0	28	24.6	55	14.2
2	32.0	29	24.1	56	13.8
3	34.0	30	23.6	57	13 4
4	35.6	31	23.1	58	13.1
5	36.0	32	22.7	59	12.7
6	36.0	33	22.3	60	12.4
7	35.8	34	21.9	61	12.0
8	35.6	35	21.5	62	11,6
9	35.2	36	21.1	63	11.2
10	34.8	37	20.7	64	10 8
11	34.3	38	20.3	65	10.5
12	33.7	39	19.9	66	10.1
13	33.1	40	19.6	67	9.8
14	32.5	41	19.2	68	9.4
15	31.9	42	18.8	69	9.1
16	31.3	43	18.5	70	8.8
17	30.7	44	18.1	71	8.4
18	30.1	45	17.8	72	8.1
19	29 5	46	17.4	73	7.8
20	28.9	47	17.0	74	7.5
21	28.3	48	16.7	75	7.2
22	27.7	49	16.3	76	6 8
23	27.2	50	16.0	77	6.4
24	26.6	51	15.6	78	6.0
25	26.1	52	15.2	79	5.5
26	25.6	53	14.9	80	5.0
27	25.1	54	14.5		

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We ſhall here ſubjoin ſome other tables, calculated by Dr. Price, on account of their connection with the ſubject of this article.

Proportion of inhabitants annually dying in

Pais De Vaud	Country Pariſh in Brandenburg	Holy Croſs, near Shrewsbury	London	Vienna	Berlin
1 in 45	1 in 45	1 in 33	1 in 20¾	1 in 19½	1 in 26½

Ages to which half the born live.

Pais De Vaud	Country Pariſh in Brandenburg	Holy Croſs	London	Vienna	Berlin
41	25½	27	2¾	2	2¾

Proportion of the inhabitants who reach eighty years of age.

Pais De Vaud	Country Pariſh in Brandenburg	Holy Croſs	London	Vienna	Berlin
1 in 21½	1 in 22½	1 in 11	1 in 40	1 in 41	1 in 37

The probabilities of living one year in

Odds	Pais De Vaud.	Country Pariſh, Brandenburg	Holy Croſs	London	Vienna	Berlin
At birth	4¼ to 1	3½ to 1	4½ to 1	2 to 1	1½ to 1	1¾ to 1
Age 12	160 to 1	112 to 1	144 to 1	75 to 1	84 to 1	123 to 1
25	117 to 1	110 to 1	100 to 1	56 to 1	66 to 1	50 to 1
30	111 to 1	107 to 1	96 to 1	45 to 1	56 to 1	44 to 1
40	83 to 1	78 to 1	55 to 1	31 to 1	36 to 1	32 to 1
50	49 to 1	50 to 1	50 to 1	24 to 1	27 to 1	30 to 1
60	23 to 1	25 to 1	26 to 1	18 to 1	19 to 1	18 to 1
70	9½ to 1	11 to 1	16 to 1	12 to 1	11 to 1	12 to 1
80	4 to 1	6 to 1	8 to 1	7 to 1	7 to 1	7 to 1

Expectations of life.

	Pais De Vaud	Country Pariſh in Brandenburg	Holy Croſs	London	Vienna	Berlin
At birth	37 yrs	32½ years	33¼ years	18 yrs	16½ yrs	18 yrs
Age 12	44⅕	44	43½	33½	35¾	35½
25	34¾	35½	35	26	28⅓	27⅓
30	31¼	31½	32	23½	25½	25¼
35	27½	28	28¼	21½	22½	22¾
40	24	25	25¼	19½	20½	20¾
45	20½	21½	23¼	17¾	17¾	18¾
50	17½	18	20	16	16	16⅓
55	14½	15	17	14⅕	13½	14
60	12	12¼	14½	12½	11¾	12½
65	9½	9¾	11¼	10½	9¾	10½
70	7½	7½	10	8¾	8½	8½
75	5½	5½	8	7	6½	7
80	4½	4½	5	5	5½	6

Dr. Price has applied his reaſoning on this ſubject to the ſolution of a curious queſtion in political arithmetic, or to determine the number of inhabitants in any place from a table of obſervations, or the bills of MORTALITY for that place, on the ſuppoſition that the yearly births and burials are equal. For this purpoſe, find by the table the *expectation* of an infant juſt born; and this, multiplied by the number of yearly births, will be the number of inhabitants.

It appears from Tab. I. that though an infant juſt born in London has not an equal chance (the probability being $\frac{4996}{10000}$) of living 3 years, his *expectation* is 20 years. The medium of the yearly births in London for 10 years from 1759 to 1768 was 15,710, multiply 15,710 by 20, and the product, viz. 314,200 will be the number of inhabitants in London, according to the bills, if the yearly burials were no more than equal to the births, or there were no ſupply of inhabitants from the country: but, during the forementioned period, the burials were at an average 22,956, and exceeded the chriſtenings 7,246, which exceſs gives the annual ſupply from other parts; and if each of theſe have an *expectation* of 30 years, or they are all of the age of 18 or 20, when they remove to London, multiply 30 by 7,246, and the product, viz. 217,380 muſt be added to 314,200, and the ſum, or 531,580 gives the number of inhabitants, ſuppoſing that the bills are perfect: but this is certainly not the caſe; the number both of births and burials is for many obvious reaſons too ſmall. If the annual defects in births and burials were 6000, then 20 × 6000 = 120,000 muſt be added to 531,580, and the whole number of inhabitants would be 651,580. If the burials are deficient only two-thirds of this number or 4000, and the births the whole of it, 20 × 6000 muſt be added to 314,200, on account of the defects in the births; and the exceſs of the burials being then only 5246, 30 × 5246 = 157,380 muſt be added on this account; and the number of inhabitants will be 591,580. If the *expectation of life* in London be diminiſhed to 18 or 17, this number muſt be reduced; and Dr. Price concludes on the whole, from a great variety of obſervations, that 591,580 is neareſt to the true number of inhabitants; though Dr. Brakenridge, allowing 6 to a houſe, makes the number of inhabitaats in London 751,800: but the allowance of 6 to a houſe is certainly too large, as Dr. Price has ſhewn in a variety of inſtances from actual ſurveys; and he obſerves, that though 5 perſons to a houſe may not be much too ſmall an allowance for London, it is too large for England in general. If the number of houſes in England and Wales be reckoned a million, the number of people will be 4½ millions, allowing 4½ to a houſe, and 5 millions, allowing 5 to a houſe. In the year 1690, the number of houſes, according to Dr. Davenant, was 1,319,215; at the Reſtoration it was 1,230,000; in 1759, 986,482; in 1766, 980,692; ſo that between the Reſtoration and Revolution the people of England increaſed above 300,000: ſince the year 1690, they have decreaſed near a million and a half. The number of houſes in Ireland in 1754 was 395,439: In 1767, it was 424,046; and allowing 4½ to a houſe, the number of people in Ireland will be 1,908,207; and if a million and a half are ſuppoſed in Scotland, the number of people in Great Britain and Ireland will be about 8 millions. De Moivre's Doctrine of Chances applied to the Valuation of Annuities, p. 288, &c. Simpſon's Select Exerciſes, p. 253, &c. and particularly Dr. Price's Obſervations on Revertionary Payments, eſſ. i. p. 168, &c. p. 364, &c. 374, &c. or Phil. Tranſ. vol. lix. p. 89. See LIFE-*annuities*, MORTALITY, SURVIVORSHIP.

EXPECTATIVE, in the *Canon Law*, a hope founded on a promiſe of obtaining the next benefice that ſhall become vacant, or a right to the reverſion of the next. See BENEFICE.

EXPECTATIVE *canons*. See CANON.

EXPECTATIVE *graces*, *Gratiæ* EXPECTATIVÆ, called alſo *preventions*, were bulls frequently given by the popes or kings for future benefices. The biſhops were exceedingly mortified with them, becauſe they encroached on their privileges; beſides, that ſuch *expectatives* are odious, as they induce people to wiſh for the death of others.

The uſe of *expectatives* is very ancient, though it was not near ſo frequent in the firſt ages as afterwards. Originally they were no more than ſimple requeſts made on the part of kings or popes, which the biſhops conſented to with the more willingneſs, as they only preſented to them perſons fit to ſerve the church: but the frequent exerciſe of this privilege made it at length be deemed a matter of obligation and neceſſity.

The council of Trent annulled all *expectatives*; but the canons relating thereto were never admitted in France, where the right of conferring *expectative* graces is looked on as one of the regalia.

EXPECTORANTS, in *Pharmacy*, are medicines that promote EXPECTORATION.

As all ſubſtances which promote excretion do not operate in the ſame manner, ſince ſome render the matter moveable and diſpoſe it for evacuation; others open the emunctories, that it may be ſeparated from the juices; and others ſtimulate the veſſels and ducts to an excretory motion; ſo *expectorants* operate in the ſame variety of ways; for if the humour ſecreted be thin and acrid, and the pores of the glands from which it is to be thrown be too much conſtricted, theſe medicines are to be given to promote expectoration, which relax ſoften and widen the paſſages, obtund the acrimony of the humours, and coagulate the too thin and fluid parts of them. To this purpoſe liquorice-root, ſpermaceti, ſaffron, mallows, red poppies, oil of almonds, and the ſtyrax pill, may be given; but when a large quantity of thick and viſcid matter is lodged in the bronchia of the lungs, and impedes reſpiration, then ſome ſtimulus to reſpiration becomes neceſſary, and expectoration muſt be aſſiſted by ſubſtances which can reſolve the tough and viſcid matter. For this purpoſe decoctions of ſcabious and the other pectoral herbs, with the terra foliata tartari, ſolutions of crab's eyes, and antimoniated nitre, are very proper. The nervous coats of the bronchia are alſo ſtimulated to an excretory motion by a certain acrid, ſubtle, and oleous principle, found in gum ammoniac and benjamin, and the like ſtimulating gums.

The roots of elecampane, and florentine orris alſo, and all the preparations of ſulphur, ſerve excellently to this purpoſe; and where a yet ſtronger ſtimulus is required, as in a pituitous aſthma, oxymel of ſquills, and the ſpiritus aſthmaticus, which is prepared with gum ammoniacum and cryſtals of copper, are found remedies of very great power. Great caution is neceſſary in the exhibition of *expectorants*, and the practitioner who gives the common medicines, known by that name at random, and without informing himſelf thoroughly of the nature of the caſe, is likely to do great miſchief inſtead of good by them. In coughs of the moiſt and chronical kind, as alſo in a pituitous aſthma, in which large quantities of phlegm

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phlegm fall into the bronchia of the lungs, ſweet ſubſtances, linctuſes, and oily medicines, weaken the ſtomach, whoſe ſtrength and tone are already too much impaired, diminiſh the appetite, digeſtion, and chyliſaction, and not only promote the generation of more recrementitious matter, and the increaſe of the diſeaſe, but alſo diſpoſe the patient to a cachexy, or to oedematous tumours, or a dropſy. In theſe caſes, it is therefore much more proper to uſe balſamic pectorals, and ſuch as are grateful to the ſtomach. Hoſm. Med. Ration. Syſt.

Expectorants ought to be cautiouſly uſed in a phthiſis, in ſpittings of blood, and in dry coughs, difficulties of breathing, and violent pains in the breaſt, which rather ariſe from a congeſtion of blood than from matter to be expectorated; and *expectorants*, whether of the ſoftening or of the ſtimulating kind, muſt certainly add to the congeſtion of the blood and humours, rather than to the relief of the patient.

In pleuriſies and peripneumonies, *expectorants* are to be very cautiouſly uſed in the beginning, leſt by their means the inflammatory ſtagnation of the blood ſhould be increaſed: but when theſe diſorders are upon the decline, and the greater part of the inflammatory matter is diſcuſſed, then they are very properly and commodiouſly uſed to draw the viſcid and concocted matter out of the pulmonary canals.

EXPECTORATION, of *ex*, *out*, and *pectus*, *breaſt*, the act of evacuating or bringing up phlegm or other matters out of the trachea, lungs, &c. by coughing, hawking, ſpitting, &c. See COUGH.

Expectoration eaſes the lungs of the viſcid or putrid matters which obſtruct their veſſels, and ſtraiten the breaſt.

EXPEDITATION, in the *Foreſt-laws*, ſignifies a cutting out the ball's of a dog's fore-feet for the preſervation of the king's game.

Every one that keeps any great dog, not *expeditated*, forfeits three ſhillings and four-pence to the king. In maſtiffs, not the ball of the feet, but the three claws, are to be cut to the ſkin. Inſtit. part iv. p 308 *Nullos Dominicos canes abbatis & monarchorum* expeditari *cogat.* Chart. Hen. III. *Et ſin quieti de eſpeditamentis canum.* Ex. Mag. Rot. Pip. de ann. 9. Ed. II.

This *expeditation* was to be performed once in every three years, and was done to every man's dog who lived near the foreſt, and even the dogs of the foreſters themſelves.

EXPEDITION, the march of an army to ſome diſtant place, with a view of hoſtilities.

Such were the *expeditions* of Cyrus againſt Xerxes, and of Bacchus and Alexander from the Indies.

Expeditions for the recovery of the Holy Land were called CROISADES.

EXPENCES, in *Book-keeping*. See BOOK *of expences*.

EXPENDITORS, in *Law*, are the perſons appointed by commiſſioners of ſewers, to pay, diſburſe, or expend the money collected by the tax for the repairs of ſewers, &c. when paid into their hands by the collectors on the reparations, amendments, and reformations ordered by the commiſſioners; for which they are to render accounts when required for that purpoſe.

Theſe officers are mentioned in the ſtatute 37 H. VIII. cap. 11. and other ſtatutes. The ſteward who ſuperviſes the repair of the banks and water-courſes in Romney-Marſh, is likewiſe called the *expenditor*.

EXPENSIS *militum levandis*, was a writ anciently directed to the ſheriff, for levying allowance for the knights of parliament. See PARLIAMENT, and REPRESENTATIVE.

EXPENSIS *militum non levandis*, &c. in *Law*, an ancient writ to prohibit the ſheriff from levying any allowance for knights of the ſhire upon thoſe that hold lands in ancient *demeſne*. Reg. Orig. 261.

EXPERIENCE, a kind of knowledge acquired by long uſe, without any teacher.

Experience conſiſts in the ideas of things we have ſeen or read, which the judgment has reflected on, to form for itſelf a rule or method.

Authors make three kinds of *experience*: the firſt is the ſimple uſes of the external ſenſes, whereby we perceive the phenomena of natural things, without any direct attention thereto, or making any application thereof.

The ſecond is, when we premeditatedly and deſignedly make trials of various things, or obſerve thoſe done by others, attending cloſely to all effects and circumſtances,

The third is that preceded by a foreknowledge, or at leaſt an apprehenſion of the event, and determines whether the apprehenſion were true or falſe; which two latter kinds, eſpecially the third, are of great ſervice in philoſophy

EXPERIMENT, in *Philoſophy*, a trial of the effect or reſult of certain applications and motions of natural bodies. in order to diſcover ſomething of the laws and relations thereof, or to aſcertain ſome phenomenon, or its cauſe.

The ſchoolmen define *experiment*, a compariſon of ſeveral things before obſerved by the ſenſes, and retained in the memory in ſome one ſimilar convenient inſtance.

The nature of *experiment*, therefore, according to them, conſiſts in comparing ſeveral things by one act; whence they diſtinguiſh two things in every *experiment*, the one *material*, viz. the ſeveral ideas remembered; the other *formal*, viz. the comparing of theſe ideas in the mind.

This will be illuſtrated by an example: a phyſician gives a quantity of rhubarb to ten ſeveral perſons, and remembers each of them. Now, coming afterwards to compare the ſeveral remembrances together, and finding the effect of the exhibition of rhubarb to be the ſame in all, viz. a purging; this is an *experiment* of rhubarb.

The making of *experiments* is grown into a kind of formed art; and we now abound in ſyſtems of *experiments*, under the denomination of *courſes of experimental philoſophy*. Sturmius has made a curious collection of the principal diſcoveries and *experiments* of the laſt age, under the title of *collegium experimentale*. Dr. Deſaguliers has alſo publiſhed a comprehenſive and uſeful courſe of *experimental* philoſophy. The chemiſts chooſe to call their *experiments*, by way of diſtinction or eminence, *proceſſes* or *operations*.

EXPERIMENTAL *Philoſophy*, by the Greeks called εμπειρια, or εμπειρικη, is that which proceeds on *experiments*, or which deduces the laws of nature, and the properties or powers of bodies, and their actions upon each other, from ſenſible *experiments* and obſervations.

Experiments are of the utmoſt importance in philoſophy; and the great advantages the modern phyſics have above the ancient, is chiefly owing to this; that we have a great many more *experiments*, and that we make more uſe of the *experiments* we have.

Their way of philoſophizing was, to begin with the cauſe of things, and argue to the effects and phenomena; ours, on the contrary, proceeds from *experiments* and obſervations alone.

Lord Bacon firſt paved the way for the new philoſophy, by ſetting on foot the making of *experiments*. His method has been proſecuted with laudable emulation by the Academy del Cimento, the Royal Society, Royal Academy at Paris; and by Mr. Boyle, Sir Iſaac Newton, and many others.

In effect, *experiments*, within the laſt century, are come into ſuch a vogue that nothing will paſs in philoſophy but what is founded on, or confirmed by, *experiment*; ſo that the new philoſophy is almoſt altogether *experimental*. Indeed, the ancients, whatever we commonly ſay to the contrary, ſeem to have thought as well of the *experimental* way as the moderns. Plato miſſes no occaſion of ſpeaking of the advantages of the εμπειρια; and as to Ariſtotle, his Hiſtory of Animals may bear witneſs for him. Democritus's great buſineſs was to make *experiments*; and even Epicurus himſelf owes part of his glory to the ſame cauſe. Plato calls it, in reſpect to its ſubject, ευαισθησαι, *ſubtlety of ſenſe*.

Yet there are ſome, even among the learned, who conceive of *experiments* in a different manner. Dr. Keil allows, that philoſophy has received very conſiderable advantages from the makers of *experiments*; but he complains of their diſingenuity, in too often wreſting and diſtorting their *experiments* and obſervations to favour ſome darling theories they had eſpouſed: but this is not all; M. Hartſoeker, in his Recueil de pluſieurs Pieces de Phyſique, undertakes to ſhew, that they who employ themſelves in the making of *experiments* are not properly philoſophers, but, as it were, the labourers or operators of philoſophers, who work under them, and for them, furniſhing them with materials to build their ſyſtems and hypotheſes upon.

The learned M. Dacier, in the beginning of his diſcourſe on Plato, at the head of his tranſlation of the works of that philoſopher, deals ſtill more ſeverely with the makers of *experiments*. He breaks out with a ſort of indignation at a tribe of idly curious people, whoſe ſole employ conſiſts in making *experiments* on the gravity of the air, the equilibrium of fluids, the loadſtone, &c. and yet arrogate to themſelves the noble title of philoſophers. See PHILOSOPHY and PHYSICS. See alſo ANALYSIS and SYNTHESIS.

EXPERIMENTUM *Crucis*, denotes a capital, leading, or deciſive experiment; thus called, either, becauſe like a croſs or direction-poſt, placed in the meeting of ſeveral roads, it guides and directs men to the true knowledge of the nature of the thing they are enquiring after; or, as it is a kind of torture, whereby the nature of the thing is, as it were, extorted by violence.

EXPIATION, the act of ſuffering the puniſhments adjudged to a man's crimes, and thus paying off, or diſcharging the debt or guilt; and it is figuratively applied

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to the pardon procured for the ſins of the penitent by the interpoſition and death of Chriſt.

The Romaniſts hold, that ſouls after death are ſent to PURGATORY to *expiate* or atone for their ſins.

EXPIATION is alſo applied to ſacrifices offered to the Deity, to implore his mercy and forgiveneſs.

EXPIATION, *the feaſt of*, among the Jews, called by our tranſlators the *day of atonement*, was held on the tenth day of Tiſri, or the ſeventh month of the Jewiſh year, anſwering to part of our September and October. It was inſtituted by God himſelf, Levit. xxiii. 27, &c. On that day the high-prieſt, the figure or type of Jeſus Chriſt, entered into the moſt holy place, and confeſſed his ſins; and, after ſeveral ceremonies, made an atonement for all the people to waſh them from their ſins. Lev. chap. xvi. See SCAPE-*goat*.

EXPIATION, among the *Heathens*, denoted a purification uſed for effacing or aboliſhing a crime, averting any calamity; and on a thouſand other occaſions, as purifying towns, temples, and ſacred places, and armies, before and after battle.

It was practiſed with divers ceremonies: the moſt uſual was ablution.

Expiations were performed for whole cities as well as particular perſons. After the young Horatius had been abſolved by the people from the murder of his ſiſter, he was farther purified by ſeveral *expiations* preſcribed by the laws of the pontifices for involuntary murders. Halicarnaſſ.

EXPILATION, from *expilo*, *I rob*, in the *Civil Law*, the act of withdrawing or diverting ſomething belonging to an inheritance, before any body had declared himſelf heir thereof.

This made a peculiar ſpecies of theft; for there could not properly be a theft in taking a thing not poſſeſſed by any body, or before the inheritance was accepted.

For this reaſon the Roman legiſlature introduced the action of *expilation* for the puniſhment of this crime.

Beſide this meaning, it was uſed in a more ſpecial manner, to ſignify a robbery committed by night; whence an *expilator* was looked upon as a greater criminal than a common thief.

The *expilators* were ſo called from their robbing and ſtripping people of their clothes.

EXPIRATION, in *Medicine*, that motion in an animal whereby the air inſpired into the lungs is expelled or thrown out of the ſame, and the cavity of the breaſt contracted.

Reſpiration conſiſts of two alternate motions or actions of the lungs, correſponding to thoſe of a pair of bellows: *inſpiration*, whereby the air is drawn in; and *expiration*, whereby it is driven out again.

By the means of this alteration, the circulation of the blood, and the motion of the heart, are maintained.

EXPIRATION is alſo uſed figuratively, for the end of a term of time granted, agreed on, or adjudged.

EXPLEES, in *Law*, the rents or profits of an eſtate, &c. See ESPLEES.

EXPLICATIVE *Propoſition*, in *Logic*. See COMPLEX *propoſition*.

EXPLICITE, in the *Schools*, ſomething clear, diſtinct, formal, and unfolded.

The will or intention is ſaid to be *explicite* when it is fully explained in proper terms; and *implicite*, when it is only to be learnt by deductions and conſequences.

The Jews had not all an *explicite* knowledge of Jeſus Chriſt, but they had at leaſt an implicite one.

Such a teſtator has declared his will *explicitely*, i. e. in formal terms; there is no need to have recourſe to explications.

EXPLOSION, from *explodo*, *I drive away with noiſe*, in *Phyſics*, the act of a thing which drives another away out of the place it before poſſeſſed.

The term is chiefly uſed for the going off of gun-powder, and the expulſion of the ball, ſhot, or the like conſequent thereon.

Hence, *exploſion* comes likewiſe to be figuratively uſed to expreſs ſuch ſudden actions of bodies as have ſome reſemblance to theſe; e. gr. thoſe which ferment with violence, immediately upon their mixture, and occaſion a crackling ſound.

EXPOLITION, in *Rhetoric*, a figure whereby we explain the ſame thing in different phraſes and expreſſions, in order to ſhew it more fully.

Expolition was the favourite figure of Balzac.

EXPONAS *Venditioni*. See VENDITIONI.

EXPONENT, from *expono*, *I expreſs*, in *Arithmetic*. *Expanent of a power* denotes the number which expreſſes the degree of the power, or which ſhews how often a given power is to be divided by its root before it be brought down to unity.

Thus, the *exponent* or index of a ſquare number is 2; of a cube, 3; the ſquare being a power of the ſecond degree; the cube, of a third, &c.

Exponents are commonly written above, and ſomewhat towards the right-hand of the number or quantity whoſe power they expreſs. Thus, 3^5, a^5, ſignifies the fifth power of 3, and of a. See POWER.

EXPONENT is alſo uſed in *Arithmetic*, in the ſame ſenſe with index or logarithm.

Thus a ſeries of numbers in arithmetical progreſſion being placed under another ſeries in geometrical progreſſion, are called the *exponents*, *indices*, or *logarithms*, thereof. E. gr. in the two progreſſions,

Geom. 1, 2, 4, 8, 16, 32, 64, 128, 256, 512
Arith. 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

0 is the *exponent*, index, or logarithm, of the firſt term 1; 5 that of the ſixth, 32, &c.

Hence, unity is to the *exponent* of a power as the logarithm of the root to the logarithm of its power; conſequently, the logarithm of the power is had by multiplying the logarithm of the root by its *exponent*; and the logarithm of the root is had by dividing the logarithm of the power by its *exponent*.

EXPONENT *of a ratio*, is the quotient ariſing upon dividing the antecedent by the conſequent.

Thus, in the ratio 3 to 2, the *exponent* is $1\frac{1}{2}$, and the *exponent* of the ratio 2 to 3 is $\frac{2}{3}$. See RATIO.

Hence, 1. If the conſequent be unity, the antecedent is the *exponent* of the ratio. Thus, e. gr. the *exponent* of the ratio 4 to 1, is 4; and again, the *exponent* of a ratio is to unity as the antecedent to the conſequent.

2. Since, in a rational ratio, the *exponent* of a ratio is had by dividing a rational number by another rational; the *exponent* of a rational ratio is a rational number.

EXPONENTIAL *Calculus*, *Calculus* EXPONENTIALIS, is a method of differencing *exponential* quantities, and of ſumming up the differences of *exponentials*. See CALCULUS.

EXPONENTIAL *curve*, is that which is defined by an *exponential equation*.

Exponential curves partake both of the nature of algebraic and tranſcendental ones; of the former, becauſe they conſiſt of a finite number of terms, though thoſe terms themſelves are indeterminate; and of the latter, becauſe they cannot be algebraically conſtructed, or repreſented by an algebraic equation. Thus, $a\,y = x^2$ is the equation of an algebraic curve; $y = a^x$ is the equation of an *exponential* curve: this equation $y = a^x$ denotes that any ordinate y is to a conſtant ordinate aſſumed equal to 1, as a conſtant quantity a raiſed to a power whoſe exponent expreſſes the ratio of the abſciſs x to the line equal to 1 is to the line taken for unit or 1, raiſed to the ſame exponent. Let b repreſent the line $= 1$, and the equation $y = a^x$, (ſince $y : b :: a^{\frac{x}{b}} : b^{\frac{x}{b}}$) will become $\frac{y}{b} = \frac{a^{\frac{x}{b}}}{b^{\frac{x}{b}}}$. Note, $y = a^x$ is the equation of the LOGARITHMIC curve.

EXPONENTIAL *equation*, is that wherein there is an *exponential* quantity. See EQUATION, &c.

EXPONENTIAL *quantity*, is a power whoſe *exponent* is an indeterminate, or variable quantity.

Exponential quantities are of ſeveral degrees and orders: when the *exponent* is a ſimple indeterminate quantity, it is called an *exponential of the firſt*, or *loweſt degree*.

When the *exponent* itſelf is an *exponential* of the firſt degree, then the quantity is an *exponential of the ſecond degree*. Thus, z^y is an *exponential* of the firſt degree, becauſe the quantity y is a ſimple flowing quantity; but z^{y^x} is an *exponential* quantity of the ſecond degree; becauſe y^x is an *exponential* of the firſt degree; ſo, alſo, $z^{y^{y^x}}$ is an *exponential* of the third degree, the *exponent* y^{y^x} being one of the ſecond; and univerſally, the *exponential* quantity of any degree has for its *exponent*, the *exponential* quantity of the degree next preceding it. See Bernoulli Oper. tom. i. p. 182, &c.

EXPORTATION, in *Commerce*, the act of ſending commodities out of one country into another.

Exportation is a part of foreign COMMERCE, diſtinguiſhed by the appellation *active*, or *ſelling part*, in oppoſition to *importation*, which is called the *paſſive*, or *buying part*. It is obſerved as a general maxim, that commerce, when active, muſt produce a flow of riches, the balance being received in money; whereas, if it be paſſive, treaſures will be exhauſted, as the BALANCE of *trade* muſt continually be made good out of the remaining coin. Hence, plenty of money in any place implies, that the quantity of goods exported far exceeds that of goods imported;

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and wherever money is ſcarce, it may be concluded, that greater quantities of goods have been imported than exported. See EXCHANGE.

The merchandiſes yearly exported from England are immenſe. The principal articles are corn, cattle, cloth, iron, lead, tin, leather, coal, hops, flax, hemp, hats, malt-liquors, fiſh, watches, ribbands, &c.

Wool, fuller's earth, &c. are contraband goods, i. e. they are prohibited to be exported. For the duties of *exportation*, ſee DUTY.

EXPOSING, the act of ſetting a thing to public view.

In the Romiſh church, the ſacrament is ſaid to be *expoſed* when it is ſhewn in public, uncovered, on feſtival days, and during the time of plenary indulgences.

EXPOSING is alſo uſed with a farther latitude; thus, we ſay, it is prohibited to *expoſe* falſe and clipped money.

Such a houſe ſtands very high, and has a delicious proſpect; but it is *expoſed* to all the four winds. Such a city being on the frontiers, and not fortified, is *expoſed* to the inſults of every party of forces.

EXPOSING *of children*, a barbarous cuſtom practiſed by moſt of the ancients, excepting the Thebans, who had an expreſs law to the contrary, whereby it was made capital to expoſe children, ordaining, at the ſame time, that ſuch as were not in a condition to educate them ſhould bring them to the magiſtrates, in order to be brought up at the public expence. Pott. Archæol. Græc. tom. ii. p. 333. Among the other Greeks, when a child was born, it was laid on the ground; and if the father deſigned to educate his child, he immediately took it up; but if he forbore to do this, the child was carried away, and *expoſed*. Pitiſc. Lex. Ant. in voc. Expoſitio.

The Lacedæmonians, indeed, had a different cuſtom; for, with them all new-born children were brought before certain tryers, who were ſome of the graveſt men in their own tribe, by whom the infants were carefully viewed; and if they were found luſty and well-favoured, they gave orders for their education, and allotted a certain proportion of land for their maintenance; but if weakly, or deformed, they ordered them to be caſt into a deep cavern in the earth, near the mountain Taygetus, as thinking it neither for the good of the children themſelves, nor for the public intereſt, that defective children ſhould be brought up.

Many perſons *expoſed* their children only becauſe they were not in a condition to educate them, having no intention that they ſhould periſh. It was the unhappy fate of daughters eſpecially to be thus treated, as requiring more charges to educate and ſettle them in the world than ſons.

The parents frequently tied jewels and rings to the children they *expoſed*, or any other thing whereby they might afterwards diſcover them, if Providence took care for their ſafety. Another deſign, in adorning theſe infants, was either to encourage ſuch as found them to nouriſh and educate them, if alive; or to give them human burial, if dead.

The places where it was uſual to *expoſe* children were ſuch as people frequented moſt. This was done in order that they might be found, and taken up by compaſſionate perſons who were in circumſtances to be at the expence of their education. With this intention the Egyptians and Romans choſe the banks of rivers, and the Greeks the highways.

EXPOSITION, the act of *expoſing*. See EXPOSING.

EXPOSITION is likewiſe applied to the interpretation or explication of an author, or paſſage therein. See EXEGESIS.

EXPOSITION, *expoſitio*, in *Rhetoric*, is ſometimes uſed for *diviſion*. See DIVISION; and ſee alſo EXERGASIA.

EXPOSITION, in *Gardening*. See EXPOSURE.

EXPOSITOR, or EXPOSITORY, a title which ſome writers have given to a leſſer kind of dictionaries or vocabularies, ſerving to expound or explain the meaning of the obſcure or difficult words of a language.

It is alſo uſed in the ſame ſenſe with COMMENTARY and PARAPHRASE.

EX POST FACTO, in *Law*, denotes ſomething done after another thing that was committed before. An eſtate granted may be made good by matter *ex poſt facto*, that was not ſo at firſt, by election, &c.

EXPOSTULATION, *expoſtulatio*, in *Rhetoric*, a complaint addreſſed to a perſon from whom we have received ſome injury. It varies according to circumſtances.

EXPOSURE, or EXPOSITION, in *Gardening*, the aſpect or ſituation of a garden wall, building, or the like, with reſpect to the ſun, wind, &c.

There are four regular kinds of *expoſures*, viz. *eaſt*, *weſt*, *north*, and *ſouth*; but it muſt be obſerved, that among gardeners theſe terms ſignify juſt the contrary to what they do among geographers.

The gardeners, in effect, do not give the names *eaſt*, *weſt*, &c. to the places where the ſun is, but to thoſe whereon he ſhines; and they conſider the manner wherein he ſhines, whether as to the whole garden, or ſome of its ſides.

If they find, that the ſun at his riſing, and during the firſt half of the day, continues to ſhine on one ſide of a garden or wall, they call that an *eaſtern expoſure*, or *eaſt wall*, &c. and if the ſun begin to ſhine later, or end ſooner, it is not a proper *eaſtern expoſure*.

For the ſame reaſon, they call the *weſt* the ſide the ſun ſhines on in the latter half of the day; i. e. from noon to night; and accordingly, the *ſouth*, or *ſouthern expoſure*, is the place whereon he ſhines from about nine o'clock in the morning till night; or which, in the general, he ſhines longeſt on in the whole day; and the part he ſhines leaſt on is the *north*, or *ſouthern expoſures*, at what hour ſoever it begin or end, being uſually from eleven o'clock to one.

The *eaſtern* and *ſouthern expoſures* are, by common conſent of all gardeners, the two principal, and have a conſiderable advantage above the reſt. A *weſt expoſure* is not much amiſs; at leaſt, it is better than a northern one, which is the worſt of all: each has its inconveniencies.

The eaſtern, commencing differently at different ſeaſons of the year, and ending about noon, ſubjects the trees, &c. to the N. E. winds, which wither the leaves and new ſhoots, blow down the fruit, &c. beſide that it has little benefit of rains, which come moſtly from the weſt. Yet does the reverend Mr. Laurence judge the eaſt better than the weſt-wall for all kinds of fruit; not that it has more hours of ſun, or that there are any peculiar virtues in the eaſtern rays, but becauſe the early rays of the ſun do ſooner take off the cold chilly dews of the night.

M. Gentil recommends the *eaſtern expoſure* as beſt for all kinds of peaches; adding, that they ripen ſooneſt, grow bigger, are better coloured, and of a finer taſte, than in any other: but Mr. Carpenter reſtrains the rule to the early and middle ſorts; for the backward, he rather chooſes a *ſouthern*, or *ſouth-eaſt expoſure*, which is beſt for all late fruits, becauſe the influence of the ſun is ſtrongeſt, and continues longeſt.

The *weſtern*, accounted from half an hour paſt eleven till ſun-ſet, is backwarder than an *eaſtern* one by eight or ten days; but it has this advantage, that it receives little damage from the froſts, which melt before the ſun comes to ſhine upon the fruit, and fall off like dew, without doing any prejudice; ſo that it may bear apricots, peaches, pears, and plums; but it is incommoded with north-weſt winds in the ſpring, as alſo with the autumnal winds, which blow down a great quantity of fruit.

According to Mr. Miller, the beſt aſpect or *expoſure* for walls in England is the point to the eaſtward of the ſouth; becauſe thoſe will enjoy the benefit of the morning ſun, and be leſs expoſed to the weſt and ſouth-weſt winds, which are very injurious to fruits in England, than thoſe walls which are erected due ſouth; the next beſt *expoſure* is due ſouth, and the next to that ſouth-eaſt, which is preferable to the ſouth-weſt. Other walls, however, may be planted with fruit-trees that ſuit their ſeveral *expoſures*.

The *northern expoſure* is the leaſt favourable of any in England, as having very little benefit from the ſun even in the height of ſummer, therefore can be but of little uſe, whatever may have been advanced to the contrary. For although many ſorts of fruit trees will thrive and produce fruit in ſuch poſitions, yet ſuch fruit can be of little worth, ſince they are deprived of the kindly warmth of the ſun to correct their crude juices, and render them well-taſted and wholeſome. It is therefore to little purpoſe to plant fruit-trees againſt ſuch walls, except it be for fruit intended for baking, &c. in which caſe the fire will ripen and render thoſe juices wholeſome which could not be performed while growing.

In ſuch ſituations, morelli cherries for preſerving may be planted, and white and red currants to come late, after thoſe which were more expoſed to the ſun are gone; and if the ſoil be warm and dry, ſome ſorts of ſummer pears will do tolerably well on ſuch an *expoſure*, and will continue longer in eating than if they were expoſed to the ſun. But winter pears ſhould by no means be planted in ſuch an aſpect, as has been practiſed by many ignorant perſons, if we find that the beſt ſouth walls in ſome bad years are barely warm enough to ripen them. Duke cherries planted againſt walls expoſed to the north will ripen much later in the ſeaſon; and if the ſoil be warm, will be well flavoured, and continue a month later than others. Miller.

The *ſouthern expoſure*, accounted from about nine till four, is recommended for peaches, pears, grapes, and plums.

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EXPRESS, ſomething that is preciſe in formal terms, or for ſome particular deſign. I told him as much in *expreſs* terms; he gave me a commiſſion *expreſs*; he had *expreſs* orders; a courier was diſpatched *expreſs*.

We alſo ſay, ſomewhat abuſively, to ſend an *expreſs*, meaning a COURIER.

EXPRESSED *Oils*, are ſuch as are procured from bodies only by preſſing; as the oils of olives, almonds, and the like. See OIL.

EXPRESSED *ſpecies*. See SPECIES.

EXPRESSION, in *Algebra*, denotes the value of a quantity expreſſed or repreſented under an algebraic form: thus, if $x = \sqrt{a^2 + b^2}$, and a and b are known, the value of x is known. See EQUATION.

EXPRESSION, in *Medicine*, *Chemiſtry*, &c. the act of *expreſſing* or extracting the juices or oils of plants, fruits, or other matters, by ſqueezing, wringing, or preſſing them in a preſs. After having let the herbs infuſe a due time, their juice muſt be drawn by *expreſſion* in a linen cloth, or by a preſs.

EXPRESSION, in *Muſic*, denotes the performing of a piece of melody, or a ſingle paſſage, with that energy and feeling which the poetry or paſſion to be impreſſed upon the hearer, requires.

EXPRESSION, in *Oratory*, denotes the manner of delivering or conveying a man's ideas to another.

EXPRESSION is more particularly uſed for the ELOCUTION, diction, and choice of words in a diſcourſe.

It is not enough a that poet or orator have fine thoughts, he muſt likewiſe have a happy *expreſſion*. Defects in the *expreſſion* ordinarily ariſe from defects in the imagination: abundance of the beauties of the ancient writers are annexed either to *expreſſions* which are peculiar to their language; or to relations, which, not being ſo familiar to us as to them, do not give us the ſame pleaſure.

EXPRESSION, *diverſifying of*, in *Rhetoric*. See DIVERSIFYING.

EXPRESSION, in *Painting*, denotes a natural and lively repreſentation of the ſubject, or of the ſeveral objects intended to be ſhewn.

The *expreſſion* conſiſts principally in repreſenting the human body and all its parts in the action ſuitable to them; in exhibiting in the face the ſeveral paſſions proper to the figures, and obſerving the motions they impreſs on the other external parts.

The term *expreſſion* is ordinarily confounded with that of *paſſion*; but they differ in this, that *expreſſion* is a general term, implying a repreſentation of an object, agreeably to its nature and character, and the uſe or office it is to have in the work; whereas paſſion, in painting, denotes a motion of the body, accompanied with certain diſpoſitions or airs of the face, which mark an agitation in the ſoul. So that every paſſion is an *expreſſion*, but not every *expreſſion* a paſſion.

EXPRESSION *in painting, laws or rules of*. *Expreſſion*, we have ſaid, is a repreſentation of things according to their character, and may be conſidered either with reſpect to the ſubject in general, or to the paſſions peculiar thereto.

I. With regard to the ſubject, it is to be obſerved,

1. That all the parts of the compoſition are to be transformed or reduced to the character of the ſubject, ſo that they may conſpire to impreſs the ſame ſentiment, paſſion, or idea: thus, e. gr. in a repreſentation of joy and peace, every thing is to appear calm and agreeable; of war, turbulent and full of terror, &c.

2. In order to this, if any circumſtance occur in hiſtory or deſcription that would invert or take from the idea, it muſt be ſuppreſſed, unleſs eſſential to the ſubject.

3. To this end the hiſtory or fable is to be well ſtudied in the authors who deſcribe it, in order to conceive its nature and character truly, and impreſs it ſtrongly on the imagination, that it may be diffuſed and carried through all the parts of the ſubject.

4. A liberty is to be taken of chooſing favourable incidents, in order to diverſify the *expreſſion*, provided they be not contrary to the principal image of the ſubject, or the truth of hiſtory.

5. The harmony of the *tout enſemble* muſt be particularly regarded, both with reſpect to the actions and the light and colour.

6. The modes and cuſtoms are to be obſerved, and every thing made conformable to time, place, and quality.

7. The three unities of time, place, and action, ought to be obſerved; that is, nothing ſhould be repreſented in the ſame picture but what paſſes at the ſame time, and may be ſeen at the ſame view.

II. With regard to the particular paſſions and affections of the ſubject: the rules are, 1. That the paſſions of brutes are few and ſimple, and have almoſt all an immediate reſpect, either to ſelf-preſervation, or the propagation of the kind; but in men there is ſcope for greater variety, and accordingly more marks and *expreſſions* thereof.

2. Children, not having the uſe of reaſon, act much after the manner of brutes; and *expreſs* the motions of their paſſions directly, and without fear or diſguiſe.

3. Though the paſſions of the ſoul may be *expreſſed* by the actions of the body, it is in the face they are principally ſhewn, and particularly in the turn of the eye, and the motions of the eye-brows.

4. There are two ways of lifting up the eye-brows, the one at the middle, which likewiſe draws up the corners of the mouth, and argues pleaſant motions: the other at the point next the noſe, which draws up the middle of the mouth, and is the effect of grief and ſadneſs.

5. The paſſions are all reducible to joy and ſadneſs; each of which is either ſimple or mixed and paſſionate.

6. Simple joy cauſes a dilation of all the parts; the eye-brows riſe in the middle, the eyes half-open, and ſmiling, the pupil ſparkling and moiſt, the noſtrils a little open, the cheeks full, the corners of the mouth drawn a little upwards, the lips red, the complexion lively, and the forehead ſerene.

7. Paſſionate joy, proceeding from love, ſhews the forehead ſmooth and even, the eye-brows a little elevated on the ſide the pupil is turned to, the eyes ſparkling and open, the head inclined towards the object, the air of the face ſmiling, and the complexion ruddy. That proceeding from deſire ſhews itſelf by the body, the arms being extended towards the object in uncertain and unquiet motions.

8. Simple ſadneſs is *expreſſed* by the body being caſt down, the head careleſly hanging aſide, the forehead wrinkled, the eye-brows raiſed to the midſt of the forehead, the eyes half ſhut, the mouth a little open, the corners downwards, the under-lip pointing and drawn back, the noſtrils ſwelled, and drawn downwards. Sadneſs mixed with fear cauſes the parts to contract and palpitate, the members to tremble and fold up, the viſage to be pale and livid, the point of the noſtrils elevated, the pupil in the middle of the eye, the mouth opened at the ſides, and the under-lip drawn back. In that mixed with anger the motions are more violent, the parts all agitated, the muſcles ſwelled, the pupil wild and ſparkling, the point of the eye-brows fixed towards the noſe, the noſtrils open, the lips big, and preſſed down, the corners of the mouth a little open and foaming, the veins ſwelled, and the hair erect. That with deſpair, reſembles the laſt, only it is more exceſſive and diſordered.

9. The hand has a great ſhare in the *expreſſion* of our ſentiments and paſſions: the raiſing of the hands conjoined towards heaven, *expreſſes* devotion; wringing the hands, grief; throwing them towards heaven, admiration; fainting and dejected hands, amazement and deſpair; holding the hands, idleneſs; holding the fingers indented, muſing; holding forth the hands together, yielding and ſubmiſſion; lifting up the hand and eye to heaven, calling God to witneſs; waving the hand from us, prohibition; extending the right hand to any one, pity, peace, and ſafety; ſcratching the head, thoughtfulneſs and care; laying the hand on the heart, ſolemn affirmation; holding up the thumb, approbation; laying the fore-finger on the mouth, bidding ſilence; giving with the finger and thumb, *parcè dare*, or *giving ſparingly*; and the fore-finger put forth, the reſt contracted, *monſtrare, & dicere, to point at, and ſay*; *hic eſt, this is he*.

10. The ſex of the figure is to be regarded; and man, as he is of a more vigorous and reſolute nature, is to appear in all his actions freer and bolder than women, who are to be more reſerved and tender:

11. So alſo the age, the different ſtages whereof incline to different motions both of body and mind.

12. The condition, or honours, with which a perſon is inveſted, render their actions more reſerved, and their motions more grave; contrary to the populace, who obſerve little conduct or reſtraint, giving themſelves for the moſt part up to their paſſions, whence their external motions become rude and diſorderly.

Laſtly, in *ſpirits* we muſt retrench all thoſe corruptible things which ſerve only for the preſervation of life, as veins, arteries, &c. only retaining what may ſerve for the form and beauty of the body. In angels, particularly, as being ſymbolical figures, we are to mark out their offices and virtues, without any draught of ſenſual paſſions, only appropriating their characters to their functions of power, activity, and contemplation.

EXPROBATION, *Exprobatio*, in *Rhetoric*, is the reproaching a perſon with ingratitude, and unmindfulneſs of ſome particular benefit conferred upon him.

EXPULSION, the act of driving a man by force out of a city, community, or the like.

EXPULSION

EXPULSION is also used in *Medicine*, for the act of driving out a foreign body with violence from the place it was in.

The uterus has the chief office in the *expulsion* of the fœtus: if the *expulsion* of the fœtus happen very soon after conception, it is called a *false birth*. See FOETUS and DELIVERY.

EXPURGATION, in *Astronomy*, is used by some authors for that state or action of the sun, wherein, after having been eclipsed and hid by the interposition of the moon, it begins to appear again.

Later astronomers call this EMERSION, not *expurgation*.

EXQUIMA, in *Zoology*, the name of a species of monkey common on the coast of Guinea. The hair on its back is of a reddish brown, and looks as if it had been singed or burnt, and resembles a rusty iron colour: among this there are a number of small white spots; its belly and chin are wholly white, and it has a very beautiful beard of a snow-white, composed of hair of two fingers length, and always lying as neatly and regularly as if it were combed. When this creature is provoked, it draws back its lips, and, shewing all its teeth, shuts its jaws very nimbly, and chatters remarkably loud. It is very nimble, and leaps surprisingly: it feeds on the fruits it finds in the woods. Ray.

There is also another species of this creature in Guinea, of the size of the former, and of a blackish brown on the greatest part of the body, but of a bluish grey on the belly, and the lower half of its tail is of a sort of tawney colour; its mouth and nose are blue, and its cheeks adorned with a multitude of yellow hairs clustered together like those of a goat's beard. Its legs and feet are wholly black, it is a sprightly animal, and skips and plays like the other. Besides these, there is also a third, of the *exquima* kind, smaller than the others, and of a mixt colour of brown, yellow, and grey: this has a long tail, a small head, and no beard.

EXSIBIDANTES, in *Antiquity*, a kind of hissers, who, in the theatre and other public auditories, used to make a noise with their feet, and even sometimes beat the seats with battons.

EXSICCATION, formed of *ex* and *siccus*, *dry*, in *Chemistry*, &c. the act of drying up or evaporating the moisture of a thing.

EXSORS *Particula*. See PARTICULA.

EXSUCCATIO, a word used by some *Chirurgical Writers*, to express an ENCHYMOSIS, or suggillation.

EXSUFFLATION, a ceremony observed in baptism, by which the candidate was supposed to renounce the devil. See BAPTISM.

EXTANT, something that still subsists, or is in being.

It is but part of the History of Livy, of the writings of Cicero, Cæsar, &c. that are *extant*, the rest are lost. We have nothing *extant* of Socrates, though he wrote a great deal.

EXTACY, Ἔκστασις, a rapture, or removal of the mind out of its natural state and situation; or a transport, whereby a person is hurried out of himself, and the office of his senses is suspended. See ENTHUSIASM.

EXTACY, in *Medicine*, is considered as a disease, near akin to a catalepsy, only differing from it in this, that the cataleptic patient has no perception of what passes in his paroxysm, nor any remembrance thereof when it is over; whereas the *extatic* is taken up with a very lively idea or imagination, which he remembers afterwards.

In an *extasy*, there must be an unusual tension of the fibres of the sensory, as in most deliriums, &c.

EXTEMPORANEOUS *Prescription*. See PRESCRIPTION.

EXTEND, in the *Manege*. To *extend a horse*, is an expression used by some to import the same with making a horse go large. See LARGE.

EXTEND, in *Law*. See EXTENDING.

EXTENDENDA *Terra*. See TERRA.

EXTENDENTIUM *Interior*, in *Anatomy*, a name given by Spigelius and others to a muscle of the wrist, called by Albinus, *ulnaris externus*, and by Winslow and others, CUBITALIS *externus*. See ULNARIS *extensor*.

EXTENDI *Facias*, in *Law*, a writ of extent, whereby the value of lands is commanded to be made and levied, &c. Reg. Orig.

EXTENDING, in a *Legal Sense*, signifies the valuing of lands and tenements of one bound by statute, &c. and who hath forfeited his bond at such an indifferent rate, as that by the yearly rent the obligator may in time be fully paid his debt. See EXTENT.

EXTENSION, in *Physics*, that whereby a thing is constituted long, broad, or thick, &c. or that property of bodies whereby they occupy a certain portion of space.

Extension is usually described as consisting in the situation of parts beyond parts; with which some authors cavil, as holding, that we can conceive absolute *extension* without any relation to parts.

If a man consider the distance between two bodies abstractedly, and without any regard to bodies which may fill that interval, it is called *space*; and when he considers the distance between the extremes of a solid body, it is called *extension*.

Extension is frequently confounded with quantity and magnitude; and, for what we can perceive, without much harm; the thing signified by them all appearing to be the same: unless we admit a distinction made by some authors, that the *extension* of a body is something more absolute, and its quantity and magnitude more respective, or implying a nearer relation to much and little. See QUANTITY, MAGNITUDE, MASS, and MATTER.

The infinite divisibility of *extension* has been a famous question in all ages. It is not easy to reconcile the doctrine of mathematicians on this head with the tenets of some philosophers. They who hold that all *extension* and magnitude are compounded of a certain *minima sensibilia*; and that a line, for instance, cannot increase or decrease but by certain indivisible increments or decrements only, must consistently with themselves affirm, that all lines are commensurable to each other, contrary to the tenth book of Euclid, who demonstrates, that the diagonal of a square is commensurable to its side. But if all lines were composed of certain indivisible elements, it is plain one of those elements must be the common measure of the diagonal and the side. This is a gordian knot which none of the philosophers have yet thought fit to untie.

Bishop Berkeley observes, that the infinite divisibility of finite *extension*, though it is not expressly laid down either as an axiom or theorem in the elements of geometry, yet is throughout the same every where supposed, and thought to have so inseparable and essential a connection with the principles and demonstrations in geometry, that mathematicians never admit it into doubt, or make the least question of it. And as this notion is the source from whence do spring all those amusing geometrical paradoxes, which have such a direct repugnancy to the plain common sense of mankind, and are admitted with so much reluctance into a mind not yet debauched by learning; so is it the principal occasion of all that nice and extreme subtilty which renders the study of mathematics so difficult and tedious. Hence, says he, if we can make it appear, that no finite *extension* contains innumerable parts, or is infinitely divisible, it follows, that we shall at once clear the science of geometry from a great number of difficulties and contradictions which have ever been esteemed a reproach to human reason, and withal make the attainment thereof a business of much less time and pains than it hitherto hath been.

Every particular finite *extension*, which may possibly be the object of our thought, is an idea existing only in the mind, and consequently each part thereof must be perceived. If therefore I cannot perceive innumerable parts in any finite *extension* that I consider, it is certain they are not contained in it; but it is evident, that I cannot distinguish innumerable parts in any particular line, surface, or solid, which I either perceive by sense, or figure to myself in my mind; wherefore, I conclude they are not contained in it. Nothing can be plainer to me, than that the *extensions* I have in view are no other than my own ideas; and it is no less plain, that I cannot resolve any one of my ideas into an infinite number of other ideas; that is, that they are not infinitely divisible. If by an infinite *extension* be meant something distinct from a finite idea, I declare I do not know what that is, and so cannot affirm or deny any thing of it. But if the terms *extension*, parts, and the like, are taken in any sense conceivable; that is, for ideas; then to say a finite quantity or *extension* consists of parts infinite in number, is so manifest a contradiction, that every one at first sight acknowleges it to be so. New Theory of Vision, § 54, 55. Analyst, § 31.

On the other hand, it is observed by an eminent mathematician, that geometricians are under no necessity of supposing that a finite quantity or *extension* consists of parts infinite in number, or that there are any more parts in a given magnitude than they can conceive or express: it is sufficient that it may be conceived to be divided into a number of parts equal to any given or proposed number; and this is all that is supposed in strict geometry concerning the divisibility of magnitude. It is true, that the number of parts into which a given magnitude may be conceived to be divided, is not to be fixed or limited, because no given number is so great but a greater than it may be conceived and assigned; but there is not therefore any necessity for supposing that number infinite; and if some may have drawn very abstruse consequences from such suppositions, they are not to be imputed to geometry. See Maclaurin's Treatise of Fluxions, art. 290.

Dr.

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Dr. Reid, a late writer, in his Inquiry into the Human Mind, on the principles of common ſenſe, endeavours to obviate the difficulties ſuggeſted by Berkeley, by overturning the ſyſtem of ideas eſtabliſhed by Mr. Locke. According to his theory, it is abſurd to deduce from ſenſation the firſt origin of our notions of external exiſtences, of ſpace, motion, and *extenſion*, and all the primary qualities of bodies; they have, he ſays, no reſemblance to any ſenſation, or to any operation of our minds, and therefore they cannot be ideas either of ſenſation or of reflection; nor can he conceive how *extenſion* or any image of *extenſion* can be in an unextended and indiviſible ſubject like the human mind.

EXTENSION *of fractured limbs*, in *Surgery*. When the fractured bones maintain their natural ſituation, the ſurgeon has nothing to do but to apply a proper bandage to keep them in it; but when the fractured parts recede from one another, ſome degree of *extenſion* is neceſſary, which muſt always be ſuited to the diſtortion of the limb. The greater diſtance there is between the extremities of the divided parts of the bone, ſo much the ſhorter will the limb become from the natural contraction of the muſcles, and the *extenſion* muſt be proportionably the greater; but in theſe caſes every thing is to be done tenderly, and with great care. 1, The patient is to be kept very firm and ſteady; the poſture of the body muſt be in this operation different, according to the different circumſtances of the caſe; ſometimes ſitting, and ſometimes lying, are the moſt proper. 2. An aſſiſtant muſt ſupport the limb with his hands, both above and below the fractured part. 3. The perſon who holds the lower part of the limb muſt extend it ſtrongly and equally, till the fractured bone can be replaced; but when the ſurgeon is called at ſome diſtance of time from the accident, and a tumour and inflammation are come on, it is beſt in ſuch caſe to defer the *extenſion* of the parts till theſe ſymptoms are removed, by letting blood, looſening the bowels, giving the patient large quantities of aqueous fluids, and preſcribing the proper internal remedies for abating inflammations, and fomenting the parts with warm diſcutient decoctions. Theſe applications will uſually ſucceed ſo well as to take down the inflammation in twenty-four hours, in ſuch a manner, that the *extenſion* of the limb may be ſafely attempted; but when they do not take place ſo ſuddenly, they are to be repeated till they have the deſired effect; and where the common fomentations fail, the following has often very great and happy ſucceſs: take two or three handfuls of ſcordium, and boil them for about a quarter of an hour in a pint of water, with ſix ounces of rectified ſpirit of wine; afterwards mix with it an ounce of common ſalt, and half an ounce of ſaltpetre, and apply this to the inflamed fractured limb. To make the proper *extenſion* of a limb, the ſurgeon muſt, while it is kept at its proper length by two aſſiſtants, direct it with his hands, ſometimes a little one way, ſometimes another, putting it into different poſitions, as the nature of the caſe ſhall require, till the parts have recovered their natural ſituation. This will be known by the remiſſion or abſence of pain, and by obſerving, that the fractured limb is of the ſame length with the ſound one; and if theſe ſigns of ſucceſs in the operation are wanting, there is great reaſon to ſuppoſe that the operation is as yet ineffectual, and the *extenſion* is to be repeated or continued till the bones are evenly and properly replaced. Heiſter's Surg. p. 108.

EXTENSOR, in *Anatomy*, a name common to diverſe muſcles, ſerving to extend or ſtretch out the parts, and particularly the hands and feet; ſuch are the

EXTENSOR *carpi ulnaris*, called alſo *cubitæus internus*, a muſcle, which, coming from the internal protuberance of the humerus, and paſſing tendinous under the ligamentum annulare, is inſerted into the upper part of the bone of the metacarpium, which anſwers to the little finger: this, and the ulnaris flexor moving together, draw the hand ſidewiſe towards the ulna. See *Tab. Anat. (Myol.) fig.* 1. *n.* 38. and *fig.* 6. *n.* 18.

EXTENSOR *carpi radialis*, called alſo *radiæus externus*, and *bicornis*, is really two diſtinct muſcles. The firſt ariſes from above the external protuberance of the humerus, and the ſecond from the lowermoſt part of the external protuberance. They both lie along the external part of the radius, and, paſſing under the annular ligament, one is inſerted into the bone of the metacarpus that ſuſtains the fore-finger, and the other to that which ſuſtains the middle-finger: theſe two extend the wriſt. See *Tab. Anat. (Myol.) fig.* 1. *n.* 29. and *fig.* 6. *n.* 19.

EXTENSOR *communis digitorum manus*, ariſes from the external protuberance of the humerus, and at the wriſt divides into three flat tendons, which paſs under the annular ligament, to be inſerted into all the bones of the fore, middle, and ring-finger. See *Tab. Anat. (Myol.) fig.* 1. *n.* 36. *fig.* 6. *n.* 20.

It very much reſembles the perforatus and perforans, and lies on the out-ſide of the fore-arm, between the ulnaris externus and radialis externus. It is fixed above, by a tendinous extremity to the poſterior and lower part of the external or great condyle of the os humeri; and, by a tendinous adheſion on each ſide to the ulnaris and radialis externus. It has likewiſe ſometimes a ſmall inſertion in the radius; it is divided into four muſcles, like the perforatus and perforans, and four long ſlender ſmall tendons. Three of theſe tendons paſs through the common external annular ligament of the carpus; and the fourth, which goes to the little-finger, and which has ſometimes its fleſhy portion diſtinct from the reſt, paſſes through a particular ring of the ſame ligament. Afterwards, theſe four tendons ſeparate as they go to the fingers, and in their paſſage communicate with each other by oblique tendinous ſeries, chiefly near the heads of the metacarpal bones. The tendons of the middle and little-finger are ſometimes double, and yet communicate with the reſt.

Each tendon having reached the baſis of the firſt phalanx, is ſlightly inſerted therein by ſome lateral expanſions, fixed in each ſide of the baſis; from thence it advances to the head of the ſame phalanx, where it is divided into two flat portions, which, at the articulation of the firſt phalanx with the ſecond, leave ſome diſtance between them. About the head of the ſecond phalanx they unite again, and are fixed in the convex ſide near the baſis in the third phalanx. The ſeparation of the two portions is in ſome ſort rhomboidal, and each portion is ſtrengthened by a common tendon of the lumbricales and interroſſei, and in the ſmall ſpaces between them are ſmall tendinous fræna, more or leſs tranſverſe. Winſlow's Anatomy, p. 199.

EXTENSOR *primi internodii pollicis*, ariſes from the upper and external part of the ulna, and paſſing obliquely over the tendon of the *radiæus externus*, is inſerted near the ſecond joint of the thumb.

EXTENSOR *ſecundi internodii pollicis*, ariſes from the upper and internal part of the radius, and is inſerted into the upper part of the ſecond bone of the thumb.

EXTENSOR *tertii internodii pollicis*, ariſes from the ulna, a little below the firſt *extenſor*, and is inſerted into the third bone of the thumb.

EXTENSOR *indicis*, comes from the middle and external part of the ulna, and paſſing under the annular ligament, is inſerted into the third bone of the fore-finger, where it joins the *extenſor communis*.

EXTENSOR *minimi digiti*, ariſes from the external protuberance of the humerus, and from the upper part of the ulna, and paſſing under the annular ligament, is inſerted into the third bone of the little-finger. See *Tab. Anat. (Myol.) fig.* 1. *n.* 37. and *fig.* 6. *n.* 17.

EXTENSOR *digitorum pedis longus*, is a muſcle derived from the fore-part of the upper epiphyſis of the tibia, and growing tendinous about the middle thereof, it runs in four tendons under the annular ligament to the third bone of every toe, except the pollex. See *Tab. Anat. (Myol.) fig.* 2. *n.* 45. *fig.* 1. *n.* 64.

According to Winſlow, it is a long muſcle, fleſhy in its upper part, but tendinous in the lower, lying between the tibialis anticus and peronæus maximus. It is fixed above by fleſhy fibres in the outſide of the head of the tibia, and inſide of the head of the fibula, in the upper part of the interoſſeous ligament, through three-fourths of the length of the fibula, and through the ſame ſpace in the tendinous ſeptum belonging to the anterior angle of that bone. It ſeems to mix ſome fibres on each ſide with the two firſt peronæi and tibialis anticus, and is very cloſely united with the peronæus maximus. It contracts in breadth a little above the annular ligament, and in paſſing through it is divided into three tendons, the firſt of which is afterwards again divided into two. Theſe four tendons are inſerted along the upper or convex ſide of the bones of the four ſmall toes. Winſlow's Anatomy, p. 222.

EXTENSOR *digitorum pedis brevis*, comes from the exterior and fore-part of the calcaneum, and goes to the ſecond joint of the toes. See *Tab. Anat. (Myol.) fig.* 1. *n.* 73.

It is fixed in the upper and outer-ſide of the anterior apophyſis of the aſtragalus, and in the adjoining part of the upper ſide of that bone. Thence it runs obliquely inwards, and is divided into four fleſhy portions, which terminate in four tendons. The firſt is inſerted in the upper part of the firſt phalanx of the great toe; and the other three, joining with thoſe of the *extenſor longus*, are inſerted along the convex ſides of all the phalanges of the three following toes. When there is a fifth tendon, which ſometimes happens, it goes in the ſame manner to the little-toe. Winſlow's Anatomy, p. 223.

EXTENSOR *indicis proprius*, a ſmall long muſcle, with a long ſlender tendon, lying a little obliquely on the lower and outer half of the fore-arm, between the ulna and the

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fore-finger. It is fixed by its fleſhy body a little higher than the loweſt third part of the outſide of the ulna, below the inſertion of the *extenſor pollicis*; and it has likewiſe a ſmall adheſion to the interoſſeous ligament. From thence it runs down, ending in a diſtinct tendon, without any communications, which having paſſed through the annular ligament of the *extenſor communis*, afterwards joins that tendon which goes to the index. Winſlow's Anatomy, p. 200.

EXTENSOR *minimi digiti proprius*, a collateral or auxiliary muſcle of the *extenſor communis*, of which it appears almoſt always to be more or leſs a portion. It is fixed along the ſuperior external half of the ulna, from whence its long ſmall tendon runs down in company with the fourth tendon af the *extenſor communis*, all the way to the little-finger, where it joins, and is inſerted with it. Sometimes this muſcle is wanting; in which caſe the *extenſor communis* ſends a double, and ſometimes a treble tendon to the little finger. Winſlow's Anatomy, p. 200.

EXTENSORES *pollicis manus*, two very diſtinct muſcles, the firſt or longeſt of which is ſometimes more, ſometimes leſs, and ſometimes altogether divided into two; in which caſe theſe muſcles are three in number. They are ſituated obliquely between the ulna and the convex ſide of the thumb.

The *extenſor primus* is a long muſcle, more or leſs double, and is fixed above by fleſhy fibres, firſt to the outſide of the ulna, near its upper extremity, below the anconæus minor and inſertion of the ulnaris externus; next to the interoſſeous ligament, under the ſupinator brevis; and laſtly, to the middle part of the outſide of the radius.

From thence it runs down, and paſſes anteriorly over the lower part of the radius, and tendons of the ſupinator longus and radialis externus; and being gradually divided, it terminates in two long flat tendons, more or leſs ſubdivided, which paſs together under a particular annular ligament, being only parted by ſepta or frænа belonging to that ligament. The firſt of theſe two principal tendons is inſerted in the edge of the baſis of the firſt phalanx, near the large tranſverſe ligament of the carpus: when this tendon is ſubdivided, the other portion of it is fixed in that bone of the carpus which ſuſtains the thumb. The other principal tendon, which often belongs to a muſcle entirely diſtinct from the former, is fixed in the convex ſide of the baſis of the ſecond phalanx, where it joins the tendon of the *extenſor ſecundus*. On account of theſe different inſertions of the two tendons, this muſcle is by ſome authors deſcribed as two.

The *extenſor ſecundus* is ſhorter than the firſt; it is fixed to the ulna below the former, and above the inſertion of the *extenſor indicis proprius*, and likewiſe to the neighbouring part of the interroſſeous ligament. From thence it runs down obliquely on the middle part of the radius, where it has alſo a ſmall adheſion; after this it paſſes through the ſmall channel in the ſtyloide apophyſis of the radius through the annular ligament belonging to the tendons of the radialis externus, and over theſe tendons, being parted from them by a ſmall ligamentary ſeptum. It is inſerted in the convex part of the third phalanx near its baſis, having, as it paſſes over the ſecond phalanx, joined the ſecond or collateral tendon of the firſt *extenſor*, more or leſs. Winſlow's Anatomy, p. 196.

EXTENSOR *pollicis pedis longus*, riſes large and fleſhy from the fore-part of the fibula, a little below its upper proceſs; whence, paſſing under the annular ligament, it is inſerted into the upper part of the ſecond bone of the great toe. See *Tab. Anat. (Myol.) fig.* 1. *n.* 71.

It is fixed to the inſide of the fibula, near the interoſſeous ligament, from the neck down to the loweſt quarter of that bone; to the interoſſeous ligament through the ſame ſpace, and a little to the lower extremity of the tibia next the fibula. It there ends in a conſiderable tendon, which paſſing through a diſtinct ring of the common annular ligament, and then through a membranous vagina, is inſerted in the baſis of the firſt phalanx of the great toe, and continued up to the ſecond. Winſlow's Anatomy, p. 221.

EXTENSOR *pollicis pedis brevis*, ſprings fleſhy from the fore-part of the os calcis, and, after a ſhort belly, is contracted into a ſlender tendon; which, running obliquely over the upper part of the foot, is inſerted into the ſecond bone of the great toe. See *Tab. Anat.* (*Myol.*) *fig.* 1. *n.* 75. *fig.* 2. *n.* 51.

EXTENSOR *proprius articularis*, in *Anatomy*, a name given by Albinus, and ſome other late authors, to one of the muſcles of the hand, called by Cowper and others the *extenſor minimi digiti*.

EXTENSOR *tarſi*, in *Anatomy*, a name given by Douglas and ſome others, to a muſcle more generally known by the name of the *plantaris*. See PLANTARIS.

EXTENT, in *Law*, ſometimes denotes a writ or commiſſion to the ſheriff for the valuing of lands and tenements; ſometimes the act of the ſheriff upon this writ; and ſometimes the eſtimate or valuation of lands, *per proprias viros*; which, when taken at the utmoſt value or *extent*, furniſh our extended, or rack-rents. Fleta, lib. 2.

EXTENUATION, the act of diminiſhing or leſſening the bulk or ſubſtance of a thing, eſpecially of the human body. Fevers, agues, long abſtinences, &c. occaſion great *extenuations* or emaciations.

EXTENUATION is alſo a figure in *Rhetoric*, oppoſite to the hyperbole. The Greeks call it λιτότης.

EXTERIOR *Polygon*, *Talus*. See the ſubſtantives.

EXTERMINATION, formed of *ex* and *terminus*, *boundary*, the act of *extirpating*, or totally deſtroying a people, race, family, &c.

The Jews have been *exterminated* out of Portugal, the Moors out of Spain, the Albigenſes out of France, &c. Philip the Fair of France, to be revenged on the Knights Templars, took a reſolution in 1307 to *exterminate* them.

EXTERMINATION, or EXTERMINATING, in *Algebra*, is uſed for taking away. Thus algebraiſts ſpeak of *exterminating* ſurds, fractions, and unknown quantities out of equations. See Maclaur. Algebr. part i. chap. 12. where we have ſome general theorems for the *exterminating* unknown quantities in given equations.

EXTERNAL, or EXTERIOR, a term of relation, applied to the ſurface or out-ſide of a body; or that part which appears or preſents itſelf to the eye, touch, &c.

In which ſenſe it is oppoſed to *internal*, or *interior*.

External medicines are alſo called *local medicines*, and *topics*. The ſenſes are divided into *external*, which are thoſe whereby we perceive ideas, or have the perception of *external* objects; as ſeeing, hearing, &c. and internal. See SENSE.

EXTERNAL is alſo uſed to expreſs any thing that is without-ſide a man, or that is not within him, and particularly in his mind. In which ſenſe, we ſay *external objects*, &c.

The exiſtence of an *external world*, i. e. of bodies and objects out of the mind, is a thing which has been greatly called in queſtion by Dr. Berkeley, and others. See EXISTENCE, BODY, and QUALITY.

EXTERNAL *angles*, are the angles of any right lined figure formed without it, when all the ſides are ſeverally produced. Theſe are all, taken together, equal to four right angles. Particularly, in a triangle, the *external* angle is equal to both the internal and oppoſite ones. See TRIANGLE.

EXTERNAL *Denomination*, *Ear*, *Modes*, *Place*. See the ſubſtantives.

EXTERNUS *auris*, in *Anatomy*, a ſmall muſcle coming from the ſide of the meatus auditorius, to the ſhort proceſs of the malleus; ſerving to draw the handle thereof downwards, and ſo to relax the membrana tympani. See EAR.

EXTERNUS *Brachiæus*, *Cubitæus*. See the ſubſtantives.

EXTERNUS *Duverni*, a name given by Douglas to one of the muſcles of the ear, called by Cowper and others *obliquus auris*, and by Albinus *externus mallei*.

EXTERNUS *Gaſtrocnemius*, *Iliacus*. See the ſubſtantives.

EXTERNUS *Mallei*, in *Anatomy*, a name given by Albinus to one of the muſcles of the ear, called by others *obliquus auris*, and *muſculus externus auris*.

EXTERNUS *Orbiter*, *Pterygoideus*, *Vaſtus*, *Rectus Capitis*. See the ſubſtantives.

EXTINCTION, the act of *extinguiſhing*, that is, of putting out, or deſtroying, fire, flame, or light.

The Ariſtotelians account for the *extinction* of fire from the principle of contrariety: thus, ſay they, water puts out fire, becauſe the qualities of water are contrary to thoſe of fire; the one being cold and moiſt, and the other hot and dry. But how far this will go, may appear hence, that fire is extinguiſhed by hot water as readily as cold; nay even by oil, earth, &c.

Some of the moderns offer two more plauſible cauſes of *extinction*; viz. *diſſipation*; as when the next, immediate fuel of the flame is diſperſed and blown off by too forcible a wind; and *ſuffocation*, when it is ſo compreſſed, that its free motion cannot be maintained; as happens upon throwing water, &c. thereon. Various preparations and engines have been contrived for extinguiſhing accidental fires. See FIRE.

Boerhaave denies, that there is properly any ſuch thing as extinguiſhing of fire: it is a body *ſui generis*, of an immutable nature; and we can no more *extinguiſh* or deſtroy it, than we can create it.

EXTINCTION, in *Chemiſtry* and *Pharmacy*, is when a metal, mineral, or the like body, after having been heated red-hot in the fire, is plunged in ſome fluid; either to ſoften or temper its acrimony, as tutty in roſe-water; or to com-

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communicate its virtue to the liquor, as iron or ſteel to common water; or, laſtly, to give it a temper, as in the *extinction* of ſteel in water, or ſome other preparation.

EXTINGUISHMENT, in *Law*, is uſed for a *conſolidation*. Thus, if a man, having a yearly rent due to him out of my lands, afterwards purchaſe the ſame lands; both the property and rent becoming conſolidated, or united in one poſſeſſor, the rent is ſaid to be *extinguiſhed*.

So, where a man has a leaſe for years, and afterwards buys the property, there is a *conſolidation* of the property, and an *extinguiſhment* of the leaſe.

So alſo, if there be lord meſne, and tenant, and the lord purchaſe the tenancy, the meſnalty is *extinct*.

Likewiſe by purchaſing of lands wherein a perſon hath common appendant, the common is *extinguiſhed*. Cro. El. 594. A releaſe of common in one acre, is an *extinguiſhment* of the whole common. Shower's Rep. 350. And where a perſon hath common of *vicinage*, if he incloſes any part of the land, all the common is extinct. 1 Brownl. 174. If a man hath a high-way appendant to land, and afterwards purchaſeth the land wherein the high-way is, the way is extinct: though it is held, that a way of neceſſity to a market or church, or to arable land, is not ſo *extinguiſhed*.

EXTINGUISHMENT *of a copyhold* takes place on any act of the copyholder's, which denotes his intention to hold no longer of his lord, and amounts to a determination of his will. As if a copyholder in fee accepts a leaſe for years of the ſame land from the lord; or accepts an aſſignment of a leaſe made to another from the leſſee, his copyhold is extinct.

EXTINGUISHMENT *of debt* happens in a variety of caſes. Thus if a creditor accepts a higher ſecurity than he had before, or accepts a bond for a legacy, the firſt debt or legacy are hereby *extinguiſhed*.

EXTINGUISHMENT *of liberties*, in *Law*. If liberties and franchiſes granted by the king, come again to the crown, they ſhall not be *extinguiſhed*; but it is otherwiſe in the king's grants of felon's goods, waifs, ſtrays, wrecks, &c. 9 Rep. 25.

EXTINGUISHMENT *of ſervices*. If the lord purchaſes or accepts any part of the tenancy, out of which an entire ſervice is to be paid, the ſervice becomes thereby extinct; unleſs it be for the public good or homage and fealty, which are not ſubject to *extinguiſhment*.

EXTINGUISHMENT *of ways*. See EXTINGUISHMENT.

EXTIRPATION, formed of *ex*, and *ſtirps*, *root*, the act of pulling up, or deſtroying, a thing to the very roots. Among the prayers of the Romiſh jubilee, there is one for the *extirpation* of hereſy.

EXTIRPATION is alſo uſed, in *Surgery*, for cutting off any part entirely; as a wen, &c. or the eating it away, as a wart, &c. by corroſive medicines. See AMPUTATION, and CORROSION.

EXTIRPATIONE, in *Law*, a judicial writ, either before or after judgment, that lies againſt a perſon, who when a verdict is found againſt him for land, &c. doth maliciouſly overthrow any houſe, or *extirpate* any trees upon it. Reg. Jud. 13. p. 56.

EXTISPEX, formed of *exta*, and *ſpicere*, of *ſpicio*, *I view*, *conſider*, in *Antiquity*, an officer who viewed and examined the entrails of victims; in order to draw preſages from them as to futurity.

This kind of divination, called *extiſpicium*, was much in vogue throughout Greece, where there were two families, the Jamidæ and Clytidæ, conſecrated, or ſet apart, peculiarly for it.

It appears to have been very ancient, and was probably derived from the ancients. Vitruvius, cap. 4. lib. i. gives the following plauſible account of its origin. He ſays that the ancients inſpected the lives of thoſe animals which frequented the places where they intended to build or encamp; and if they commonly found that the liver, to which they attributed ſanguification, was injured, they concluded that the waters and nouriſhment collected near ſuch places were not wholeſome.

In Italy, the firſt *extiſpices* were the Hetrurians; among whom, likewiſe, the art was in great repute. Lucan gives us a fine deſcription of one of theſe operations in his firſt book.

EXTORTION, in *Law*, an illegal manner of wreſting any thing from a man, either by force, menace, or authority.

If an officer, by terrifying another, on pretence of his office, takes more than his ordinary fees, or dues, he commits, and is indictable for *extortion*.

So the exacting of unlawful uſury, winning by unlawful game, and, in fine, all taking of more than is juſtly due, by colour or pretence of right, as exceſſive tolls in millers, exceſſive prices of ale, bread, victuals, wares, &c. come under *extortion*.

Crompton ſays, that wrong done by any man, is properly a treſpaſs, but exceſſive wrong is *extortion*; which is moſt properly applicable to ſheriffs, mayors, bailiffs, and other officers, who, by colour of their office, greatly oppreſs and wrong the king's ſubjects, by taking exceſſive rewards, or fees, for executing their office.

EXTRA-*conſtellary ſtars*. See SPORADES.

EXTRA-*judicial*, ſomething done out of the proper court, or the ordinary courſe of law. As when judgment is given in a cauſe, or caſe, not depending in that court where ſuch judgment is given, or wherein the judge has no juriſdiction.

EXTRA-*mundane ſpace*, is the infinite, empty, void ſpace, which is by ſome ſuppoſed to be extended beyond the bounds of the univerſe; and conſequently in which there is really nothing at all.

EXTRA-*parochial*, a place out of the bounds of any pariſh; or privileged and freed from the duties of a pariſh.

EXTRACT, EXTRACTUM, in *Pharmacy*, the pureſt and fineſt part of a vegetable, or other body, ſeparated from the coarſer, by diſſolution and digeſtion with a proper menſtruum; and afterwards reduced into a thick, moiſt conſiſtence by diſtillation, or evaporation of the humidity of the menſtruum.

Mr. Geoffroy, who well knew the value of this form of medicine, attempted to improve upon the common method of making *extracts*, and ſucceeded greatly to his wiſhes; the conſequence of which was his preſenting to the academy of ſciences at Paris his method of doing it.

The hint was taken from a method uſed by the count Lagarais, to make what he called his eſſential ſalts of plants; which were only dry *extracts*, prepared by powdering the ſubſtance, and then keeping it in continual motion for ſix or ſeven hours in common water, by means of a chocolate mill, turned by a large horizontal wheel. After the matter had ſubſided for an hour, the remaining liquor was poured off, and evaporated over a balneum Mariæ, or in the ſun, and a valuable dry *extract* prepared. The method of this proceſs made it impracticable in large quantities of medicines; and Mr. Geoffroy removed the great difficulties that attended it, by proving from repeated experiments, that boiling or infuſing the ſubſtances in hot water, extracted from them all that was got out by the long motion of the mill; as was inſtanced in the moſt familiar manner, in the common way of making tea and coffee, which were found to impregnate water with as much of their virtue by the methods of infuſion and decoction, as by ever ſo long an operation in the count's method. The expence of making *extracts* of this kind cannot but be greater than that of managing the ſame medicines any other way; but the eaſe of taking, and the ſmall doſe, cannot but ſufficiently recommend them; and according to Mr. Geoffroy's method, the ſick may prepare them for themſelves. Mr. Geoffroy gives ſome examples of his ſucceſs in theſe preparations: he took a dram of ſena in powder, and pouring on it a quantity of hot water, left it in infuſion twenty-four hours; then filtering the infuſion, he evaporated the liquor in balneo Mariæ, to the conſiſtence of a thin ſyrup, and ſpreading this over the bottoms of two or three broad earthen plates, that it might dry regularly, he evaporated the remaining humidity over the ſame balneum, and procured twenty-four grains of a dry *extract*, wholly reſembling count Lagarais's ſalts, and operating in the ſame manner, and with the ſame virtues, as a dram of ſena, whether taken in powder or bolus, or diſſolved in any fluids; in any of which forms it had nothing of the nauſeous taſte of ſena. See Mem. Acad. Scienc. Par. 1738.

Extracts are prepared from a variety of different drugs; as the bark, gentian, jalap, opium, &c. See EXTRACTUM *Catharticum*.

EXTRACT, in *Matters of Literature*, denotes a ſhort abridgment of a book or paper, or of ſome of the matters thereof. The journals, nouvelles, bibliotheques, memoires, and other monthly reviews, or quarterly accounts of the affairs of learning, conſiſt principally of *extracts* of the moſt material paſſages, doctrines, &c. found in the ſeveral books publiſhed in that time.

EXTRACT *ab eccleſia*. See RESTITUTIONE *extractı*.

EXTRACTA *curiæ*, in our *Old Writers*, the iſſues or profits of holding a court, ariſing from the cuſtomary fees, &c.

EXTRACTION, in *Pharmacy* and *Chemiſtry*, an operation, whereby eſſences, tinctures, &c. are drawn from natural bodies.

Some will have *extraction* to ſignify any ſolution made by menſtruums; but, in ſtrictneſs, there is this difference, that in *ſolution* the menſtruum abſorbs the whole ſubſtance of the body, but in *extraction* it carries off only a certain part of it; and in this ſenſe, camphire is diſſolved in ſpirit of wine, but jalap is more properly ſaid to

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to be *extracted*; for the reſin is only taken out by the menſtruum, the other particles being left untouched.

EXTRACTION alſo frequently ſignifies ſuch an inſpiſſation, or thickening of a ſolution, as that a certain quantity of the menſtruum being drawn off, the remaining mixture is reduced to the conſiſtence of honey; as in the *extracts* of ſaffron, gentian, and the like.

Extracts are chiefly made from vegetables, and require different menſtruums, according to the different nature of the plants, eſpecially the gummous kind; for ſuch as are mucilaginous, as gum Arabic, and tragacanth, &c. are not eaſily diſſolved but in aqueous liquors; whereas reſinous gums, as galbanum, ſcammony, &c. muſt have burning ſpirits to diſſolve them.

There are others again of a middle nature, which may be diſſolved in either ſort of menſtruums, though not ſo eaſily in one as the other: thus aloes, and rhubarb, which are ſomething reſinous, are better made into *extracts* with ſpirit of wine, than water; but plants, which abound leſs with reſin, ſuch as hellebore, &c. are more commodiouſly *extracted* with water.

To perform *extraction*, therefore, a proper menſtruum is neceſſary, and one which is as near a-kin as poſſible to the body to be *extracted*.

EXTRACTION, in *Surgery*, denotes an operation whereby ſome foreign matter lodged in the body, contrary to the order of nature, is drawn out of the ſame by manual application, or the help of inſtruments.

Such is the *extraction* of a ſtone, formed in the bladder, or in the kidneys, &c.

EXTRACTION *of a cataract*. See CATARACT.

Extraction belongs to the EXÆRESIS, as a ſpecies to its genus.

EXTRACTION, or *deſcent*, in *Genealogy*, denotes the ſtock, or family, which a perſon is deſcended from.

In ſome military orders, chapters, &c. a candidate muſt make proof of the nobility of his *extraction* before he is admitted.

EXTRACTION *of roots*, the method of finding the roots of given numbers, or quantities. See ROOT.

The ſquare, cube, and other powers of a number, or root, are formed by multiplying the given number into itſelf a greater or leſs number of times, as the POWER required is higher or lower.

This multiplication compounds the powers; and the *extraction* of the root decompounds them again, or reduces them to their principles or roots. So that the *extraction* of the root is to the multiplication of the power, what the analyſis is to the ſyntheſis.

Thus, 4, multiplied by 4, produces 16; which is the ſquare of 4, or the factum of 4, by itſelf; and 16, multiplied by 4, makes 64, which is the cube of 4, or the factum of 4 by its ſquare. Such is the compoſition of powers.

Again, the ſquare root of 16 is 4, becauſe 4 is the quotient of 16 divided by 4; and the cube root of 64 is likewiſe 4, as 4 is the quotient of 64 divided by the ſquare of 4. Such is the *extraction* of roots.

Hence to *extract* the root out of a given power, is the ſame thing as to find a number, e. gr. 4, which being multiplied a certain number of times into itſelf, produces the given power, e. gr. 16 or 64.

For the *extraction* of ſquare and cube roots, it is neceſſary to have the ſquares and cubes of all the digits in readineſs; as exhibited in the following table.

Roots	1	2	3	4	5	6	7	8	9
Square	1	4	9	16	25	36	49	64	81
Cube	1	8	27	64	125	216	343	512	729

To extract *the ſquare root out of a given number*. 1. Divide the given number into claſſes, of two figures a-piece; and include each claſs between two dots, commencing with the place of units, and proceeding to the left in integers, and to the right in decimals; the root will conſiſt of ſo many parts, or figures, as you have claſſes. By the way obſerve, it may happen, that for the laſt claſs on the left-hand there ſhall only be one figure left.

2. Then the left-hand claſs being the ſquare of the firſt figure of the root ſought, look in the table of roots for the ſquare root anſwering to that number; or, if that ſquare number be not preciſely there, to the next leſſer number: this root write down for the firſt figure of the quotient; and ſubtract its ſquare from the left-hand claſs. To the remainder bring down the next claſs toward the right.

3. Write down the double of the quotient figure under the left-hand figure of the ſecond claſs; and ſeek how oft this duple is contained in the figure over it: the quotient gives the ſecond figure of the root.

4. Write the ſame quotient under the right-hand figure of the ſame claſs; and ſubtract the product of the whole number underwritten, multiplied by the ſecond figure of the root, from the number over it, as in diviſion.

5. The operation being repeated according to the third and fourth ſteps, i. e. the remainder being ſtill divided by the double of the root as far as *extracted*; and from the remainder ſubtract the product of the laſt diviſor, having the laſt found figure of the quotient added to it, multiplied by this figure, you will have the root required.

E. gr. To *extract* the root of 99856, point it after the following manner, 99856: then ſeek a number, whoſe ſquare ſhall equal the firſt figure 9, viz. 3, and write it in the quotient; then having ſubtracted from 9, 3×3, or 9, there will remain 0; to which ſet down the figures as far as the next point, viz. 98, for the following operation. Then, taking no notice of the laſt figure 8, ſay, How many times is the double of 3, or 6, contained in the firſt figure 9? Anſwer, 1. Wherefore having written 1 in the quotient, ſubtract the product, of 1×61, or 61 from 98, and there will remain 37, to which connect the laſt figures 56, and you will have the number 3756, in which the work is next to be carried on. Wherefore alſo neglecting the laſt figure of this, viz. 6, ſay, How many times is the double of 31, or 62, contained in 375 (which may be gueſſed at from the initial figures 6 and 37, by taking notice how many times 6 is contained in 37)? Anſwer, 6; and writing 6 in the quotient, ſubtract 6×626, or 3756, and there will remain 0; whence it appears, that the buſineſs is done, the root coming out 316.

```
99856 ( 316
9
----
098
 61
----
3756
3756
----
   0
```

Otherwiſe, with the diviſors ſet down, it will ſtand thus:

```
99856 (316
9
----
6) 98
   61
-----
62) 3756
    3756
-------
       0
```

And ſo in others.

Again, if you were to *extract* the root out of 22178791:

```
22178791 ( 4709, 43637, &c.
16
----
617
609
----
 88791
 84681
 -----
 411000
 376736
 ------
  3426400
  2825649
  -------
  60075100
  56513196
  --------
  356190400
  282566169
  ---------
  73624231
```

firſt, having pointed it, ſeek a number, whoſe ſquare (if it cannot be exactly equalled) ſhall be the next leſs ſquare (or neareſt) to 22, the figures to the firſt point, and you will find it to be 4. For 5×5, or 25, is greater than 22; and 4×4, or 16, is leſs; wherefore 4 will be the firſt figure of the root. This, therefore, being writ in the quotient, from 22 take the ſquare 4×4, or 16; and to the remainder 6, adjoin the next figures 17, and you will have 617; from whoſe diviſion, by the double of 4, you are to obtain the ſecond figure of the root, viz. neglecting the laſt figure 7, ſay, how many times 8 is contained in 61? Anſwer, 7; wherefore write 7 in the quotient, and from 617 take the product of 7 into 87, or 609, and there will remain 8, to which join the two next figures 87, and you will have 887; by the diviſion whereof by the double of 47, or 94, you are to obtain the third figure; in order to which ſay, how many times is 94 contained in 88? Anſwer, 0; wherefore write 0 in the quotient, and adjoin the two laſt figures 91, and you will have 88791, by whoſe diviſion by the double of 470, or 940, you are to obtain the laſt figure; viz. ſay, how many times 940 in 8879? Anſwer, 9; wherefore write 9 in the quotient, and you will have the root 4709. But ſince the product 9×9409, or 84681, ſubtracted from 88791, leaves 4110, the number 4709 is not the root of the number 22178791 preciſely, but a little leſs.

If then it be required to have the root approach nearer, carry on the operation in decimals, by adding to the remainder two cyphers in each operation. Thus the remainder

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mainder 4110, having two cyphers added to it, becomes 411000; the diviſion whereof, by the double of 4709, or 9418, will give the firſt decimal figure 4. Then having writ four in the quotient, ſubtract 4×94184, or 376736, from 411000, and there will remain 34264. And ſo having added two more cyphers, the work may be carried on at pleaſure, the root at length coming out 4709, 43637, &c.

But when the root is carried on half-way or above, the reſt of the figures may be obtained by diviſion alone: as in this example, if you have a mind to *extract* the root to nine figures, after the five former 4709,4 are *extracted*, the four latter may be had, by dividing the remainder by the double of 4709,4.

Thus if the root of 32976, were to be *extracted* to five places, in numbers; after the figures are pointed, write 1 in the quotient, as being the figure whoſe ſquare 1×1, or 1, is the greateſt that is contained in 3, the figure to the firſt point; and having taken the ſquare of 1 from 3, there will remain 2; then having ſet the two next figures, viz. 29, to it (viz. to 2), ſeek how many times the double of 1, viz. 2, is contained in 22, and you will find indeed that it is contained more than ten times; but you are never to take your diviſor 10 times, nor even 9 times in this caſe;

```
 32976 ( 181,59
 -
  1
 ----
 2)229
   224
 -----
36) 576
    361
 -----
362)215(59, &c.
```

becauſe the product of 9×29, or 261, is greater than 229, from which it would be to be taken, or ſubtracted; wherefore write only 8. And then having written 8 in the quotient, and ſubtracted 8×28, or 224, there will remain 5; and having ſet down to this the figures 76, ſeek how many times the double of 18, or 36, is contained in 57, and you will find 1, and ſo write 1 in the quotient; and having ſubtracted 1×361, or 361, from 576, there will remain 215. Laſtly, to obtain the remaining figures, divide this number 215, by the double of 181, viz. 362, and you will have the figures 59, which, being writ in the quotient, give the root 181, 59. After the ſame manner are roots *extracted* out of decimal numbers. Thus, the root of 329,76 is 18,159; and the root of 3,2976 is 1,8159; and the root of 0,032976, is 0,18159, and ſo on. But the root of 3297,6 is 57,4247; and the root of 32,976 is 5,74247. And thus the root of 9,9856 is 3,16.

To extract *the other, or higher root, out of a given number.* The *extraction* of the cubic root, and all other roots, may be comprehended under one general rule; viz. every third figure, beginning from unity, is firſt to be pointed, if the root to be *extracted* be a cubic one; or every fifth, if it be a quadrato-cubic (or of the fifth power); and then ſuch a figure is to be writ in the quotient, whoſe greateſt power (that is, whoſe cube, if it be a cubic power; or whoſe quadrato-cube, if it be the fifth power, &c.) ſhall either be equal to the figure, or figures, before the firſt point, or next leſs under them; and then having ſubtracted that power, the next figure will be found by dividing the remainder augmented by the next figure of the reſolvend, by the next leaſt power of the quotient multiplied by the index of the power to be *extracted*, that is, by the triple ſquare, if the root be a cubic one; or by the quintuple biquadrate (that is, five times the biquadrate), if the root be of the fifth power, &c. And having again ſubtracted the power of the whole quotient from the firſt reſolvend, the third figure will be found by dividing that remainder, augmented by the next figure of the reſolvend, by the next leſſer power of the whole quotient, multiplied by the index of the power to be *extracted*.

Thus, to *extract* the cube root of 13312053, the number is firſt to be pointed after this manner, viz. 13312053; then you are to write the figure 2, whoſe cube is 8, in the firſt place of the quotient, as, that which is the next leſſer cube to the figure 13 (which is not a perfect cube number), or as far as the firſt point; and having ſubtracted that cube, there will remain 5; which being augmented by the next figure of the reſolvend 3, and divided by the triple ſquare of the quotient 2, by ſeeking how many times 3×4, or 12, is contained in 53, gives 4, or the ſecond figure of the quotient. But ſince the cube of the quotient 24, viz. 13824, would come out too great to be ſubtracted from the figures 13312, that precede the ſecond point, there muſt only 3 be writ in the quotient; then the quotient 23 being in a ſeparate place multiplied by 23, gives the ſquare 529, which again multiplied by 23, gives the cube 12167; and this taken from 13312, will leave 1145; which augmented by the next figure of the reſolvend 0, and divided by the triple ſquare of the quotient 23, viz. by ſeeking how many times 3×529, or 1587, is contained in 11450, gives 7, for the third figure of the quotient. Then the quotient 237, multiplied by 237, gives the ſquare 56169, which again multiplied by 237, gives the cube 13312053; and this taken from the reſolvend, leaves 0. Whence it is evident, that the root ſought is 237.

```
 13312053 (237
Subt. the cube 8
 ---------
 12) rem: 53 (4 or 3
 ----------
Subtract cube  12167
 1587) rem:  11450( 7
 ----------
      13312053
    Remains 0
```

So alſo, to *extract* the quadrato-cubical root of 36430820, it muſt be pointed over every fifth figure; and the figure 3, whoſe quadrato-cube, or fifth power 243, is the next leſſer to 364, viz. to the firſt point, muſt be writ in the quotient. Then the quadrato-cube 243 being ſubtracted from 364, there remains 121, which augmented by the next figure of the reſolvend, viz. 3, and divided by five times the biquadrate of the quotient, viz. by ſeeking how many times 5×81, or 405, is contained in 1213, gives 2 for the ſecond figure. That quotient 32, being thrice multiplied by itſelf, makes the biquadrate 1048576; and this again, multiplied by 32, makes the quadrato-cube 33554432, which, being ſubtracted from the reſolvend, leaves 2876388. Therefore 32 is the integral part of the root, but not the true root; wherefore, if you have a mind to proſecute the work in decimals, the remainder, augmented by a cypher, muſt be divided by five times the aforeſaid biquadrate of the quotient, by ſeeking how many times 5×1048576, or 5242880, is contained in 2876388,0, and there will come out the third figure, or the firſt decimal 5. And ſo by ſubtracting the quadrato-cube of the quotient 32,5 from the reſolvend, and dividing the remainder by five times its biquadrate, the fourth figure may be obtained. And ſo on *in infinitum*.

```
 36430820 ( 32, 5
 --------
  243
 ------
 405 ) 1213 ( 2
       ----
      33554432
 5242880 ) 2876388, 0 ( 5
```

In ſome caſes, it is convenient only to indicate the *extraction* of a root, eſpecially where it cannot be had exactly. Now, the ſign, or character, whereby roots are denoted, is $\surd$; to which is added, the exponent of the power, if it be above a ſquare, and even ſometimes if it be not. E. gr. $\sqrt[2]{}$ denotes the ſquare root; $\sqrt[3]{}$ the cube root, &c. See ROOT.

When a biquadratic root is to be *extracted*, you may *extract* twice the ſquare root, becauſe $\sqrt[4]{}$ is as much as as $\sqrt[2]{} \times \sqrt[2]{}$. And when the cubo-cubic root is to be *extracted*, you may firſt *extract* the cube root, and then the ſquare root of that cube root, becauſe the $\sqrt[6]{}$ is the ſame as $\sqrt[2]{} \times \sqrt[3]{}$; whence ſome have called theſe roots, not cubo-cubic ones, but quadrato-cubes. And the ſame is to be obſerved in other roots, whoſe indices are not prime numbers.

To prove the extraction *of roots.* 1. For a *ſquare root:* multiply the root found by itſelf, and to the product add the remainder, if there were any: if the ſum be equal to the number given, the operation is juſt.

2. For a *cube root.* Multiply the root found by itſelf; and the product, again, by the ſame root. To the laſt product, add the remainder, if there were any. If the ſum come out the number firſt given, the work is juſt.

After the like manner may the *extraction* of the other roots be proved.

To extract *the roots of equations, or algebraic quantities.* The *extraction* of roots out of ſimple algebraic quantities, is evident, even from the nature, or marks of notation itſelf; as that $\surd aa$ is a, and that $\surd aacc$ is ac, and that $\surd 9aacc$ is $3ac$; and that $\surd 49a^4xx$ is $7aax$. And alſo that $\surd \frac{a^4}{cc}$, or $\frac{\surd a^4}{\surd cc}$ is $\frac{aa}{c}$, and that $\surd \frac{a^4bb}{cc}$ is $\frac{aab}{c}$, and that $\surd \frac{9aazz}{25bb}$ is $\frac{3az}{5b}$, and that $\surd \frac{4}{9}$ is $\frac{2}{3}$, and that $\sqrt[3]{} \frac{8b^6}{27a^3}$ is $\frac{2bb}{3a}$, and that $\sqrt[4]{}aabb$ is $\surd ab$: moreover, that $b\surd aacc$, or b into $\surd aacc$, is equivalent to b into ac, or abc: and that $3c\surd \frac{9aazz}{25bb}$, is equivalent to $3c \times \frac{3az}{5b}$, or $\frac{9acz}{5b}$. And that $\frac{a+3x}{c}\surd \frac{4bbx^4}{81aa}$ is equivalent to $\frac{a+3x}{c} \times \frac{2bxx}{9a}$, or to $\frac{2abxx+6bx^3}{9ac}$. I ſay all theſe are evident, becauſe it will appear at firſt ſight, that the propoſed quantities

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are produced, by multiplying the roots into themſelves (as a a from a into a; a a c c from a c into a c; 9 a a c c from 3 a c into 3 a c, &c.) The rule is to *extract* the required root of the numeral co-efficient, if there be any, and to divide the exponents of the literal or algebraic quantities by the number that denominates the root required. It is evident from the application of this rule, that any power which has a poſitive ſign may have either a poſitive or negative root, if the root is denominated by an even number; becauſe + or −, multiplied into themſelves an even number of times will give +. Alſo, that if a power have a negative ſign, no root of it denominated by an even number can be aſſigned. But if the root to be extracted is denominated by an odd number, the ſign of the root will be the ſame as the ſign of the given quantity whoſe root is required. However, it will often happen, that the number denominating the required root will not exactly divide the exponent of the given power, in which caſe the required root will have a fractional exponent: thus, $\sqrt[3]{8a^5}$ is $= 2a^{\frac{5}{3}}$. But when quantities conſiſt of ſeveral terms, the buſineſs is performed as in numbers.

Thus to *extract* the ſquare root out of a a + 2 a b + b b: in the firſt place, write the root of the firſt term a a, viz. a, in the quotient, and having ſubtracted its ſquare a × a, there will remain 2 a b + b b to find the remainder of the root by. Say, therefore, how many times is the double of the quotient, or 2 a, contained in the firſt term of the remainder 2 a b? I anſwer, b [times]: therefore write b in the quotient, and having ſubtracted the product of b into 2 a + b, or 2 a b + b b, there will remain nothing; which ſhews that the work is finiſhed, the root coming out a + b.

```
a a + 2 a b + b b (a + b
a a
-----
  0 + 2 a b + b b
    + 2 a b + b b
  ---------------
    0     0
```

And thus to *extract* the ſquare root out of $a^4 + 6a^3b + 5aabb - 12ab^3 + 4b^4$, firſt ſet in the quotient the root of the firſt term a^4, viz. a a; and having ſubtracted its ſquare a a × a a, or a^4, there will remain $6a^3b + 5aabb - 12ab^3 + 4b^4$ to find the remainder of the root. Say, therefore, how many times is 2 a a contained in $6a^3b$? Anſwer, 3 a b; wherefore write 3 a b in the quotient; and having ſubtracted the product of 3 a b, into 2 a a + 3 a b, or $6a^3b + 9aabb$, there will yet remain $-4aabb - 12ab^3 + 4b^4$ to carry on the work. Therefore, ſay again, how many times is the double of the quotient, viz 2 a a + 6 a b, contained in $-4aabb - 12ab^3$? or, which is the ſame thing, ſay, how many times is the double of the firſt term of the quotient, or 2 a a, contained in the firſt term of the remainder $-4aabb$? Anſwer, − 2 b b. Therefore having writ − 2 b b in the quotient, and ſubtracted the product − 2 b b into 2 a a + 6 a b − 2 b b, or $-4aabb - 12ab^3 + 4b^4$, there will remain nothing.

Whence it follows, that the root is a a + 3 a b − 2 b b.

```
a^4 + 6 a^3 b + 5 a a b b - 12 a b^3 + 4 b^4 (a a + 3 a b - 2 b b
a^4
-------
  - 6 a^3 b + 5 a a b b - 12 a b^3 + 4 b^4
  0 + 6 a^3 b + 9 a a b b
  ----------------------
    0 - 4 a a b b - 12 a b^3 + 4 b^4
      - 4 a a b b - 12 a b^3 + 4 b^4
    ------------------------------
      0       0       0
```

And thus the ſquare root of the quantity $xx - ax + \frac{1}{4}aa$ is $x - \frac{1}{2}a$; and the ſquare root of the quantity $y^4 + 4y^3 + 8y^2 + 8y + 4$ is $yy + 2y + 2$; and the ſquare root of the quantity $16a^4 - 24aa\,xx + 9x^4 + 12bb\,xx - 16aabb + 4b^4$ is $3xx - 4aa + 2bb$, as may appear underneath.

1.
```
xx - a x + 1/4 a a (x - 1/2 a
xx
-----
  0 - a x + 1/4 a a
  -----------------
    0     0
```

2.
```
                    + 16 a^4
9 x^4 - 24 a a      - 16 a a b b (3 x^2 - 4 a a
      + 12 b b x^2  + 4 b^4      + 2 b b
9 x^4
-----------------------------------------
0                   + 16 a^4
  - 24 a a x^2      - 16 a^2 b^2
  + 12 b b          + 4 b^4
-----------------------------------------
  0                 0
```

3.
```
y^4 + 4 y^3 + 8 y^2 + 8 y + 4 (y y + 2 y + 2
y^4
---
0
```



```
4 y^3 + 8 y y
-------------
  0 + 4 y y + 8 y + 4
    + 4 y y + 8 y + 4
  -----------------
    0   0   0
```

If you would extract the cube root out of $a^3 + 3aab + 3abb + b^3$, the operation is performed thus:

```
a^3 + 3 a a b + 3 a b b + b^3 (a + b
a^3
---
3 a a) 0 + 3 a a b (b
-------------------
  a^3 + 3 a a b + 3 a b b + b^3
    0       0       0
```

Extract firſt the cube root of the firſt term a^3, viz. a, and ſet it down in the quotient: then ſubtracting its cube a^3, ſay, how many times is its triple ſquare, or 3 a a, contained in the next term of the remainder 3 a a b? and there comes out b; wherefore write b in the quotient, and ſubtracting the cube of the quotient a + b, there will remain 0; therefore a + b is the root. After the ſame manner, if the cube root is to be *extracted* out of $z^6 + 6z^5 - 40z^3 + 96z - 64$, it will come out $zz + 2z - 4$. And ſo likewiſe in higher roots.

The general rule for *extracting* any root out of any given quantity, is as follows. Having ranged the quantity according to the dimenſions of its letters, *extract* the ſaid root out of the firſt term, and that ſhall be the firſt member of the root required; then raiſe this root to a dimenſion lower by unit than the number that denominates the root required, and multiply the power that ariſes by that number itſelf; divide the ſecond term of the given quantity by the product, and the quotient ſhall give the ſecond member of the root required. The other members of the root, if there be more than two, are found after the ſame manner. In ſome caſes the exact root cannot be found in finite terms: thus, the ſquare root of $a^2 + x^2$ is found to be $a + \frac{x^2}{2a} - \frac{x^4}{8a^3} + \frac{x^6}{16a^5} - \frac{5x^8}{128a^7}$, &c.

The operation is thus:

```
a^2 + x^2 (a + x^2/2a - x^4/8a^3 + x^6/16a^5, &c.
a^2
-------
2a + x^2/2a ) * + x^2
  x x^2/2a  ) = x^2 + x^4/4a^2
-------------
2a + x^2/a - x^4/8a^3 ) - x^4/4a^2
     x - x^4/8a^3     ) = - x^4/4a^2 - x^6/8a^4 + x^8/64a^6
                        ---------------------------------
                          + x^6/8a^4 - x^8/64a^6, &c.
```

In the ſame manner the cube root of $a^3 + x^3$ will be found to be $a + \frac{x^3}{3a^2} - \frac{x^6}{9a^5} + \frac{5x^9}{81a^8} - \frac{10x^{12}}{243a^{11}}$, &c. Thus,

```
a^3 + x^3 (a + x^3/3a^2
a^3
---
3a^2 ) * x^3
```

Then cube $a + \frac{x^3}{3a^2}$, and we ſhall have $a^3 + x^3 + \frac{x^6}{3a^3} + \frac{x^9}{27a^6}$, which, ſubtracted from the given quantity $a^3 + x^3$, leaves $-\frac{x^6}{3a^3} - \frac{x^9}{27a^6}$ for the next reſolvend; and this divided by $3a^2$ will give $-\frac{x^6}{9a^5}$ for the next term of the quotient, &c. But the roots of quantities of this kind are much more expeditiouſly obtained by means of the BINOMIAL *theorem*. For the ſquare root of $a^2 + x^2$ $= \overline{a^2 + x^2}^{\frac{1}{2}}$; and $\overline{a^2 + x^2}^{\frac{1}{2}} = \overline{a^2}^{\frac{1}{2}} + \frac{1}{2} \times \overline{a^2}^{\frac{1}{2}-1} \times x^2 + \frac{1}{2} \times \frac{\frac{1}{2}-1}{2} \times \overline{a^2}^{\frac{1}{2}-2} \times \overline{x^2}^2 + \frac{1}{2} \times \frac{\frac{1}{2}-1}{2} \times \frac{\frac{1}{2}-2}{3} \times \overline{a^2}^{\frac{1}{2}-3} \times \overline{x^2}^3$, &c. $= \overline{a^2}^{\frac{1}{2}} + \frac{1}{2} \times \overline{a^2}^{-\frac{1}{2}} x^2 + \frac{1}{2} \times -\frac{1}{4} \times \overline{a^2}^{-\frac{3}{2}} x^4 + \frac{1}{2} \times -\frac{1}{4} \times -\frac{1}{2} \times \overline{a^2}^{-\frac{5}{2}} x^6$, &c. $= a + \frac{1}{2} \times a^{-1} x^2 - \frac{1}{8} \times a^{-3} x^4 + \frac{1}{16} \times a^{-5} x^6$, &c. = (bringing the powers of a from the numerators to the denominators, by

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by changing the ſigns of their exponents) $a + \frac{x^2}{2a} - \frac{x^4}{8a^3} + \frac{x^6}{16a^5}$, &c.

Thus alſo the cube root of $a^3 + x^3 = \overline{a^3 + x^3}^{\frac{1}{3}}$; and $\overline{a^3 + x^3}^{\frac{1}{3}} = \overline{a^3}^{\frac{1}{3}} + \frac{1}{3} \times \overline{a^3}^{\frac{1}{3}-1} \times x^3 + \frac{1}{3} \times \frac{\frac{1}{3}-1}{2} \times \overline{a^3}^{\frac{1}{3}-2} \times \overline{x^3}^2 + \frac{1}{3} \times \frac{\frac{1}{3}-1}{2} \times \frac{\frac{1}{3}-2}{3} \times \overline{a^3}^{\frac{1}{3}-3} \times \overline{x^3}^3$, &c. $= \overline{a^3}^{\frac{1}{3}} + \frac{1}{3} \times \overline{a^3}^{-\frac{2}{3}} x^3 + \frac{1}{3} \times -\frac{1}{3} \times \overline{a^3}^{-\frac{5}{3}} x^6 + \frac{1}{3} \times -\frac{1}{3} \times -\frac{5}{9} \times \overline{a^3}^{-\frac{8}{3}} x^9$, &c. $= a + \frac{1}{3} \times a^{-2} x^3 - \frac{1}{9} \times a^{-5} x^6 + \frac{5}{81} a^{-8} x^9$, &c. $= a + \frac{x^3}{3a^2} - \frac{x^6}{9a^5} + \frac{5x^9}{81a^8}$, &c. See Maclaurin's Algebra, part i. ch. viii. p. 50, 51. See ROOT.

EXTRACTOR, in *Midwifery*, an inſtrument contrived to extract children in caſes of difficult births. We have the deſcription of a forceps for extracting children by the head, when lodged low in the pelvis of the mother, in the Medic. Eſſ. Edinb. vol. iii. art. 20. See alſo the abridgment of this book, vol. ii. p. 438, where ſome alteration is mentioned of this inſtrument from Giffard's Midwifery, and an improvement of it by Mr. Freke.

EXTRACTUM *catharticum*, a form of medicine in the London Diſpenſatory, intended as an equivalent for the *extractum Rudii*, commonly called Rudius's pill. It is made in this manner: take Socotorine aloes an ounce and half; pith of coloquintida, ſix drams; ſcammony, and the leſſer cardamom ſeeds huſked, of each half an ounce; proof ſpirit a pint; pour the ſpirit on the coloquintida cut ſmall; then add the ſeeds bruiſed; draw a tincture with a gentle heat, continued four days; then to the tincture preſſed out, add the aloes and ſcammony, firſt ſeparately reduced to powder; and theſe being diſſolved, draw off the ſpirit, and reduce the maſs by evaporation to the conſiſtence of a pill. This for many reaſons is a better compoſition than the Rudius's pill.

EXTRADOS, the outſide of a vault.

EXTRANEOUS *motion*. See MOTION.

EXTRAORDINARII, in *Roman Antiquity*, a body of forces, conſiſting of a third part of the horſe, and a fifth part of the foot, which was ſeparated from the reſt, to prevent any deſign that might be formed againſt the natural forces. See ABLECTI.

EXTRAORDINARY, ſomething out of the common courſe.

EXTRAORDINARY *couriers*, are thoſe ſent expreſs on ſome urgent occaſion.

EXTRAORDINARY *embaſſador*, or *envoy*, is ſuch a one as is ſent to treat or negociate ſome ſpecial and important affair, as a marriage, a treaty, confederacy, &c. or even on occaſion of ſome ceremony, as condolence, congratulation, &c. See EMBASSADOR.

A Gazette, Journal, or other News-paper *extraordinary*, is that publiſhed after ſome great and notable event, containing the detail or particulars thereof, which are not found in the ordinary papers. Our news-writers generally uſe poſtſcripts, or ſupplements, inſtead of *extraordinaries*.

EXTRAORDINARY *culverin*. See CULVERIN.

EXTRAVAGANTES, a part of the canon-law, containing divers conſtitutions of the popes, not included in the body of the canon-law; whence the denomination *extravagantes; quaſi extra corpus juris vagantes*.

The *extravagantes* are divided into two parts: the firſt contains twenty conſtitutions of John XXII. and the ſecond, other later conſtitutions of the ſaid John, and his ſucceſſors. See CANON-*Law*, and DECRETALS.

EXTRAVASATION, formed of *extra*, *without*, and *vas*, *veſſel*, in *Medicine*, a motion of the blood, whereby it breaks out of its ordinary veſſels, the veins or arteries, and either gathers, and ſtagnates in ſome ſoft part, or is thrown quite out of the body.

The ordinary cauſes of *extravaſations*, are unnatural repletions, and diſtenſions of the veſſels; or lacerations, and eroſions thereof. There is a neceſſity for bleeding, to prevent the blood's accumulating ſo as to *extravaſate*. In wounds of the head, particularly, bleeding is neceſſary, to prevent the *extravaſation* of the blood in the brain.

In the contuſions, fiſſures, depreſſions, fractures, and other accidents of the cranium, one or more of the blood-veſſels diſtributed on the dura mater are frequently divided. The blood that is diſcharged from theſe veſſels greatly oppreſſes the brain, and diſturbs its offices; frequently brings on pains and other miſchiefs, and often death itſelf, unleſs the patient be timely relieved. If the quantity of *extravaſated* blood be ever ſo ſmall, it will certainly corrupt and affect the meninges, and the brain itſelf with the ſame diſorder; and from hence will proceed violent inflammations, deliriums, and ulcers, and finally death; and this will frequently be the caſe, after a violent blow upon the cranium, though the bone ſhould eſcape without injury. In theſe injuries of the head, the blood is ſpilt either between the cranium and the dura mater, or between the dura and pia mater, or between the pia mater and the brain, or laſtly into the ſinuſes of the brain. Either of theſe caſes is attended with very great danger; but the deeper the extravaſation happens, ſo much greater muſt the danger be. Blood *extravaſated* in the cavity of the cranium, will be diſcovered from the violence of the ſymptoms that ſucceed a blow on the head; as if the patient lies ſtill without ſenſe or motion, if blood flows from the mouth, ears, or noſe; if the eyes are much inflamed and ſwelled; if vomitings ſucceed; when upon the remiſſion of theſe ſymptoms the patient complains of a remarkable heavineſs of head, ſleepineſs, vertigo, blindneſs, ſpaſms, and diſorders of this kind. When the quantity of *extravaſated* blood on theſe accidents is very conſiderable, and oppreſſes the cerebellum, the patient dies upon the ſpot; but when it is not in a very large quantity, or does not affect the cerebellum, life ſtill remains, but the ſymptoms juſt mentioned come on. In this caſe, if no fiſſure, or contrafiſſure is to be found, nor any external injury on the integuments of the head after a violent blow, it proves very difficult to find in what part of the head the *extravaſation* is ſeated. It will be proper in this caſe firſt to ſhave the head all over, and then thoroughly to examine it; for if any part is ſofter than ordinary, or is enlarged, or red from ſtagnating blood, it is plain that this is the part that has received the injury. But if neither in this way, nor by inquiry among the perſons preſent at the accident, you can get light into the affair, it will be proper to cover the whole head with an emollient plaſter, laying over it medicated bags of herbs, &c. well heated. This application will in a few hours time produce a tumor and ſoftneſs upon the injured part. Sometimes the patient alſo, though he lies ſpeechleſs, and ſeemingly ſenſeleſs, will be continually putting his hand to the injured part; and if either ſide of the patient has loſt ſenſe or motion, and is become paralytic, it is an apparent ſign, whatever ſome might think to the contrary, that the injury has been received on the contrary or ſound ſide. If after accidents of this kind you can diſcover any wound in the ſkin, that muſt be enlarged with the knife till the injury of the cranium, of whatever kind it be, is come at.

When the ſeat of the injury is diſcovered, the firſt intention is to diſcharge the *extravaſated* blood, and then to clean the wound, and remove all ſplinters, or extraneous bodies. Some have recourſe on theſe occaſions to the inſtant uſe of the trepan; but patients have been often very ſucceſsfully recovered without it. It is therefore beſt firſt to open a vein, and take away as much blood as the ſtrength of the patient will permit; this will take off the impetus of the veſſels, and prevent the *extravaſation* of more blood. Preſcribe after this a briſk purge to leſſen the quantity of the fluids; foment the head with medicated bags, and apply a melilot plaſter to it; endeavour to rouſe the patient by volatile applications to the noſtrils, ſuch as ſal volatile, ſpirit of ſal ammoniac, or ſpirit of hartſhorn; and give frequently attenuating fluids, ſuch as the decoctions of betony, ſage, roſemary, lavender-flowers, ſaſſafras, and the like. This method does not immediately produce the deſired effect, but is to be continued for ſome time, and the preſcriptions frequently repeated, particularly when the bad ſymptoms ſeem by degrees to abate; and if the patient finds relief from the firſt bleeding, it will be proper to repeat it a ſecond or third time, eſpecially if he be of an athletic conſtitution. When notwithſtanding this method, the ſymptoms are found however rather to increaſe than abate, it will be neceſſary to make a perforation in the cranium with the TREPAN, to give a paſſage for the diſcharge of the confined grumous blood; and when there is no finding out the part affected, the ſkull muſt be perforated in ſeveral parts till the right is found. Heiſter's Surg. p. 90. See ECCHYMOSIS.

EXTRAVASATION is ſometimes likewiſe uſed in ſpeaking of other humours beſide the blood; as the lympha, urine, &c. The gardeners uſe the term in ſpeaking of gums, juices, &c. which ouſe out of their trees either ſpontaneouſly, or at inciſions.

EXTRAVERSIO, in *Chemiſtry*, a term uſed to expreſs the rendering manifeſt any thing ſaline, alcaline, or acid, concealed in mixed bodies; and is juſt the reverſe to one of the ſpecies of concentration, which hides theſe qualities.

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EXTREAM, or EXTREME, is applied to the laſt and outermoſt part of any thing; or that which finiſhes and terminates it on that ſide.

The *extreams* of a line are points. There is no paſſing out of one *extream* into the other, without going through the middle. *Extream* remedies muſt only be had recourſe to in *extream* neceſſity.

Some anatomiſts apply the denomination *extreams*, or *extremities*, to the arms and legs.

The arms, or upper *extremities*, conſiſt of ſixty-two bones; thirty-one in each, viz. the omoplate, humerus, cubitus, radius, eight in the carpus, four in the metacarpus, and fifteen in the fingers.

The *lower extremities*, or legs, conſiſt of ſixty; thirty in each; viz. the femur, rotula, tibia, fibula, ſeven in the tarſus, five in the metatarſus, and fourteen in the toes.

Galen, in his comment on the prognoſtics, obſerves, that theſe parts in acute diſeaſes often afford great matter for prognoſtication; ſince death never happens without ſome alteration in thoſe parts, from their natural ſtate; for in dying perſons the *extream* parts are neceſſarily refrigerated, and turn livid and black; and oftentimes the hands and feet are ſubject to odd and irregular motions.

EXTREAMS, in *Logic*, denote the two *extream* terms of the concluſion of a ſyllogiſm; viz. the predicate and ſubject. They are called *extreams*, from their relation to another term, which is a medium or mean between them.

The predicate, as being likewiſe had in the firſt propoſition, is called the *majus extremum*, *greater extream*; and the ſubject, as being put in the ſecond, or minor, propoſition, is called the *minus extremum*, *leſſer extream*.

Thus, in the ſyllogiſm, man is an animal; Peter is a man, therefore Peter is an animal; the word animal is the greater *extream*, Peter the leſs *extream*, and the man the medium. See SYLLOGISM.

EXTREAM *and mean proportion*, in *Geometry*, is when a line is ſo divided, that the whole line is to the greater ſegment, as that ſegment is to the other.

Or, as Euclid expreſſeth it, when the line is ſo divided, that the rectangle under the whole line, and the leſſer ſegment, is equal to the ſquare of the greater ſegment.

The invention of this diviſion is thus: let the given line be AB = a (*Tab.* II. *Geometry*, *fig.* 43.) and for the greater ſegment put x, the leſſer will be $a-x$. Then, by the hypotheſis, $a : x :: x : a-x$. Therefore $aa-ax = xx$, conſequently $aa = ax+xx$. And, by adding $\frac{1}{4}aa$ on each ſide, to make $xx+ax+\frac{1}{4}aa$ a complete ſquare, the equation will ſtand thus, $\frac{5}{4}aa = xx+ax+\frac{1}{4}aa$.

Now, ſince the latter is exactly a ſquare, its root $x+\frac{1}{2}a = \sqrt{\frac{5}{4}aa}$, and by tranſpoſition it will be $\sqrt{\frac{5}{4}aa}-\frac{1}{2}a = x$; which laſt equation is a canon for finding x.

For at the foot of AB = a, ſet at right angles $CB = \frac{1}{2}a$; then draw CA, the ſquare of which is equal $ABq + CBq = \frac{5}{4}aa$. And therefore $AC = \sqrt{\frac{5}{4}aa}$; make CD = CA. From whence $CB = \frac{1}{2}a$ being taken, as the caſe requires, there remains $BD = x$; which transferred into AB, ſhall give the point E, where AB is cut according to *extream and mean proportion*.

This cannot be exactly done in numbers; but if you would have it tolerably near, add together the ſquare of any number, and the ſquare of its half, and extract, as near as you can, the ſquare root of the ſum; from whence taking half, the remainder is the greater part.

EXTREAMS, in right-angled ſpherical trigonometry. When one of the five circular parts of a right-angled ſpherical triangle, viz. (the three ſides and two oblique angles, for the right angle is neglected) is pitched upon for the middle term, then the two circular parts lying immediately next to it are called *extreams conjunct*; and the two parts remote from the aſſumed middle part, or not immediately next it, *extreams disjunct*. See CIRCULAR *parts*, TRIANGLE, and TRIGONOMETRY.

EXTREAM-UNCTION, one of the ſacraments of the Romiſh church, the fifth in order, adminiſtered to people dangerouſly ſick, by anointing them with holy oils, and pronouncing ſeveral prayers over them.

It is called *extream unction*, as being only given to perſons in *extremity*. In the thirteenth century, it was called the *unction of the ſick*, and not *extream unction*: for, in the earlier ages, it was given before the *viaticum*; which practice, according to F. Mabillon, was not changed till the thirteenth century.

The reaſons he aſſigns for the change are, that in that age there aroſe divers miſtaken opinions, ſeveral of which we find mentioned and condemned in the Engliſh councils: among the reſt, it was held, that ſuch as had received this ſacrament, in caſe they recovered, might not make uſe of their wives, nor eat meat, nor go barefooted; whence they choſe to forbear it till the laſt extremity; which practice prevailed. See the councils of Worceſter and Exeter, in the year 1287; that of Winchester, in 1308; and F. Mabillon, Acta Sanct. Benedict. Sæc. iii. p. 1.

The form of *extream unction* is now deprecative, as the divines call it; formerly it was abſolute, and indicative. This ſacrament is not only in uſe in the Latin, but alſo in the Greek church, and throughout the Eaſt, though under another name, and with ſome difference in the circumſtances; in that the orientals do not wait till their ſick are come to extremity, in order to anoint them; but the ſick generally go to church themſelves; and it is adminiſtered to them as often as they are indiſpoſed: the Greeks taking that direction of St. James, chap. v. ver. 14. which is the foundation of the practice, in a general ſenſe: *Is any ſick among you? let him call for the elders of the church, and let them pray over him, anointing him with oil.* F. Dandini diſtinguiſhes two kinds of *unction* among the Maronites: the one called *unction with the oil of the lamp*; but this he ſuggeſts, is not the ſacramental *unction* ordinarily adminiſtered to ſuch as are in extreme ſickneſs; becauſe the oil is only conſecrated by a prieſt, and it is given to all who are preſent; not to the ſick only, but alſo to the healthy; even the prieſt who officiates partakes of it. The other kind of *unction*, according to that father, is only for the ſick: this is performed with oil conſecrated by the biſhop alone, on Holy Thurſday; and this, it ſeems, is their ſacramental *unction*.

The *unction* with lamp-oil is in uſe, not only among the Maronites, but throughout all the eaſtern church, who uſe it very religiouſly. The truth is, they do not ſeem to have any other ſacrament of *extream unction* beſide this. Yet F. Goar obſerves, though it be only a ceremony, with regard to thoſe in health, it is a real ſacrament to thoſe that are ſick.

In their great churches they have a lamp, wherein this oil for the ſick is preſerved; this lamp they call κανδηλα τε ευχελαιου; that is, *the lamp of oil joined with prayer*; for what the Latins call *extream unction*, the Greeks call ευχελαιον, or αγιον ελαιον; that is, *oil with prayer*, or *holy oil*.

EXTREMITIES *of figures*, in *Painting*, is uſed for the head, hands, and feet. Theſe ſhould be drawn with more nicety and exactneſs, or more terminated than other parts; and thus help to render the action more expreſſive.

EXTREMUM *clauſit diem*. See DIEM.

EXTRINSIC is applied, in the *Schools*, in various ſenſes.

Sometimes it ſignifies a thing's not belonging to the eſſence of another: in which ſenſe, the efficient cauſe, and the end, or ſcope, of a thing, are ſaid to be *extrinſic*, or *extrinſic cauſes*.

Sometimes it implies a thing not being contained within the capacity of another. In which ſenſe, thoſe cauſes are ſaid to be *extrinſic*, which introduce ſomething into a ſubject from without: as when fire introduces heat, &c.

Sometimes it denotes a thing added, or applied to another. Thus, accidents and adherences are ſaid to be *extrinſic* to the ſubject; and thus viſion is *extrinſic* to the object ſeen.

EXTRINSIC *Argument*, *Service*. See the ſubſtantives.

EXTUBERANCES, in *Medicine*, are ſwellings forth, or riſings up in the fleſh, or other parts of the body.

EXUBERANCE, compounded of *ex* and *uber*, *plentiful*; of *uber*, *udder*, in *Rhetoric*, a redundancy. See REDUNDANCE, and PLEONASM.

EXUDATION, the act of ſweating out. In which manner, gums, balſams, &c. are uſually produced from trees.

EXUCONTIANI, a branch of Arian heretics. See EXOUCONTII.

EXVERRÆ, in *Antiquity*, a kind of bruſh uſed in cleanſing houſes, out of which a dead perſon had been carried.

EXULCERATION, in *Medicine*, the act of cauſing, or producing ulcers.

Thus, arſenic *exulcerates* the inteſtines; corroſive humours *exulcerate* the ſkin.

EXULCERATION is ſometimes alſo uſed for an ULCER itſelf; but, more generally, for thoſe beginning eroſions which wear away the ſubſtance, and form ulcers.

Exulcerations in the inteſtines are marks of POISON.

EXUPORA, in *Botany*, a name by which ſome authors have called the verbena, or common vervain.

EXUSTION, of *ex* and *uro*, *I burn*, the act of burning with fire; uſed in ſome operations by ſurgeons. See BURN.

EXUVIÆ, formed from *exuere*, *to put off*, *to diveſt*, in *Phyſiology*, tranſient parts of certain animals, which they put off, or lay down, and aſſume new ones.

Such, eſpecially, are the ſkins, or ſloughs, of ſerpents; ſhells of lobſters, and the like; which are annually changed, and renewed in the ſpring.

The outer integument of the body, which in man and other larger animals is ſo durably fixed on the body, is in

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in many of the animals of the reptile kind much more looſely fixed, and is changeable ſeveral times during the period of their lives. The ſerpent-kind all ſhift their ſkins ſeveral times in their lives, and the water-newt has been lately obſerved to do the ſame; but no creature in the world does it ſo often as the caterpillar, almoſt every ſpecies of theſe inſects throwing off their old ſkin once in ten or twelve days, or leſs; and this in ſuch a manner as is extremely worthy an attentive obſervation. Malpighi obſerved that the common ſilkworm changed its ſkin four times during its continuance in that ſtate; the firſt of theſe changes happening at eleven or twelve days from its appearance from the egg, and the others at the diſtance of five or ſix days each; and probably the reſt of the caterpillar-kind obſerve nearly the ſame periods.

Neither is this change of the ſkin confined to the few creatures we have mentioned; but among the whole inſect claſs, the moſt numerous of that of all animated beings we know, there is ſcarce one ſpecies every individual of which does not throw off its ſkin, once at leaſt, before it arrives at its full growth. The term changing the ſkin is ſcarce expreſſive enough for this operation in the caterpillar-kinds; for the creature throws off the external covering of every the minuteſt part and organ of its body, and the ſkins they thus depoſite have ſo much the appearance of a complete inſect, that they are very often miſtaken for ſuch, preſenting us with every thing that we ſee in the external appearance of the living animal. If the caterpillar has been one of the hairy kinds, the ſkin which it throws off is hairy, containing the integument as it were of every hair and of each of the legs; and even the claws and other parts, which are not viſible without the aſſiſtance of a microſcope, are as plain in this as in the living animal. But what is moſt of all amazing, is to find that the very ſolid parts which form the head, are alſo found in the *exuviæ*, the ſkull and teeth being plainly diſtinguiſhable in them; it is eaſy to conceive that this muſt be a ſtrange operation, for an animal in this manner to withdraw the ſeveral parts of its body out of their ſheaths and caſes, which they have plainly been fitted into in ſo nice a manner; and particularly the throwing off an old ſkull and teeth to make way for new ones, ſeems an act beyond all comprehenſion. The operation however appears as tedious and painful to the animal as we can expect; if we examine it ſtrictly a day or two before this change happens, the creature always refuſes to eat, and loſes its former activity; either never walking at all, or at the utmoſt but very ſlowly; though they do not move out of their places, however, they are very full of ſome particular motions in their body; they turn themſelves about from ſide to ſide, and often elevate their back, and then gently depreſs it again; they frequently raiſe up their heads, and ſtrike them down rudely againſt the things they ſtand upon, and frequently the anterior half of the body is raiſed from the place, and thruſt very briſkly backwards and forwards from ſide to ſide, for three or four times together. Theſe are the more obvious motions; but beſide theſe there are other leſs ſenſible ones within every ring; theſe are ſeparately inflated and contracted again alternately, and by this means the ſkin is greatly looſened from them; and by theſe motions, and the remaining without food, it is that the body by degrees diſengages itſelf from the ſkin. Reaumur, Hiſt. Inſ. vol. i. part i. p. 225.

M. Reaumur obſerved three or four hairy caterpillars, at the time when they were juſt preparing for their change; and when they ſhewed the very firſt ſigns of its approaching, by ceaſing to eat and move, he cut, with a fine pair of ſciſſars, many of the hairs off, as cloſe to the body as he could. When the change was perfected, and this ſkin thrown off, he examined the hairs of the parts, correſponding to thoſe he had cut them ſhort upon in the old ſkin, while yet upon the animal. If theſe had been the caſes of the new hairs, thoſe muſt certainly have been cut ſhort with them; but, on the contrary, they were found, in the caterpillar, as long in thoſe parts as in any others. It appears from hence, that though all the other parts thrown off are but the ſheaths and caſes to what they covered, yet the hairs are real and ſolid things themſelves; and hence it appears, that the creature, when hatched from the egg, muſt have all its ſkins perfectly formed, one lying under another, and each furniſhed with its covering of hairs, ſo that the old ones are to fall off with the old ſkins, and the new ones to appear with the new; and probably this may be one great means of forcing off and diſlodging the old ſkin from every part, by the creature's erecting them in part. Ibid. p. 241.

EXUVIÆ is alſo uſed for ſome ſhells, and other marine bodies, frequently found in the bowels of the earth; ſuppoſed to have been depoſited there at the deluge, as being the real ſpoils of once living creatures. See SHELL, FOSSIL, and DELUGE.

EY, in our *Old Writers*, the ſame with *inſula*, an *iſland*; from which comes *eyet*, a ſmall iſland or iſlet, vulgarly called *eyght*.

EYE, the organ, or part, of the body, whereby viſion is effected; i. e. whereby viſible objects are repreſented to the mind. The *eye*, or organ of ſight, is generally divided into *internal* and *external* parts; or into the *eye properly ſo called*, and the *appendages* thereof.

Under the latter claſs come the *orbit*, or cavity, wherein the *eye* is placed; the *ſupercilium*, or *eye-brow*, whereby the rays of light are moderated in their paſſage to the *eye*, and ſweat, and other nuiſances, are prevented from falling down into it, though both theſe purpoſes are better anſwered by the anterior and inferior part of the *os frontis*; the *palpebræ*, or *eye-lids*, which cover and defend it in time of ſleep; with their *cilia*, or fringes of hair, to break the too fierce impreſſion of the light, and keep off flies and moats, and by their frequent motions to aſſiſt in diffuſing the tears, and oily ſecretions of the ſebaceous or ciliary glands of the *eye-lids*, equally over the ſurface of the globe of the *eye*; and the *canthi*, or angles. The *eye, properly ſo called*, is of a globular form, and conſiſts of tunics, humours, and veſſels.

In ſome parts it is lined with fat, and it is moved with muſcles; which two latter are by ſome anatomiſts, though ſomewhat inaccurately, reckoned among the conſtituent parts of the *eye*. The *tunics, coats, or membranes, of the eye*, are ſeven; viz. 1. The *adnata*, or *conjunctiva*, covering the whole ball of the *eye*, except the fore-part, called the *ſight*. 2. The *tunica albuginea*, which is placed immediately under the former, and is formed by the expanded tendons of the four ſtrait muſcles of the globe of the *eye*. Theſe two which ſome conſider only as one coat, are called partial coats, becauſe they inveſt only a part of the globe of the *eye*. 3. Immediately under the *adnata* and *abuginea*, is the *ſclerotica*, which covers the whole globe of the *eye*; being opake everywhere but in the fore-part, which covers the ſight, and is tranſparent like horn; which has occaſioned anatomiſts to account this a diſtinct membrane, the fourth in number, and to denominate it the *cornea*. The fifth is the *choroides*, ſituate immediately under the *ſclerotica*: the internal ſurface of the *choroides*, called the *tunica Ruyſchiana*, from profeſſor Ruyſch, or the vaſcular coat from its texture, immediately inveſts the external or poſterior ſurface of the *retina*; its fore-part, like the former, is tranſparent, and therefore accounted a diſtinct, or ſixth coat, and called the *uvea*. Of the duplicature of this part of the tunic, is formed a ſtriped, variegated circle, called the *iris*, which, in different ſubjects, is of different colours, and gives the denomination of this or that colour to the *eye*. Near its middle is an aperture, or perforation, called the *pupil*, or *apple* of the *eye*, about which the iris forms a ring; from the inſide of this tunic ſpring certain fibres, which ſpreading round the cryſtalline humour, form the *ligamentum ciliare*. The ſeventh tunic, which ſome only make the third, is the *retina*, ſo called, as reſembling a net, and covering only the fund, or bottom, of the *eye*, oppoſite to the ſight.

Of the three proper tunics, the *ſclerotica*, *choroides*, and *retina*, the firſt is derived from the *dura mater*, being detached from the brain as an outer coat, or cover, of the optic nerve, till, arriving at the ball of the *eye*, it is there expanded into a tunic: the ſecond is derived from the *pia mater*, and tranſmitted likewiſe from the brain, along with the optic nerve; the third may be ſaid to be derived from the brain, or *medulla* itſelf, as being an expanſion of the medullary ſubſtance of the optic nerve. See each tunic deſcribed under its proper article. See alſo IRIS and PUPIL.

The *humours of the eye*, incloſed between theſe tunics, are three; viz. 1. The *aqueous*, a limpid, tranſparent humour, ſituate in the fore-part of the *eye*, immediately under the *cornea*, and occaſioning its protuberance. 2. The *cryſtalline*, ſituate immediately under the aqueous, behind the uvea, oppoſite to the pupil. 3. The *vitreous*, or glaſſy humour, which fills all the hind-part of the cavity of the globe; and is that which gives the ſpherical figure of the *eye*: on its back part is the *retina* ſpread. See each humour under its proper article, AQUEOUS, CRYSTALLINE, and VITREOUS.

Some authors, finding theſe humours covered with proper membranes, have given diſtinct names to them; as the *aqueous*, *cryſtalline*, and *vitreous tunics*; but theſe being only productions of the other coats above mentioned, the diſtinction is not much regarded. See the ſituation of the ſeveral coats and humours above deſcribed, repreſented by a figure of the *eye*, in *Tab.* II. *Optics*, *fig.* 26. *a a* is the *ſclerotica*; A A the *cornea*; *c c* the *choroides*; *p p* the *pupil*; *b p*, *b p*, the *iris*; CC the *cryſtalline humour*,

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ſuſpended by *l*, *l*, the *ligamenta ciliaria*, or *proceſſus ciliares*; NN the optic nerve, the expanſion of which, as far as the *ligamenta ciliaria*, forms the *retina*. The *aqueous humour* is contained in the cavity lying between the *cryſtalline* and the *cornea*; and the larger cavity, beyond the *cryſtalline*, is occupied by the *vitreous humour*.

The *veſſels of the eye* are, nerves, glands, arteries, and veins. 1. The nerves are, the optic pair, which, iſſuing through a perforation in the ſkull, behind the orbit, enter the ball of the *eye*, and diffuſe and loſe themſelves therein; the outer coat, as already obſerved, going to form the *ſclerotica*, the inner to the *choroides*, and the *medulla* to the *retina*.

Beſides which, the *motorii*, *pathetici*, the firſt branch of the fifth pair, called *ophthalmics*, and the ſixth pair, are beſtowed on the muſcles of the *eye*.

2. On the upper part of the ball of the *eye*, near the leſſer or outer canthus, is the *glandula innominata*, or *lachrymalis*, which ſeparates the matter of the tears, to be diſcharged by the continual motion of the *eye-lid* upon the *cornea*, to moiſten it, and facilitate its motion: the tears, falling down the *cornea*, are ſtopped by the edge of the under *eye-lid*, along which they run, till they fall into two ſmall holes in the great angle, one in each *eye-lid*, called *puncta lachrymalia*, which lead to a ſmall bag, called *ſaccus lachrymalis*, from the bottom of which a ſmall tube ariſing, called *ductus ad naſum*, opens into the noſe. Between the two *puncta* is a caruncle, or eminence, which ſerves to ſeparate and keep them open, and which was anciently taken for the *glandula lachrymalis*. Near this *caruncula lachrymalis* is ſituated a ſmall ſemilunar membrane, called *valvula ſemilunaris*, which mutually aſſiſts, and is aſſiſted by, the caruncle, in directing the tears to the *puncta lachrymalia*.

The *glandulæ ciliares*, or *glandulæ ſebaceæ Meibomii*, and their orifices, called *puncta ciliaria*, are ſituated in regular rows, parallel to the borders, or internal edges of the *palpebræ*, formed by the *tarſi*, or their cartilages, compoſing the greater part of the edge of each *eye-lid*. The uſe of the ciliary glands is to ſeparate an oily, ſoft fluid; and the uſe of their *foramina*, or *puncta*, is to convey this fluid, when ſecreted, to the ſurface of the internal parts of the *eye-lids*, and to the external ſurfaces of the globes of the *eyes*.

3. The *eye* receives arteries, both from the internal and external carotids, and returns the blood by veins that go to the jugulars.

The *muſcles of the eye* are ſix; four of which are, from their ſituation, called *recti*, or ſtrait muſcles; and two, *obliqui*. The *recti* come from ſeveral points of the bottom of the orbit, and run immediately between the *ſclerotica* and *adnata*: they derive ſeveral denominations from their ſeveral offices; viz. *attollens*, or *ſuperbus*, which draws the *eye* upwards; *deprimens*, or *humilis*, which caſts it down; *adducens*, and *potator*, which draws the *eye* towards the noſe; and *abducens*, or *indignator*, which draws it the other way towards the leſſer angle. The two obliique muſcles are, the *ſuperior*, called alſo *rotator*, and *trochlearis*, and the *inferior*. Theſe muſcles, together with the optic nerve, are ſurrounded by a conſiderable quantity of fat, which makes an eaſy bed for them, and for the whole globe of the *eye*, and thus greatly aſſiſts the muſcles of the *eye* and the *eye* itſelf, in the variety of motions of which they are capable. See each muſcle in its proper place.

The whole ſtructure and apparatus of the *eye* tend to this; that there be produced a diſtinct and vivid collection in the bottom of the *eye*, directly under the pupil, of the rays which proceeding from any point of an object and entering the *eye*, penetrate the cryſtalline humour; and that ſo many points be painted in the bottom of the *eye* as are conſpicuous in an object, that ſo a ſmall image ſimilar to it may be repreſented on the *retina*.

In order to this, the rays from any radiant or reflecting point ſtriking on the *cornea* are refracted towards the perpendicular, and thus determined to proceed through the aperture of the pupil to the ſurface of the cryſtalline; while other rays, which entered ſo obliquely as to be thrown upon the iris are reflected out again, that they may not diſturb the diſtinctneſs of the ſight; and others, whoſe leſs obliquity threw them between the *uvea* and vitreous humour, are extinguiſhed in the darkneſs thereof, that none may be propagated through the vitreous but ſuch as paſſing through the pupil ſtrike on the cryſtalline.

In the mean time the iris, contracting by its circular, or dilating by its right fibres, the *pupilla* of the *eye* admits fewer or more rays, as the object is nearer or more vivid, or remoter, and more languid. See PUPIL.

Now, the flatter the figure of the *cornea* is, the leſs does it collect the rays emitted from any lucid point; whence fewer arrive at the cryſtalline, and thoſe more diverging, unleſs when they come from a very remote object: on the contrary, the rounder it is the more of the rays from any point does it collect, and throw on the cryſtalline, and thoſe the more converging; whence one great cauſe of the defects in the *eyes* both of old men and myopes. Again, the rays tranſmitted through the pupil to the cryſtalline are there refracted a-new, farther collected, and rendered converging; ſo that thoſe which came from the ſame point of the object are now thrown in one point through the vitreous upon the *retina*, where they paint or exhibit that preciſe point of the object whence they flowed. Accordingly, if the cryſtalline be very denſe or ſpherical, the focus, or the point wherein they are united, will be too near; and if too flat, or rare, the point will be too remote; the effect of both which is confuſion. And hence another cauſe of the defects of myopes and preſbytæ.

It is not, however, myopes and old men alone that would labour under theſe defects, and have their viſion in moſt caſes confuſed, as in objects very near or very remote, very ſmall or very great; but this would be the common condition of viſion. Diſtinct viſion, depending abſolutely on the union of all the rays coming from the ſame point of the object on the ſame preciſe point of the *retina*, and rays from the objects at different diſtances being united at different diſtances behind the cryſtalline; it were impoſſible, e. gr. for the ſame *eye* to ſee diſtinctly any two objects differently diſtant from it: but nature has made a proviſion againſt theſe defects; and that principally by bringing the cryſtalline nearer to the *cornea*, or farther from it, occaſionally; which is effected two ways, viz. either by compreſſing the bulk of the *eye* by the four muſcles, all ſtrongly contracted at once, which changes the figure of the aqueous humour, and renders the *eye* oblong; or by the *ligamentum ciliare* augmenting and diminiſhing the convexity of the cryſtalline, and ſetting it nearer or farther from the *retina*. As complex as the mechaniſm of the *eye* may ſeem, and as manifold as the parts are which have a relation thereto, the juſtneſs of viſion ſeems to require an exact habitude in them all: thus, though the pupil be no ſubſtantial part of the *eye*, but only an aperture of the *uvea* almoſt perpetually changing its bigneſs, according to the different degrees of light the *eye* chances to be expoſed to; and therefore ſhould ſeem, while this hole remains open, to perform its office, by giving entrance to the incident rays of light; yet Mr. Boyle ſaw a woman, who, after a fever, not being able to dilate the *pupillæ* of her *eyes* as before, though they were little narrower than ordinary, yet had ſhe thereby almoſt loſt her ſight; and on the other ſide, though a competent wideneſs of the pupil be requiſite to a clear and diſtinct viſion, yet if its dilatation exceeds the due limits, there is thereby produced a conſiderable diſtemper of ſight. It may ſeem alſo but a ſlight circumſtance that the tranſparent coats of the *eye* ſhould be devoid of colour, and of as little moment that the *cornea* ſhould be very ſmooth, provided it remain tranſparent; yet when either of theſe circumſtances is wanting, the ſight is greatly vitiated. Thus, we ſee that in the yellow-jaundice the adventitious colour wherewith the *eye* is tinged makes the patient think he ſees many objects yellow which are of a contrary colour.

It has been of late an opinion, that though both *eyes* be open, and turned towards an object, yet only one of them at a time is effectually employed in giving the repreſentation of it; ſo that the having of the two *eyes* ſhould ſeem in ſome ſort a redundance. But Mr. Boyle furniſhes ſeveral conſiderations which invalidate this opinion, and ſhew that both the *eyes* are of uſe at the ſame time. He aſſures us, he has found by frequent experiment, that his two *eyes* together beheld an object in another ſituation than either of them apart would do: he adds, that he has met with a perſon who had a cataract in his *eye* for two or three years, without finding any impediment in his ſight, though others had, during that time, taken notice of a white film that croſſed his *eye*; till at length happening to rub the ſound *eye*, he was ſurpriſed to find himſelf in the dark; and that a very ingenious perſon, who, by an accident had one of his *eyes* ſtruck out, told him, that for ſome months after he was apt to miſtake the ſituation and diſtances of things; for having frequent occaſion to pour liquors out of one phial into another after this misfortune, he often ſpilt them, and let them run quite beſide the necks of the phials, which he thought he was pouring them directly into.

The like was related to him by another perſon, who had by a wound loſt the uſe of one of his *eyes*, viz. that for ſome time after, he often in pouring out his wine miſſed the mouth of the bottle or glaſs.

A yet more conſiderable inſtance of this kind the ſame author gives us of a noble perſon, who, in a fight had one of

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of his *eyes* ſtrangly mangled by a muſquet-ball, which came out at his mouth; after which accident he could not well pour drink out of one veſſel into another; but had broken many glaſſes by letting them fall out of his hand, when he thought he had given them to another, or ſet them down on the table: he added, that this aptneſs to misjudge of diſtances and ſituation continued with him, though not in the ſame degree, for two years. See VISION.

It is no uncommon thing for the *eyes* to be terribly moleſted by extraneous bodies accidentally fallen into them, ſuch as a bit of ſand, a ſplinter of wood, the cutting of a quill, or of one's nails, a ſmall inſect, or the like. The moſt eaſy method of getting theſe bodies out is the opening and extending the *eye-lid* with one's fingers, and agitating it, holding the head down; by this means the foreign bodies are often waſhed out of the *eye*, by the increaſed flux of tears, without much difficulty. If this does not ſucceed, the beſt method is next to blow ſome levigated crabs-eyes, or the like fine powder, under the *eye-lids*; that this, being waſhed out by the tears, may carry alſo the other bodies out with it. Heiſter's Surg. p. 364.

The ſeed called *oculus Chriſti*, from its ſuppoſed virtue in clearing the ſight, is very efficacious in ſuch accidents. This it does by its viſcous covering; for when any thing happens to fall into the *eye*, if one of theſe ſeeds is put in at one corner, and the *eye-lid* kept cloſe over it, moving the ſeed gently along the *eye*, whatever happens to be there will ſtick to the ſeed, and ſo be brought out.

If all this fails, the *eye-lid* muſt be gently and carefully lifted up, and the offending body ſought for, and carefully taken out with the end of a probe, or the like inſtrument. Or another method, is the dipping a fine pencil-bruſh, or a ſmall piece of ſponge, tied to a ſmall ſtick, into warm-water, and paſſing it under the *eye-lid*, and by that means puſhing the offending matter out. Lime, or any other acrid ſubſtance, ſhould always be waſhed out with milk or milk and water, and the *eye* after theſe accidents be waſhed with a collyrium made of roſe-water, with a little of the white of an egg beat up in it, and a ſmall admixture of ſaccharum ſaturni, or powder of tutty; and if there be any conſiderable inflammation, it will be proper to bleed.

It is well known from inſpection, and from the writings of anatomiſts, that there are two veins which run one on each ſide the noſe, through the canthi majores or great corners of the *eyes*; theſe proceed partly from the forehead, and partly from the *eyes*, and, like the frontal vein, diſcharge their blood down into the external jugular veins. Bleeding in theſe canthal veins has been approved of by all oculiſts for inflammations and other diſorders of the *eyes*, though perhaps with very little ſolid foundation. When this operation is to be performed, a ſtricture is made about the neck; and when the inciſion has been made, the patient muſt hold his head in a proper poſition for the blood to flow, without being troubleſome to his *eye* or mouth; and when the neceſſary quantity of blood has been diſcharged, a thick triangular compreſs muſt be applied, and ſecured on with a proper bandage. Heiſter's Surg. p. 282.

EYES, *running of the*, in *Infants*. See INFANT.

EYES, *ſcarification of the*, is a chirurgical operation, by many confounded with that of bleeding in the *eyes*, but improperly enough, ſince the parts of the operation are different; for bleeding is confined in this organ to the white of the *eye* alone, whereas *ſcarification* is practiſed as well upon the inner ſurface of the *eye-lid* as on the white of the *eye*; and they are alſo performed by different inſtruments.

This is no new operation, ſince Hippocrates, Celſus, &c. all preſcribed it; but of latter ages it grew much into diſuſe.

To perform this operation, the patient is to be ſeated in a good light, and his head held ſtill by an aſſiſtant, while the ſurgeon preſſes his thumb and fore-finger on the *eye-lids*, ſo as to open them and turn them outward, that their interior red ſurface may come into view: this is much more conveniently performed on the under than on the upper *eye-lid*. When the ſurface is thus turned up, the ſurgeon draws the ſcarifying inſtrument backward and forward over it with great ſwiftneſs, as alſo over the white of the *eye*, if there be occaſion, and by this means opens all the turgid veſſels, and makes them bleed plentifully: this ſhould be promoted by fomenting the *eye* with a ſponge dipped in warm water. Heiſter's Surgery, p. 401.

When the operation is over, great care is to be taken that the wounded parts do not cohere together; the patient muſt move the *eye-lids* about at times to prevent this; and the *eye* when bound up at night muſt have a piece of gold-beater's ſkin applied between the *eye-lids* and the *eye*.

Many different inſtruments have been uſed for making the *ſcarification*. Hippocrates uſed a prickle of a thiſtle, and Celſus and Ægineta a ſteel raſp. Others have choſen the ſtalks of the naked horſe-tail, called ſhave-graſs, which do very well; but the beſt of all inſtruments is a beard of barley or rye; theſe beards are furniſhed with rows of ſharp teeth or hooks, and ten, twelve, or fifteen of theſe are to be cut and tied together by a ſtring, ſo as to reſemble a bruſh, the teeth of each beard being turned outward all round: their ſlender ends in this caſe form a ſort of handle, by which the body of the bruſh may be moved about.

EYE, *contuſions of the*. When the *eye* is by any accident contuſed, it will be entirely deprived of ſight, unleſs the contuſion be ſlight, or the proper remedies inſtantly applied. If the *eye* have received a very ſlight contuſion, it will be proper to waſh it frequently for the firſt day with cold ſpring-water, laying on it linen rags, wet with the ſame: on the next day it muſt be rubbed externally with camphorated ſpirit of wine, and covered up with ſtupes wrung out of decoctions made in wine, of *eye-bright*, ſpeed-well, hyſſop, ſage, chamomile-flowers, and fennel-ſeeds; but if theſe things are not to be had, bolſters dipped in warm wine muſt be applied, and renewed very often; and if the patient be of a plethoric habit, bleeding is alſo neceſſary. If the contuſion of the *eye* is ſo violent that you can plainly ſee the extravaſated blood through the cornea, and all objects appear red to the patient, a vein muſt be either opened in the foot or neck: the *eye* muſt be kept continually fomented with warm ſtupes, wrung out of the ſame decoctions as are before mentioned, and the feet muſt be bathed in warm water two or three times a day, and a few drops of pigeons blood muſt be two or three times a day poured into the *eye*; and if all theſe attempts prove fruitleſs, you may very probably ſucceed by making an opening in the cornea with a lancet. Heiſter's Surgery, p. 110.

EYE, *wounds of the*. If the *eye* is wounded, but not ſo as to let out the vitreous or cryſtalline humour, the wound muſt be anointed two or three times a day with a feather or fine rag well dipped in the white of an egg, or elſe in a mucilage made of quince-ſeeds, or of fleawort-ſeeds, in roſe-water; and after each dreſſing a compreſs is to be laid on, well ſaturated with a collyrium made of the whites of eggs; two ounces and a half of roſe-water, half a dram of oil of roſes, and three grains of camphor, well mixed together, and thoroughly ſhook up every time it is to be uſed. If the accident is attended with any great degree of inflammation, as is very frequently the caſe, it will be proper to cover the ſmall compreſs, firſt laid over the *eye*, with a larger, dipped in warm ſpirits of wine, with camphor. The bowels muſt in this caſe be kept open, and the patient blooded, if of a plethoric habit; and if it happen that the cryſtalline humour, or any part of it, ſticks in the orifice of the wound, it muſt in this caſe be pulled out, that it may not bring on a deformity or worſe miſchief to the *eye*. Heiſter's Surgery, p. 90.

EYE, *falling out of the*. See PROLAPSUS *oculi*.

EYE, *diſeaſes of the*, are an opthalmia, or inflammation of the *eyes*; the gutta ſerena, or amauroſis; a ſuffuſion, or cataract; an ectropium; a glaucoma; an amblyopia, or obſcurity of ſight, including the myopia, the preſbytopia, the nyctalopia, and the amauroſis; the ſtrabiſmus, or ſquinting; an unguis pannus, or pterygium of the membrane of the *eye*; the albugo, leucoma, or ſpot in the *eye*; a ſugillation of the *eye*; an epiphora, or rheum in the *eyes*; a trichiaſis; and the fiſtula lachrymalis. See each deſcribed under its peculiar denomination. See Warner's Deſcription of the Human *Eye*, &c. with its principal Diſeaſes, &c. 2d edit. 1775.

The comparative ſtructure and anatomy of the *eye* is very curious; the ſituation, number, conformation, &c. of this organ in different animals, being finely and wonderfully adapted to their different circumſtances, occaſions, and manners of living.

In man, and ſome other creatures, an ingenious author obſerves, the *eye* is placed chiefly to look forward; but withal is ſo ordered as to take in nearly the hemiſphere before it. In birds, and ſome other creatures, the *eyes* are ſo ſeated as to take in near a whole ſphere, that they may the better ſeek their food and eſcape danger. In others they are ſeated ſo as to ſee behind them, or on each ſide, whereby to ſee the enemy purſuing them: thus, in hares and conies, the *eyes* are very protuberant, and placed ſo much towards the ſide of the head, that their two *eyes* take in nearly a whole ſphere; whereas in dogs that purſue them, the *eyes* are ſet more forward in the head, to look that way more than backward.

Generally, the head is contrived to turn this and that way

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way chiefly for the occaſions of the eyes; and generally the *eyes* themſelves are moveable upwards, downwards, backwards, and ſidewiſe, for the more commodious reception of the viſual rays. Where nature deviates from theſe methods, ſhe always makes uſe of very artful expedients to anſwer the ſame end.

Thus, in ſome creatures the *eyes* are ſet out at a diſtance from the head, to be moved here and there, the one this way, and the other that; as in ſnails, particularly, whoſe *eyes* are contained in their four protuberances, like atramentous ſpots fitted to the end of their horns, or rather to the ends of thoſe black filaments or optic nerves ſheathed in the horn. Power, Exper. Phil. Obſ. 31.

And in other creatures, whoſe *eyes* or head are without motion, and in divers inſects, that defect is ſometimes made up by their having more *eyes* than two; as in ſpiders, which having no neck, and conſequently the head being immoveable, the defect is ſupplied by the ſituation and multiplicity of their *eyes*; ſome having four, ſome ſix, and others eight, all placed in the fore-front of their head, which is round, like a locket of diamonds. The reaſon Dr. Power gives, is, that being to live by catching ſo nimble and ſhy a prey as flies, they ought to ſee every way, and ſo take them *per ſaltum*, without any motion of the head to diſcover them.

Again, men, and moſt quadrupeds, are found to have ſeveral muſcles belonging to their *eyes*, by help whereof they can turn them any way, and ſo obvert the organ of ſenſe to the object. But nature not having given that mobility to the *eyes* of flies, ſhe in recompence furniſhes them with a multitude of little protuberant parts, finely ranged upon the convex of their large bulging *eyes*; ſo that by means of theſe numerous little ſtuds numberleſs rays of light are deflected from objects placed on either hand, above or beneath the level of the *eye*, and conveniently thrown upon that organ, to render the objects they come from viſible to the animal; and by the help of a good microſcope, and a clear ſight, ſome hundreds of theſe little round protuberances may be diſcovered, curiouſly ranged on the convexity of a ſingle *eye* of an ordinary fleſh-fly.

So ſcorpions are found to have above a hundred *eyes*; and Swammerdam has obſerved no leſs than two thouſand in the little inſect called *ephemeron*.

In other creatures the like deficiency is ſupplied by having their *eyes* nearly two protuberant hemiſpheres, each conſiſting of a prodigious number of other little ſegments of a ſphere.

The *eyes* of a camelion, Dr. Goddard obſerves, reſemble a lens, or convex-glaſs, ſet in a verſatile globular ſocket, which ſhe turns backward and forward without ſtirring the head, and ordinarily the one a contrary way to the other.

Laſtly, the mole, which the ancients, Ariſtotle, Pliny, Alb. Magnus, &c. ſuppoſed to have no *eyes* at all, is now found to furniſh a notable inſtance of the diverſity of the apparatus of viſion; for that animal living altogether under ground, ſight would generally be uſeleſs to it, and ſo tender a part as the *eye* troubleſome. It has therefore *eyes*, but thoſe ſo exceedingly ſmall, and withal ſituated ſo far in the head, and covered ſo ſtrongly over with hair, that they cannot ordinarily be of ſervice or diſſervice to it. Yet, to guide and ſecure it a little when it chances to be above-ground, Borrichius, Blaſius, Schneider, Dr. Derham, and others, obſerve that it can protend, or put them forth beyond the ſkin, and again draw them back at pleaſure, ſomewhat after the manner of ſnails.

In the *eyes* of nocturnal animals is a part not yet mentioned, viz. a ſort of tapetum at the bottom of the *eye*, which gives a kind of radiation on the pupil, enabling them to ſee and catch their prey in the dark. Thus, Dr. Willis, *Hujus uſus eſt* oculi *pupillam quaſi jubare inſito illuminare—quare in fele plurimum illuſtris eſt; at homini, avibus, & piſcibus, deeſt.* De Anima Brutor.

He adds, that in ſome perſons the iris has a faculty alſo of darting out light; and inſtances in a man of a hot head, who after a plentiful drinking of generous wine, could ſee to read in the darkeſt night. Ibid.

The like Pliny tells us of Tib. Cæſar, that upon his firſt waking in the night he could ſee every thing for a little while as if in broad day-light. Nat. Hiſt. lib. xi. cap. 37. and Dr. Briggs gives a parallel inſtance of a gentleman in Bedfordſhire. Ophthal. cap. v. § 12.

Frogs, beſide the parts of the *eye* which they have in common with men, and moſt quadrupeds, have a peculiar membrane or cartilage, which is not commonly perceived, wherewith they can at pleaſure cover the *eye*, without too much hindering the ſight; becauſe the membrane is both tranſparent and ſtrong, ſo that it may paſs for a kind of moveable cornea, or occaſional ſafeguard to the *eye*. A like membrane is alſo found in many birds, as alſo in the crocodile.

Naturaliſts relate wonders of the ſharpneſs and accuracy of the *eye* of ſome animals, as the eagle, &c. beyond thoſe of men.

Yet do thoſe of men ſeem improveable to a ſurpriſing degree. Mr. Boyle inſtances in a major of a regiment of king Charles I. who being afterwards forced abroad, ventured at Madrid to do his king a piece of ſervice of an extraordinary nature and conſequence; which being there judged very irregular, he was committed to an uncommon priſon or rather dungeon, having no window belonging to it, only a hole in the wall, at which the keeper put in proviſions, and preſently cloſed it again on the outſide, but not perhaps very exactly. For ſome weeks this gentleman continued utterly in the dark, very diſconſolate; but afterwards he began to think he ſaw ſome little glimmering of light; and this from time to time increaſed ſo, that he could not only diſcover the parts of his bed, and other ſuch large objects, but at length, amidſt this deep obſcurity, could perceive the mice that frequented his chamber to eat the crums of bread which fell upon the ground, and diſcern their motions very well.

The author juſt mentioned, in his Obſervations on Vitiated Sight, gives us ſome uncommon phenomena that regard the *eyes*. He furniſhes ſeveral inſtances of nyctalopias, or people whoſe *eyes* in the day-time were quite dark, or at leaſt ſo dim that they could hardly diſcern their way; who yet, ſoon after ſun-ſet, and during twilight, ſaw very clearly.

EYES *of fiſh*. Theſe differ ſo much in their ſeveral kinds, that they make a very eſſential part in their deſcription, and often are characters ſufficient for diſtinguiſhing the ſpecies. Their differences are in regard to their figure, ſituation, proportion, and integuments. In regard to their figure, ſome are flat and depreſſed, as is the caſe in the greater number of fiſhes. 2. Some are convex, as is the caſe in the pleuronecti of many kinds: the *eyes* of theſe much reſemble thoſe of quadrupeds, the others are very different. 3. Some are rounder than ordinary, as in the cyprini, conger, and petromyzon; and laſtly, ſome are oblong, as the *eyes* of the ſoces.

Theſe are the differences of the *eyes* of fiſh as to figure: in regard to their ſituation they alſo differ as much: 1. In moſt fiſh they are placed in the ſides of the head; inſtances of this poſition are ſufficiently common. 2. In ſome they are placed both in the upper part of the head, as in the uranoſcope, or ſtar-gazer. 3. They are in ſome placed very cloſe to one another, as in the pleuronecti; and in others they are ſet at very remarkable diſtances, as in the clariæ. They differ alſo greatly in proportion, in reſpect to the body of the fiſh. Thus they are very ſmall in the whales, and other cetaceous fiſhes; and they are as remarkably large in the apua, boops, and gaſteroſteus.

The *eyes* in fiſh differ alſo greatly in regard to their integuments. In ſome fiſh they are free, and are only covered with their proper membranes, as in the ſalmon, cyprini, &c. 2. They are in ſome covered in part with the ſkin of the head, as in the clupea, mackrel, &c. 3. In ſome they are wholly covered with the ſkin of the head as with a ſort of veil. Examples of this kind there are in the ſyngnathi, pleuronecti, petromyza, and others.

The pupil of the *eye* is in moſt kinds of fiſh either round or oblong; but in ſome, as in the ſalmons and coregones, they run out into an acute angle in the anterior part. The colour of the iris in ſeveral fiſh is ſo very diſtinct that it makes a very obvious and diſtinctive character.

The *eyes* of almoſt all fiſh are without eye-lids, properly ſo called; but ſeveral kinds have, beſide the membranes and common tunics, a ſort of tranſparent membrane, with which the *eye* is in part at times covered. The cetaceous fiſhes, in particular, ſeem to have real eyelids: Tyſon has demonſtrated them in his accurate and excellent anatomy of the phocæna.

It is obſerved by Mr. Baker, that if the *eyes* of fiſh are carefully examined when ſwimming in a glaſs veſſel, the cornea or black uvea may be ſeen, ſometimes advancing forwards, and at other times retiring back, juſt as their ſight is directed to near or diſtant objects, through a groſſer or finer medium; the form of their *eyes* altering as occaſion requires to make them diſtinct objects; and their *eyes* have ſo great a liberty in the orbits, that they are able to turn them any way, upwards, downwards, to one ſide or the other, nearly a quarter of a circle, which makes them full amends for the want of motion in their necks, and enables them to change the direction of their optic axis to any deſigned place in a moment. Phil. Tranſ. vol. xlv. p. 153.

EYES *of flies*. Every naturaliſt has obſerved, that the *eyes* of flies are of a reticulated texture; and each reticulated *eye* of this kind is truly an aſſemblage of multitudes, often

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often of many thouſands, of ſmall but perfect *eyes*. The reticulated *eyes* of flies are large, not only in proportion to the ſize of the creature, but abſolutely, and in themſelves; but the ſeveral ſmall *eyes* of which they are compoſed are remarkably minute in compariſon of thoſe of the butterfly claſs.

Many of the butterfly claſs have in each of their reticulated *eyes* many thouſand ſmall *eyes*; but the fly claſs greatly exceed them in number of theſe, as many of the *eyes* of theſe are three times as large as thoſe of the butterflies; and beſides, that each ſmaller *eye* is vaſtly more minute than the ſmall *eyes* of the butterflies.

Mr. Hook computed 14,000 hemiſpheres in the two *eyes* of a drone; Mr. Lewenhoeck reckoned 6236 in a ſilk-worm's two *eyes* in its fly-ſtate; 3181 in each *eye* of a beetle; and 8000 in the two *eyes* of a common fly. The pearl-*eyes* of the DRAGON-*fly* appear with a common reading-glaſs like ſhagreen; and Mr. Lewenhoeck reckons in each *eye* of this inſect 12,544 lenſes, placed in an hexangular poſition, each lens having ſix others round it. He alſo obſerved in the center of each lens a minute tranſparent ſpot, brighter than the reſt, ſuppoſed to be the pupil, ſurrounded with three circles, and in appearance ſeven times leſs than the diameter of the whole lens. Mr. Puget counted 17,325 in the *eye* of a butterfly, which Malpighi concludes to be diſtinct and ſeparate *eyes*. The abbé Catalan, and others, have ſince ſhewn, that all the eminences diſcoverable in the cornea of inſects have the neceſſary parts, and perform the offices of an *eye*. Lewenhoeck diſcovered the bundles of optic nerves which ſerve theſe ſmall lenſes; and Reaumur ſuppoſes that theſe ſupply the place of all that is wanting behind the lenſes, for the organiſation of an *eye* complete for viſion. Baker's Micr. 1743, p. 228. Reaumur, Hiſt. Inſ. vol. i. p. 261, &c.

That part of each ſide of the head of a fly which is cut, as it were, into a multitude of ſmall facets, is one of the reticulated *eyes* of the creature, and is uſually ſomewhat elevated above the ſurface of the reſt of the head, but differently, and of a different form and extent in the ſeveral different flies. Ibid. vol. iv. p. 239.

It is the cuſtom of nature to allot two of theſe reticulated *eyes* to each fly; and as they each contain ſuch a vaſt multitude of ſmaller, but perfect *eyes*, one would imagine this to be very ſufficient for all the occaſions of the animal. There are, however, notwithſtanding, certain flies of the ephemeron or day-fly kind, which have four of theſe reticulated *eyes*, two of which are placed as is uſual in the fly kind, and are but of ſmall extent; the other two have each the appearance of a ſort of turban, and are placed one beſide the other upon the upper part of the head.

Theſe have each much of the figure of a muſhroom, the head of it extended a little beyond the ſtalk, and the upper convex ſurface cut into almoſt an innumerable quantity of facets. Id. ibid. p. 240.

The firſt pair of the reticular *eyes* of this fly which are placed as thoſe of the other flies, are in colour brown; thoſe of the muſhroom form are of a very beautiful citron colour, and as tranſparent as the moſt pellucid reticular *eyes* of the other flies; for, among the various ſpecies of flies, ſome have theſe *eyes* much more tranſparent than others.

The fly thus remarkably furniſhed with *eyes* is produced from a worm of the ſame kind with the common ſpecies of ephemerons; its body is of a pale yellow, and its wings white; the two inferior ones of theſe are ſo ſmall that they are not eaſily diſtinguiſhed.

Among the fly claſs theſe reticular *eyes* are in different ſpecies of different colours; there are ſome which have them brown, others yellow, others green, and others red, and this in all the different ſhades of thoſe colours. Some of them have alſo the gloſs of metals highly poliſhed, others afford us a view of changeable colours, and others have arrangements of different colours, but thoſe fixed and invariable. Id. ibid. p. 241.

The *eyes* of one ſpecies of the gad-fly, ſo troubleſome to oxen, have ſtreaks of red, green, and brown, placed alternately.

One would imagine, that as every fly has two of theſe reticular *eyes*, each compoſed of ſuch a multitude of real *eyes*, they could have no occaſion for any *eyes* beſide theſe; but ſo it has not appeared to the great being that formed them, for they have, many ſpecies of them at leaſt, other *eyes* beſide theſe.

The *eyes* already deſcribed are properly called reticular ones; and to avoid confuſion, it will be neceſſary to know the other *eyes*, which are extremely different from thoſe, by ſome determinate name. Theſe other *eyes*, when examined by the beſt microſcopes, appear of a perfectly ſmooth, gloſſy, and poliſhed ſurface, but plain and ſimple, without the leaſt appearance of a reticulated texture. Theſe are alſo much ſmaller than the reticulated *eyes*, and may therefore be called, by way of diſtinction, the ſmaller *eyes*, or the ſmooth *eyes*.

M. De la Hire ſeems to have been the firſt perſon who diſcovered theſe little ſmooth *eyes* in the fly race. He obſerved three of them diſpoſed in a triangular form, on the back part of the heads of theſe little creatures. When he found that three ſmall convex ſhining bodies were uſually ſituated in this part, he ſoon diſcovered that they were tranſparent, and thence naturally judged them to be of the ſame nature of the corneæ of our *eyes*, and really to ſerve the ſame office to the creature poſſeſſed of them.

We find three of theſe ſmooth *eyes* placed triangularly on the back part of the head of vaſt numbers of the genera of flies, as well of the two-winged as of the four-winged kinds; but there are alſo ſome flies of both theſe claſſes in which they are wanting.

All the ſpecies of gnats, and all the ſpecies of tipulæ, are without theſe ſmooth *eyes*. The heads of theſe ſpecies of flies are very ſmall in proportion to the bulk of their body, and are in a manner covered with their reticular *eyes*, which in ſuch a manner meet and touch one another, as to leave no room nor occaſion for the ſmooth *eyes*.

Theſe flies have the want of their ſmall *eyes* amply made up by the ſize and extent of the larger; but there are ſome other kinds which want them, without having this advantage in their place. Of the two-winged flies with ſhort bodies, the gad-flies want theſe *eyes*; and among the longer bodied and four-winged kinds, the flies produced from the puceron-eaters want them.

Notwithſtanding, therefore, that many ſpecies of flies have theſe *eyes*, there are yet ſo many that want them, that, if M. De la Hire's opinion, that the reticulated *eyes* of flies were not true *eyes*, held good, there muſt be very many of theſe inſects blind.

Though moſt of the flies that have theſe *eyes* have three of them, and thoſe triangularly placed, yet there are ſome that have more, and ſome that have leſs than that number. A certain fly which has two filaments attached to the hinder part of its body, and its hinder pair of legs faſtened to the annular portion of its body, has four of theſe ſmooth *eyes* placed at the four corners of a ſquare; the two anterior tolerably large, and the two poſterior ſo ſmall as to be ſcarce diſtinguiſhable. And other flies, as the papilionaceous ones, produced of water-worms, have only two of them. Ibid.

The poſition of theſe *eyes* varies alſo in the different ſpecies of flies which are poſſeſſed of them; for though their uſual place is in the hinder part of the head, there are ſome which have them before. Some ſpecies of the ephemerons have three of theſe *eyes*, which may be called large in regard to their uſual ſize in other flies. The one of theſe is placed in the middle of the forehead; the other two at the roots of the antennæ, placed ſideways by them, but a little more backward. This ſpecies has two reticular *eyes* beſide theſe, but they are ſmaller than is uſual in that ſpecies of fly.

Theſe *eyes* are not peculiar to the fly claſs alone, ſome other of the inſects which have reticular *eyes* have theſe alſo; among which are the graſshopper, in which they are placed near the noſe.

Notwithſtanding that theſe *eyes* are not well diſtinguiſhed in flies without the aſſiſtance of glaſſes, they may, however, ſerve very well for the diſtinctions of genera among thoſe ſpecies which have them. Id. ibid. p. 245.

Theſe *eyes*, though very ſmall in themſelves, yet, in compariſon with the ſingle *eyes*, which form the reticular ſort, they are very large. See INSECT.

EYES *of horſes*, in the *Manege*, &c. Theſe ſhould be bright, lively, full of fire, pretty large, and full; but not too big, gogling, or ſtaring out of the head: they ſhould alſo be reſolute, bold, and briſk. A horſe, to appear well, ſhould look on his object fixedly, with a kind of diſdain, and not turn his *eyes* another way.

In the *eye* of a horſe are diſcovered his inclination, health, and indiſpoſition. When the *eyes* are ſunk, or the *eye-brows* are too much raiſed up, and as it were ſwelled, it is a ſign of viciouſneſs and ill-nature. When the pits above the *eyes* are extremely hollow, it is for the moſt part a certain ſign of old age: this, however, does not hold of horſes got by an old ſtallion; for theſe have them very deep at the age of four or five years, as alſo their *eye-lids* and *eye-brows* wrinkled and hollow.

Two things are chiefly to be conſidered in the *eye* of a horſe, viz. the cryſtalline part, and the bottom or ground. The cryſtalline, or moſt tranſparent part, ſhould, for clearneſs, reſemble a piece of rock-cryſtal, otherwiſe the *eye* cannot be good. When this part is reddiſh it is a ſign that the *eye* is inflamed, or elſe, as ſome pretend, influenced by the moon. When it is of the colour of a withered

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withered or dead leaf upon the lower part, and troubled on the upper, it infallibly ſhews that the horſe is lunatic, which diſtemper continues no longer than while the humour actually poſſeſſes the *eye*.

As to the ground or bottom of the *eye*, which is properly its pupil or apple, it ſhould be large and full, and ought to be carefully inſpected, that there be no *dragon*, as it is called, on it. This is a white ſpot or ſpeck, which at firſt appears no bigger than a grain of millet, but grows to ſuch a bigneſs as to cover the whole apple of the *eye*: it is incurable, never failing to make a horſe blind in the *eye* where it is found. If the whole bottom of the *eye* be white, or of a tranſparent greeniſh white, it is a bad indication, though perhaps the horſe is not as yet quite blind: however, it ought to be obſerved, that if you view a horſe's *eyes* when oppoſite to a white wall, the reflection of it will make their apples appear whitiſh, ſometimes inclining to green, though they be really good. When this is perceived, you may try whether his *eyes* have the ſame appearance in another place.

In caſe you perceive above the bottom of the *eye*, as it were, two grains of chimney-foot fixed thereto, it is a ſign the cryſtalline is tranſparent; and if, beſides this, the ſaid bottom be without a ſpot or whiteneſs, then you may infer that the *eye* is ſound.

You ought alſo to examine whether an *eye* which is troubled and very brown be leſs than the other; for if it be, it is irrecoverably loſt.

All *eyes* which are ſmall, narrow, and have long pupils, run a greater riſk of looſing the ſight than any others. See BLINDNESS.

The diſeaſes of the *eyes* in horſes proceed either from a defluxion, or from ſome external hurt. In the former caſe the *eyes* are watery, hot, red, and ſwollen, the diſtemper advancing by degrees; in the latter the malady comes ſpeedily to a height, and the ſkin on the outſide of the *eye* is peeled off.

If the diſtemper takes its riſe from a rheum or defluxion, it is to be conſidered whether it proceeds from the *eye* itſelf, or from another aggrieved part: in the latter caſe, the redreſſing of the part will ſet the *eye* free; in the former, it is proper to cool the horſe's blood with an ounce of ſal prunellæ, mingled every day with his bran; and when it leſſens his appetite, to change it for liver of antimony till he recovers his ſtomach.

For ſore *eyes*, where a ſkin is growing over them, the following receipt is recommended: to the white of an egg add a little fine powdered ſalt; then ſet this on the fire till it be reduced to a powder. This, mixed with a little honey, is to be put into the horſe's *eye* with a feather. If it is found inſufficient to eat off the ſkin, the powder alone muſt be blown into the *eye* with a quill.

In caſe of a blow on the *eye*, take honey; and having added a ſmall quantity of power of ginger, put it into the horſe's *eye*; or elſe take hog's lard, with the oil of roſes and elder, of each an equal quantity; then, having melted them together, anoint the *eye* therewith.

Some horſes have naturally tender weeping *eyes*, which void a ſharp eating humour; theſe are eaſily cured, by waſhing or bathing them every morning or evening with brandy. See HORSE.

We ſay alſo, *a horſe unſhod of one eye*, which is a rallying expreſſion, importing that he is blind of an *eye*.

EYE *of the branch of a bridle*, in the *Manege*, is the uppermoſt part of the branch which is flat, with a hole in it, for joining the branch to the head-ſtall, and for keeping the curb faſt.

EYE *of a bean*, in the *Manege*, is a black ſpeck or mark in the cavity of the corner-teeth, which is formed there about the age of five and a half, and continues till ſeven or eight; aod it is from hence that we uſually ſay, ſuch a horſe marks ſtill, and ſuch a one has no mark.

EYE, *artificial*, is an optical machine, wherein objects are repreſented after the ſame manner as in the natural *eye*, of conſiderable uſe in illuſtrating the nature and manner of viſion.

Its conſtruction is thus: provide two hollow hemiſpheres of hard, dry wood, well cemented together, to repreſent the ball of the *eye*; let the interior or fore-hemiſphere be perforated with a round hole in C (*Tab. Optics*, *fig.* 9. *n.* 2.) to ſupply the place of a pupil, and therein fit a thin, plain glaſs, or, which amounts to the ſame, a concavo-convex glaſs, to ſerve for the cornea. In the inſide put a ſhort draw-tube G, with a lens convex on both ſides, to do the office of the cryſtalline therein. In the hind, or poſterior hemiſphere, fit another draw-tube E F, with a plain glaſs therein, having its inner ſurface ſmooth, though not poliſhed, repreſenting the retina and optic nerve.

If now the aperture C be turned towards any object, and the draw-tube F E be gradually pulled out, you will have the object beautifully and ſtrongly repreſented in all its colours on the retina, only in an inverted order. See VISION.

It being of no conſequence what the figure of the inner cavity is; any room or chamber ſo darkened as only to receive light from a ſingle hole, with a glaſs convex on both ſides fitted therein, will do the office of an *artificial eye*, and exhibit all the objects oppoſed to the aperture on a wall or a white cloth ſtretched at a proper diſtance from the aperture, with this circumſtance, that the leſs ſphere the glaſs is a ſegment of, the larger will the figures appear; and this is the celebrated *camera obſcura*. See CAMERA *obſcura*.

EYE *in perſpective*. See PERSPECTIVE.

EYE, *altitude of the*. See ALTITUDE.

EYE, in *Architecture*, is uſed for any round window made in a pediment, an Attic, the reins of a vault, or the like.

EYE, *bullock's*, *Oeil de bœuf*, denotes a little ſky-light in the covering or roof, intended to illumine a granary, or the like.

The ſame term is applied to the little lutherns in a dome; as in that of St. Peter's at Rome, which has forty-eight in three rows. See LUTHERN.

EYE *of a dome*, denotes an aperture at the top of the dome; as that of the Pantheon at Rome, or of St. Paul's at London. It is uſually covered with a lantern.

EYE *of the volute*, in *Architecture*, is the center of the volute, or that point wherein the helix or ſpiral whereof it is formed, commences; or, it is the little circle in the middle of the volute, wherein are found the thirteen centers for deſcribing the circumvolutions thereof. See *Tab. Archit. fig.* 30. and *fig.* 29.

EYE-*flaps*, thoſe pieces of leather which cover the *eyes* of coach-horſes.

EYE, in *Agriculture* and *Gardening*, denotes a little bud or ſhoot inſerted into a tree by way of GRAFT.

The term *eye*, *oculus*, is alſo uſed for a gem or bud, as it ſtands on the parent tree. See BUD and PRUNING.

EYE *of a pear*, the extremity oppoſite to its ſtalk. See PEAR.

EYE *of a tree*, a ſmall pointed knot to which the leaves ſtick, and from which the ſhoots or ſprigs proceed.

EYE, in a *Ship*. The hole wherein the ring of the anchor is put into the ſhank is called the *eye of the anchor*; and the compaſs or ring which is left of the ſtrop to which any block is ſeized is called the *eye of the ſtrop*.

EYE *of a ſtay*, is that part of a ſtay which is formed into a ſort of collar to go round the maſt-head.

EYE-*bolt*, is a long bar of iron with an *eye* in one end of it, formed to be driven into the decks or ſides of a ſhip for divers purpoſes, as to hook tackles, or faſten ropes to, as occaſion requires.

EYE-*let-hole*. See SAIL.

EYES *of a ſhip*, a name frequently given to thoſe parts which lie near the hauſe-holes, particularly in the lower apartments within the veſſel.

EYE-*bright*, in *Botany*, *euphraſia*, a genus of the *didynamia angioſpermia* claſs. This is a medicinal plant which grows naturally in ſterile fields and commons in moſt parts of England. Its characters are theſe: the flower is of the perſonated kind, divided into two lips, and having the upper one placed erect, and divided into ſeveral ſegments: the lower one divided into three principal ſegments, each of which is alſo bifid. The piſtil ariſes from the cup, and is fixed in the manner of a nail to the back part of the flower: this finally ripens into a capſule of an oblong ſhape, containing ſmall ſeeds. There are two ſpecies. Tourn. Inſt. 174.

Theſe plants always grow among heath, furze, graſs, or ſome other cover, nor will they grow when theſe are cleared from about it, nor when ſown in a garden. The herb-women ſupply the markets with it in plenty from the fields.

Eye-bright is much recommended in diſorders of the *eyes*, eſpecially weakneſs and dimneſs of ſight. It is given in ſeveral forms, but the powder of its leaves is thought moſt effectual as well as ſafeſt, the doſe being from one to three drams.

EYE, among *Naturaliſts*, is ſometimes alſo uſed for a hole or aperture: whence it is that the firſt of the larger inteſtines is called *cæcum*, or the *blind gut*, as having no *eye* or perforation. For a like reaſon the chemiſts call a cloſe veſſel uſed in diſtillation, a *blind head*.

EYE, in *Printing*, is ſometimes uſed for the thickneſs of the types and characters uſed in printing; or more ſtrictly, it is the graving in relievo on the top of the letter; otherwiſe called its *face*.

It is the *eye* or *face* that makes the impreſſion; the reſt, which they call the *body*, ſerving only to ſuſtain it.

The *eye* of the *e* is the little aperture at the head of that character, which diſtinguiſhes it from the *c*. See E.

EYE is alſo uſed among Jewellers for the luſtre and brilliance

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liance of pearls and precious ſtones, more uſually called the *water*.

EYE-*brows, wounded.* In wounds of this part great care muſt be taken to guard againſt inflammations, leſt the *eyes* ſhould partake of the injury; all hot and ſharp things muſt be avoided in eating and drinking; and the patient ſhould be blooded if plethoric; the wound muſt be dreſſed with vulnerary balſams, and the dreſſings covered with compreſſes dipped in camphorated ſpirit of wine. If the wound be large, and the *eye-brow* entirely divided, it will be neceſſary to uſe the ſuture and dreſs over it with a vulnerary balſam, covering both *eyes*, and keeping them as much as poſſible from motion. Heiſter's Surg. p. 79.

EYE-*brow*, in *Architecture*. See FILLET.

EYE-*lids*, *palpebræ*, in *Anatomy*, thoſe external moveable covers which ſerve to ſcreen and defend the *eyes*.

They conſiſt of a thin muſcular membrane, covered on the outſide with a ſtrong, yet flexible ſkin, and lined within-ſide with a production, as ſome think, of the pericranium. Their edges are fortified with a ſoft cartilage, by means whereof they are enabled to cloſe the better.

Out of theſe cartilages grow a paliſade of ſtiff hairs, called *cilia*, of great uſe to warn the *eye* of the approach of danger either in ſleeping or waking; to keep off motes, flies, &c. in the air, and to break the too fierce impreſſion of the rays of light.

Theſe hairs, it is obſerved, only grow to a certain convenient length, and never need cutting, as moſt others do; add to this, that their points ſtand out of the way; thoſe of the upper *eye-lid* being bent upwards, as thoſe of the lower downwards, ſo nice is nature in ſuch ſmall matters.

At the commiſſure, or joining of the upper and under *eye-lids*, are formed two angles called *canthi*.

In the inner of theſe is a gland called *glandula lachrymalis*, from which proceed two or three ducts, which, opening on the inner ſurface of the *eye-lid*, ſerve to moiſten the ball of the *eye*, and keep its membranes from growing harſh and dry.

Near the other angle is a gland called *innominata*, which helping alſo by ſeveral branches to irrigate the *eye*, the overplus is carried to the greater angle, and tranſmitted to the noſe through the puncta lachrymalia.

By theſe glands it is that the humour, called tears, is ſecerned.

The *eye-lids* are both moveable, eſpecially the upper, which has two muſcles to raiſe and depreſs it, called *attollens* and *deprimens*, or *orbicularis*. See ATTOLLENS and ORBICULARIS.

In quadrupeds the lower *palpebra* is moveable, and is the ſmaller; in birds, on the contrary, the lower is moveable, and the greater.

Animals that have hard *eyes*, as lobſters, and the generality of fiſhes, have no *palpebræ*, ſuch *eyes* being ſufficiently ſecured without.

In the generallty of brutes there is a kind of a third *eye-lid*, which is drawn like a curtain, to wipe off the humidity which might incommode the *eyes*; it is called the *nictitating membrane*.

The monkey is almoſt the only one that wants it, as being furniſhed, like a man, with hands to wipe the *eye* on occaſion.

EYE-*lids wounded.* Wounds, either of the upper or lower *eye-lid*, will not readily heal, not ſo much from the thinneſs of the parts as from the great quantity of fluids with which the *eye* is continually moiſtened. It is neceſſary, therefore, firſt to foment the part with decoctions of chamomile, hyſſop, or eyebright, till the flux of the blood is ſtopped, and the wound well cleanſed; then if the wound is tranſverſe, it muſt be ſtitched up in the middle with a fine needle, and ſprinkled over afterwards with the powder of comfrey-root, gum arabic, or other ſuch medicines, or anointed with balm of Gilead, or Peru, or Capivi, laying over theſe applications a plaſter of diachylon, and tying it up in ſuch a manner that the *eye* may have very little power to move about. If the wound is made lengthways it will require ſeveral ſtitches, and muſt be dreſſed over them as before. Heiſter's Surgery, p. 79.

EYE-*glaſs*, in our *Double Microſcopes*, is uſually a lens convex on both ſides; but Euſtachia Divini long ſince invented a microſcope of this kind, the power of which he places very greatly above that of the common ſort; and this principally depending on the *eye-glaſs*, which was double, conſiſting of two plano-convex glaſſes, ſo placed as to touch one another in the middle of their convex ſurface. This inſtrument is ſpoken of with great credit by Fabri in his Optics, and is ſaid to have this peculiar excellence, that it ſhews all the objects flat, and not crooked, and takes in a large area, though it magnifies extremely much. Phil. Tranſ. N° 40.

EYE-*ſucker*, in *Natural Hiſtory*, a ſmall ſea-inſect, which is ſometimes found fixed by the ſnout to the *eyes* of ſprats, whence it has received its name. It is about three inches in length, whereof the head is one quarter part. The body is ſomewhat thicker than a hog's briſtle, and of a pleaſant green colour. Phil. Tranſ. N° 472, § 7. or vol. xliii. p. 35.

EYE-*water*. See WATER.

EYE, *white of the*. See WHITE.

EYE-*glaſs*, in *Teleſcopes*, is the lens next the *eye*; and if the teleſcope conſiſt of more than two lenſes, all but that next the object are called *eye-glaſſes*.

EYE, *Bull's*, in *Aſtronomy*, a ſtar of the firſt magnitude, in the conſtellation Taurus, by the Arabs called *Aldebaran*. Its longitude, latitude, &c. ſee among thoſe of the other ſtars in the conſtellation TAURUS.

EYE, *cat's*, *Oculus cati*, in *Natural Hiſtory*, a precious ſtone, called alſo *ſun's eye*, *oculis ſolis*, and taken by Dr. Woodward for the aſterias of the ancients.

It is tranſparent, of a glittering grey, interchanged with a ſtraw-colour; uſually oblong as to figure, and not unlike the opal, only much harder. It is found in divers parts of the Eaſt Indies; but thoſe of the iſland of Ceylon are the moſt prized. See ASTERIAS and CAT's *eye*.

EYE, *crab's*, *Oculus cancrorum*. See CRABS-*eyes*.

EYE, *goat's*, *Oculus caprinus*, is when there is a white ſpeck on the pupil of the *eye*, as is ſeen in the *eyes* of goats. Phyſicians call it *ægias*.

EYE, *golden*, in *Ornithology*. See DUCK.

EYE, *hare's*, *Oculus leporinus*, in *Medicine*, a diſeaſe ariſing from a contraction of the upper *eye-lid*, which prevents its being able to cover its part of the *eye*; ſo that the patient is obliged to ſleep with the *eye* half-open, after the manner of *hares*.

Phyſicians call it *lagophthalmia*, a Greek word, ſignifying the ſame thing, being compounded of λαγως, *hare*, and οφθαλμος, *eye*.

EYESS, in *Falconry*. See FALCON.

EYRE, or EIRE, in *Law*, ſignifies the court of juſtices itinerant.

The word ſeems formed of the old French, *irre iter*, *way*, *track*.

Hence juſtices in *eyre*, as thoſe whom Bracton calls *juſticiarii itinerantes*.

EYRE *of the foreſt*, is otherwiſe called *juſtice-ſeat*, which by the ancient cuſtoms was to be held every three years by the juſtices of the foreſt, journeying up and down for that purpoſe.

EYRIE, or AYRIE, among *Falconers*, the neſt where hawks ſit and hatch, and feed their young.

Hence, a young hawk newly taken from the neſt, is called an *eyeſs*.

EZEKIEL, a canonical book of the Old Teſtament, referring chiefly to the degenerate manners and corruptions of the Jews in the times when the author wrote.

It abounds with fine ſentiments and rich compariſons, and diſcovers much learning in profane matters.

Ezekiel was carried captive to Babylon with Jechoniah or Jehoiachiin, and began his prophecies in the fifth year of the Captivity, or in the year before Chriſt 595. He was contemporary with Jeremiah, who propheſied at the ſame time in Judea. He foretold many events, particularly the deſtruction of the temple, the fatal cataſtrophe of thoſe who revolted from Babylon to Egypt, and the happy return of the Jews to their own land.

EZEKIEL's *reed*, or *rod*, a ſcripture meaſure, computed by late writers to amount to 1 Engliſh foot 11 inches $\frac{1}{3}$ of an inch.

EZQUADUITL, a name by which ſome authors have diſtinguiſhed the tree from which we have the common dragon's blood of the ſhops.

EZRA, or EZDRAS, in *Divinity*. *The Book of Ezra* is a book of Holy Scripture, compoſed in Hebrew by *Ezra* or *Ezdras*, the high-prieſt of the Jews during the captivity; and particularly about the time when they returned to Paleſtine, under the reign of Cyrus.

This book contains the hiſtory of the Jews from the time of Cyrus's edict for their return, to the twentieth year of Artaxerxes Longimanus. It ſpecifies the number of Jews who returned, and Cyrus's proclamation for rebuilding the temple, the obſtruction it met with, and the finiſhing thereof in the reign of Darius. It is canonical, and allowed as ſuch both by the church and the ſynagogue.

The books of *Ezra*, called in the Engliſh verſion *the Firſt and Second Books of Eſdras*, though held by ſome, particularly the Greeks, for canonical, are thrown by the Engliſh church into the number of apocryphal books, being only extant in Greek.

The *Canon of Ezra* is the collection of the books of Scripture made by that pontiff. It appears, however, that the ſynagogue added other books to *Ezra*'s canon; witneſs the book of *Ezra* itſelf, that of Nehemiah, and ſeveral others. See CANON.

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F.

F, The ſixth letter of the alphabet, and the fourth conſonant.

The letter F may be either conſidered abſolutely, and in itſelf, or with regard to the particular languages where it is found. In the firſt view, *F* is generally placed by grammarians among the ſemi-vowels, and diſtinguiſhed in the enumeration of the alphabet by a name beginning with a vowel; though it has ſo far the nature of a mute that it is eaſily pronounced before a liquid in the ſame ſyllable. Joh. Conrad. Amman (in his Diſſertatio de Loquela) divides the conſonants into ſingle and double, and the ſingle into hiſſing and exploſive. Among thoſe called hiſſing, there are ſome pronounced by the application of the upper teeth to the lower lip; and theſe are the *F* and *ph*. The reaſon why ſome account the *F* a ſemi-vowel, and Amman places it among the hiſſers, is, that one may pronounce a little ſound without any other motion of the organs than what is neceſſary to the pronunciation of the *F*.

In Engliſh its ſound is invariable, being formed by compreſſion of the whole lips, and a forcible breath.

This letter is derived to us from the Romans, who borrowed it from the Æolians; among whom it is called *digamma*, or *double gamma*, as reſembling two Γ's, one over the other: add, that the digamma ſeems in its origin to have been no other than the Greek Φ, which being made at three ſtrokes, degenerated at length into the figure *F*. For the letter Φ being compounded of an omicron with a perpendicular drawn through it, if that perpendicular be made firſt, and the O at two ſtrokes afterwards, viz. firſt the upper, then the under part, it may happen, eſpecially in writing faſt, that the two parts ſhall not join; and even inſtead of two arches of circles, haſte and conveniency may naturally enough make two ſtrait lines.

What confirms this tranſmutation of the Φ into *F*, is, that on the medals of Philip, and the kings of Syria, in the words ΕΠΙΦΑΝΟΥΣ and ΦΙΛΑΔΕΛΦΟΥ, the *phi* is frequently ſeen in the form juſt mentioned; i. e. it has no circle or omicron; but acroſs the middle of the perpendicular is a kind of right line, formed only of two dots, the one on the right ſide, and the other on the left, repreſenting a croſs †. Such appears to be the origin of the letter *F*, which of conſequence is no other than a corruption of the Greek Φ; and accordingly, on the medals of the Faliſci the *F* is ordinarily put in lieu of the Greek Φ: but it muſt be added, that though the Greek and Latin letter were thus the ſame thing, yet the ſound was much ſofter among the Latins than among the Greeks, as was long ago obſerved by Terentianus.

The Romans for ſome time uſed an inverted, F Ⅎ, in lieu of a V conſonant, which had no peculiar figure in their alphabet: thus, in inſcriptions we meet with TERMINAⅎIT, DIⅎI, &c. According to Lipſius, in his Comment on the Annals of Tacitus, lib. xi, Covarruvias and Dauſquius, this inverted digamma Ⅎ was firſt introduced by the emperor Claudius. See Tacit. An. lib. xi. cap. 4. and Suet. in Vit. Claud. cap. 41.

It may be added, that the prounciation of the *F* is almoſt the ſame with that of the V, as will be evident by attending to the manner of pronouncing the following words: *F*avour, *V*anity, *F*elicity, *V*ice, *F*oment, *V*ogue, &c. The French particularly, in borrowing words from other languages, uſually turn the final *v* into an *f*, as chetif of cattivo, neuf of novus, nef of navis, &c.

In the latter Roman writers we find the Latin *F* and Greek Φ *ph* frequently confounded; as in *F*alanx for *Ph*alanx, *F*iloſophia for *Ph*iloſophia, &c. which abuſe is ſtill retained by many French writers, who write *F*iloſophie, *F*ilippe, Epi*f*ane, &c. and even ſometimes by the Engliſh, as in *f*antaſy, *f*iltre, &c.

F, in the *Calendar*, is the ſixth dominical letter.

F, in the *Civil Law*. Two ff's joined together ſignify the Pandects: ſee the reaſon of this under PANDECT.

F, in our *Ancient Cuſtoms*, was a ſtigma or brand.

He that ſhall maliciouſly ſtrike any perſon with a weapon in church or church-yard, or draw any weapon there with an intent to ſtrike, ſhall have one of his ears cut off; and if he have no ears he ſhall be marked on the cheek with a hot iron having the letter F, whereby he may be known for a fray-maker, or fighter.

F, or FA, in *Muſic*, denotes the baſs-clef, being placed on the fourth line upwards.

Indeed the character or ſign by which the *f* and *c* clefs are marked bear no reſemblance to thoſe letters. Mr. Malcolm thinks it were as well if we uſed the letters themſelves; but cuſtom has carried it otherwiſe. The ordinary character of the *F* or baſs-clef is 𝄢, which Kepler takes a great deal of pains to deduce by corruption from the letter *F* itſelf.

F, in the *Italian Muſic*, is often uſed inſtead of FORTE.

FF, in the *Italian Muſic*, ſtands for *forte forte*, and intimates to play very ſtrong and loud.

F, in *Phyſical Preſcriptions*, ſtands for *fiat*, *let it be done*, as *F. S. A.* denotes as much as *fiat ſecundum artem*.

F, among ſuch as give us the numeral value of letters, ſignifies 40, according to the verſe

Sexta quaterdenos gerit quæ diſtat ab alpha.

And when a daſh was added over it $\overline{F}$, ſignified 40,000.

F, on the *French Coins*, is the mark of the town of Angers.

FA is one of the notes of muſic, being the fourth, riſing in the order of the gammut, *ut*, *re*, *mi*, *fa*. See NOTE.

FABA, in *Botany*. See BEAN.

FABA *Bengalenſis*, in the *Materia Medica*, a roundiſh compreſſed ſubſtance, about an inch in diameter, brought from Bengal, and thought to be a vitiated fruit of the myrobalans kind. It is a very good aſtringent, and therefore preſcribed with good ſucceſs in fluxes and hæmorrhages.

FABA *Græca*, in *Botany*. See *Indian Date* PLUM.

FABA *St. Ignatii*, in the *Materia Medica*. See NUX *vomica*.

FABA *purgatrix*, in the *Materia Medica*, the fruit of a ſpecies of *ricinus*. See PALMA *Chriſti* and CASTOR-*oil*.

FABACIUM, a word uſed by the ancients to expreſs a ſort of food then in uſe, which was a kind of cake made of bean-meal.

FABAGO, in *Botany*. See BEAN-*caper*.

FABALIS *Lapis*, in *Natural Hiſtory*, a ſtone mentioned by many ancient authors of repute as found in the river Nile, of the ſhape of a common bean, and of a black colour. They ſay it had the virtue of curing dæmoniacs, and that dogs durſt not bark if it was laid before them. Theſe, and many other like virtues, are attributed to this ſtone, to the great diſgrace of the ſober authors who relate them. The ſtone ſeems to have been of thoſe extraneous foſſils which Dr. Hill has ſtiled ICHTHYPERIA, from their having been formerly parts of the boney palates of fiſhes which feed on the ſhell-fiſh kinds; and other authors SILIQUASTRI, from their reſembling the pod of the lupine or bean.

FABARIA, in *Botany*, a name given by ſome authors to the telephium or ORPINE, and by which it is in ſome places called in the ſhops.

FABARIÆ *calendæ*, among the Romans, the calends of June, ſo called becauſe the beans being then firſt ripe, ſome of them were offered to the goddeſs Carna, the wife of Janus.

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FABATARIUM, among the ancients, ſignifies, according to ſome, a large veſſel in which beans were kept; others will have it to have been a kind of diſh or plate into which bean-pulſe was put and offered to the houſhold gods.

FABER, in *Ichthyography*. See DOREE.

FABIANS, FABII, in *Antiquity*, a part of the LUPERCI. Thoſe prieſts conſiſted of two colleges, the firſt of which was called the *Fabii*, and the ſecond the Quintilii, from their reſpective chiefs. The *Fabii* were for Romulus, and the Quintilii for Remus.

FABLE, a tale or feigned narration, deſigned either to inſtruct or divert; or, as Monſ. de la Motte defines it, an inſtruction diſguiſed under the allegory of an action.

Fable ſeems to be the moſt ancient way of teaching: the principal difference between the eloquence of the ancients and that of the moderns conſiſts, according to Pere Boſſu, in this; that our manner of ſpeaking is ſimple and proper, and theirs full of myſteries and allegories: with them the truth was uſually diſguiſed under thoſe ingenious inventions, called, by way of excellence, μυθοι, *fabulæ*, *fables*; that is, words, as intimating that there was the ſame difference between theſe *fabulous* diſcourſes of the learned and the common language of the people, as between the words of men and the voices of beaſts.

At firſt *fables* were only employed in ſpeaking of the Divine Nature, as then conceived; whence the ancient theology was all *fable*. The Divine attributes were ſeparated as into ſo many perſons, and all the œconomy of the Godhead laid down in the feigned relations and actions thereof; either becauſe the human mind could not conceive ſo much power and action in a ſingle and indiviſible being; or, perhaps, becauſe they thought ſuch things too great and high for the knowledge of the vulgar; and as they could not well ſpeak of the operations of this Almighty Cauſe without ſpeaking likewiſe of its effects, natural philoſophy, and at length human nature, and morality itſelf, came thus to be veiled under the ſame *fabulous* allegoric expreſſion; and hence was the origin of poetry, and particularly of epic poetry.

The critics after Aphthonius and Theon reckon three kinds of *fables*, rational, moral, and mixed.

FABLES, *rational*, are called alſo parables: theſe are relations of things ſuppoſed to have been ſaid and done by men, and which might poſſibly have been ſaid and done, though in reality they were not. Such in the ſacred writings, are thoſe of the ten virgins, of Dives and Lazarus, the prodigal ſon, &c. Of theſe rational *fables* we have likewiſe about a dozen in Phædrus.

FABLES, *moral*, called alſo apologues, are thoſe wherein not only beaſts, but trees, and other inanimate ſubſtances, are introduced as actors and ſpeakers. Theſe are alſo called *Æſopic fables*; not that Æſop was their inventor, for they were in uſe long before him, viz. in the times of Homer and Heſiod, but becauſe he excelled in them. Such was Jotham's *Fable* of the Trees, the moſt ancient of any that are now extant.

The *rational* differs from the *moral fable* in this; that the former, though it be feigned, might be true; but the latter is impoſſible, as it is impoſſible for brutes or ſtocks to ſpeak.

FABLES, *mixed*, are thoſe compoſed of both ſorts, rational and moral, or wherein men and brutes are introduced converſing together. Of theſe we have a fine inſtance in Juſtin, lib. xxxiii. cap. 4. made by a petty king to alarm the ancient Gauls againſt the Maſſilians, who, ariving out of Aſia into Spain, charmed with the place, begged leave of the inhabitants to build a city. To this effect: A bitch big with young begged of a ſhepherd a place to lay her whelps in; which when ſhe had obtained, ſhe farther begged for leave to rear them there. At length the whelps being now grown up, depending on the ſtrength of her own family, ſhe claimed the property of the place. So the Maſſilians, who are now only ſtrangers, will hereafter pretend to be maſters of this country.

As to the laws of *fable*, the principal are, 1ſt. That to every *fable* there be ſome interpretation annexed, to ſhew the moral ſenſe or deſign thereof. This interpretation, if it be placed after the *fable*, is called επιμυθιον, or *affabulatio*; if before it, προμυθιον, *præfabulatio*. 2. That the narration be clear, probable, ſhort, and pleaſant. To preſerve this probability the manners muſt be expreſſed and cloſely kept to, as in poetry. See PROBABILITY and MANNERS.

M. de la Motte has ſome fine remarks on the ſubject of *fables*, at the beginning of his *Fables* Nouvelles, dediées au Roi, 1719. A *fable*, according to this polite writer, is a little epic poem, differing in nothing from the great one but in extent; and in that being leſs confined as to the choice of its perſons, it may take in all ſorts at pleaſure, as gods, men, beaſts, or genii; or even if occaſion be, create perſons; i. e. perſonify virtues, vices, rivers, trees, &c. Thus, M. de la Motte very happily introduces virtue, talent, and reputation, as perſons making a voyage together. See EPOPOEIA and PERSONIFYING.

That author ſuggeſts two reaſons why *fables* have pleaſed in all ages and places. The firſt is, that ſelf-love is ſpared in the inſtruction. The ſecond, that the mind is exerciſed by the allegory. Men do not love direct precepts; too proud to condeſcend to thoſe philoſophers who ſeem to command what they teach, they require to be inſtructed in a more humble manner; they would never amend, if they thought that to amend were to obey: add, that there is a ſort of activity in the mind which muſt be humoured; it pleaſes itſelf in a penetration which diſcovers more than is ſhewn; and in apprehending what is hid under a veil, fancies itſelf in ſome meaſure the author of it. The *fable* muſt always imply or convey ſome truth; in other works, delight alone may ſuffice; but the *fable* muſt inſtruct. Its eſſence is to be a ſymbol, and of conſequence to ſignify ſomewhat more than is expreſſed by the latter. This truth ſhould for the generality be a moral one; and a ſeries of fictions conceived and compoſed in this view would form a treatiſe of morality preferable to any more direct and methodical treatiſe; accordingly, Socrates, we are told, had a deſign to compoſe a courſe of morality in this way. This truth ſhould be concealed under the allegory; and in ſtrictneſs, it ought not to be explained either at the beginning or end.

The truth or idea intended ſhould ariſe in the reader's mind from the *fable* itſelf. However, for the conveniency of the leſs diſcerning readers, it may be a good way to point out the truth or moral in preciſer terms. To have the moral at the end of the *fable* ſeems much better than at the beginning: the mind is apt to be foreſtalled in the latter caſe; I carry the key along with me, ſo that there is no room to exerciſe my mind in finding any thing myſelf.

The image, M. de la Motte obſerves, muſt be juſt, and expreſs the thing intended directly, and without any equivoque: it muſt be one; i. e. all the parts muſt be viſibly acceſſory to one principal end: and it muſt be natural; i. e. founded on nature, or at leaſt on opinion.

The writers of *fables* are not many. If there were any before Æſop, who lived in the time of Solon, about the fifty-ſecond Olympiad, his ſucceſs has quite effaced their memory; and even occaſioned all the good things of that kind to be aſcribed to him. His Life, as written by Planudes, is itſelf a thorough *fable*. It muſt be owned to be very happily imagined to make the inventor of *fables* a ſlave, and his maſter a philoſopher: the ſlave has his maſter's pride and ill humour to deal with throughout. His leſſons were all contained in the *fables* themſelves, and the readers were left the pleaſure of diſcovering them.

It is generally allowed among the learned, that though the matter and invention of the *fables* be Æſop's, the turn and expreſſion is not. The Greek is of Planudes; and bad Greek it is, in the judgment of F. Vavaſſor, De Ludica Dict. Some authors will have Socrates the author of the *Fables* of Æſop; others attribute them to Solomon, and others to Homer.

Phædrus was a ſlave too, and a freed-man of Auguſtus; but he had the advantage over Æſop in education: he is only a fabuliſt, as he tranſlates and copies. Though his *fables* be generally ſhort, yet he is prolix compared with his author. His ſtyle, however, is always florid, his deſcriptions conciſe, and his epithets ſuitable: he frequently adds graces never dreamt of by the inventor, and everywhere enriches the ſimplicity of Æſop in the moſt delicate manner.

Pilpay, another fabuliſt, governed Indoſtan a long time under a powerful emperor; but he was not the leſs a ſlave, for the prime miniſters of ſuch princes are always more ſo than the meaneſt ſubjects. Pilpay compriſed all his politics in his *fables*; and accordingly his work long continued the book of ſtate, or the diſcipline of Indoſtan. It was tranſlated into Perſian and Arabic, and ſince into the modern languages. His *fables*, M. de la Motte obſerves, are rather famous than good; but he is the inventor, and the merit of invention will always compenſate for many faults. His *fables* are often wild and artleſs; and the collection is a ſort of romantic aſſemblage of men and genii, compoſed in its kind like Cyrus or Orlando, where the adventures are continually thwarting and claſhing with each other.

We ſay nothing of the *fables* of Gabrias, or Babrias, Avienus, who lived towards the end of the fourth century, under the empire of Gratian, Abſtemius, &c.

Among the moderns, the moſt celebrated writers are Meſſ. de la Fontaine and De la Motte: the firſt of whom has picked

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out all the beſt things in Æſop, Phædrus, and Pilpay, and given them anew in French, with a delicacy and ſimplicity peculiar to himſelf; and which, in the judgment of his countrymen, ſets him even above Phædrus. The latter, rather than content himſelf with what De la Fontaine had left, choſe to be an inventor. He has ſucceeded. His *fables* are many of them very happy, though ſome think them too full of thought and reaſoning. His verſification is infinitely more correct than that of La Fontaine, and more ſuitable to the ſubject than that of Le Noble.

We have likewiſe ſome *fables* much eſteemed of Mr. Gay and Mr Moore.

FABLE is alſo uſed for the plot of an epic or dramatic poem, or the action which makes the ſubject of ſuch a poem or romance. See POEM, DRAMA, EPIC, and ACTION.

The *fable*, according to Ariſtotle, is the principal part, and as it were the ſoul of a poem. It muſt be conſidered as the firſt foundation of the compoſition, or the principle which gives life and motion to all the parts. In this ſenſe the *fable* is defined, "A diſcourſe invented "with art, to form the manners by inſtructions diſ"guiſed under the allegory of an action."

The epic *fable*, according to Boſſu, is confined to the rational kind; i. e. the actors and perſons are to be gods and men; and yet it admits of great latitude: it may be either grave, illuſtrious, and important, or low and popular; either whole or defective, in verſe or in proſe; much epiſodified, or brief; rehearſed by an author, or repreſented by actors on the ſtage; all which are ſo many circumſtances which do not make any alteration in the nature and eſſence of the *fable*.

The characters that ſpecify the epic *fable* are theſe: it is rational and probable; it imitates a whole and an important action; and it is long, and related in verſe: none of which properties affect the nature of the *fable*, or make it leſs a *fable* than thoſe of Æſop.

The *fable*, according to Ariſtotle, conſiſts of two eſſential parts, viz. truth, as its foundation; and fiction, which diſguiſes the truth, and gives it the form of *fable*. The truth is the point of morality intended to be inculcated; the fiction is the action, or words the inſtruction is covered under.

To make a plot or *fable*, the firſt thing, according to the great critic juſt mentioned, is to pitch on ſome moral inſtruction to be exemplified.

E. gr. I would exhort two brothers, or other perſons, who have ſome common intereſt, to live in amity, in order to preſerve it. This is the end of the *fable*, and the firſt thing I have in view. In order to this, I endeavour to impreſs this maxim on our minds, that "ill "underſtanding ruins families, and all kinds of ſociety." This maxim is the moral or truth which is to be the ground of the *fable*; which moral truth is now to be reduced into action, and a general action to be framed from ſeveral ſingle and real actions of ſuch as were ruined by ill underſtanding.

Thus, e. g. I ſay, that certain perſons united together for the preſervation of ſomething that belonged to them in common, coming to diſagree, their diviſion left them open to an enemy who ruined them: ſuch is the firſt plan of a *fable*. The action preſented by this narration has four conditions; it is univerſal, imitated, feigned, and contains a moral truth under an allegory.

The names given to the ſeveral perſons begin to ſpecify the *fable*. Æſop uſes thoſe of brutes. Two dogs, ſays he, appointed to watch a flock, fall out, fight, and leave all open to the wolf, who carries off what he pleaſes.

If you would have the action more ſingular, and render the *fable* rational, take the names of men. Pridamant and Orontes, brothers by a ſecond venter, were left very rich by their father's will; but diſagreeing about the partition of their effects, they engaged themſelves ſo far againſt each other that they took no care of their common intereſt againſt Clitander, their eldeſt brother by the firſt venter; which laſt, artfully inflaming their quarrel, and feigning he had no view but to ſome moderate augmentation, which might be made him without oppreſſing them, in the mean time, gets the judges on his ſide, and the other perſons intruſted with the affair, procures the will to be affirmed, and becomes entitled to the whole eſtate about which the brothers were at variance. Now, this *fable* is rational; but the names being feigned as well as the things, and beſides, the perſons being only of a private rank, it is neither epic nor tragic. However, it may be employed in comedy, it being a rule laid down by Ariſtotle, that epic and tragic poets only invent things, but comic poets invent both names and things. See COMEDY, &c.

To accommodate this comic *fable* more to the mode and taſte of the town, ſome Dorinda muſt be imagined to have been promiſed to Clitander; but her father, finding him diſinherited by the will, changes his reſolution, and will have her marry one of the rich, ſenſeleſs, young brothers, whom ſhe deſpiſes, &c.

But to return. The fiction may be ſo diſguiſed with the truth of hiſtory that there ſhall not appear any fiction at all. To effect this the poet looks back into hiſtory for the names of ſome perſons to whom the feigned action either really or probably did happen, and relates it under thoſe known names, with circumſtances which do not change any thing of the ground of the *fable*.

As for the *fable*, it matters but little whether the perſons be called dogs, or Orontes and Pridamant, or Robert of Artois and Ralph de Neſle, or Achilles and Agamemnon.

The epic *fable* we ſhall now propoſe in its juſt extent under theſe two names laſt mentioned. It is too ſhort for the epopœia in the two preceding ones. We chooſe the *Fable* of the Iliad, as being the fineſt plan of an epic poem in the world, and at the ſame time the moſt uſeful ſyſtem of the precepts of the art, it being hence that Ariſtotle was furniſhed with all his reflections.

In every diſcreet undertaking the end is the firſt thing propoſed; and by this the whole work and all its parts are regulated; conſequently, the deſign of the epopœia being to form the manners, it is with this firſt view the poet muſt begin. Now, the philoſopher dwelling on virtues and vices in general, the inſtructions he gives ſerve equally for all ſtates and all ages; but the poet has a more immediate regard to his countrymen, and the preſſing occaſions of his fellow-citizens. On this view it is that he chooſes his moral, which he is to inſinuate into the people by accommodating himſelf to their peculiar cuſtoms, genius, and inclinations. See how Homer has acquitted himſelf in theſe reſpects.

He ſaw the Greeks, for whom he wrote, divided into as many ſtates as cities, each whereof was a body apart, and had its government independent of the reſt. Yet were theſe different ſtates frequently obliged to unite into one body againſt their common enemies. Here then were two ſorts of government too different to be commodiouſly treated in one poem; the poet accordingly had recourſe to two *fables*; the one for all Greece, conſidered as confederated together, only conſiſting of independent parts; the other for each particular eſtate, ſuch as they are in time of peace, and without the firſt relation. The firſt is the ſubject of the ILIAD, the ſecond of the ODYSSEY.

For the firſt kind of government, all experience agrees, that the only thing which can render it happy, and its deſign ſucceſsful, is a good underſtanding, and due ſubordination among the ſeveral chiefs that compoſe it; and that miſunderſtandings, a deſire of ſway, &c. are the inevitable bane of ſuch confederacies. The beſt inſtruction therefore that could be given them, was to ſet before their eyes the deſtruction of the people, and even of the princes themſelves, through the ambition and diſcord of theſe latter. Homer therefore, for the ground or moral of his *fable*, choſe this great truth, that the miſunderſtandings of princes ruin their ſtates. "I ſing, "ſays he, the wrath of Achilles, ſo fatal to the Greeks, "and which deſtroyed ſo many heroes, occaſioned by a "diſagreement between king Agamemnon and that "prince."

To enforce this truth, he repreſents divers confederate ſtates firſt at variance and unproſperous; then reconciled and victorious: all which he thus includes in one univerſal action. Several independent princes league againſt a common enemy; he whom they chooſe as their leader affronts the braveſt of all the confederacy; upon which the offended prince withdraws, and refuſes any longer to fight for the common cauſe. This miſunderſtanding gives the enemy ſo much advantage that the confederates are ready to relinquiſh the enterprize. The diſaffected perſon himſelf becomes a ſharer in the calamities of his allies, one of his chief friends and favourites being killed by the chief of the enemies. Thus, both parties grown wiſe by their own injury, are reconciled. Upon which the valiant prince joining again in the war, turns the ſcale to his own party, and kills the enemy's chief.

Such is the firſt general plan of the poem. To render this probable and more intereſting, circumſtances of time, place, perſons, &c. are to be added; that is, the poet looks into hiſtory or tradition for perſons to whom ſuch actions may with truth or probability be attributed.

He pitches on the ſiege of Troy, and ſuppoſes the action to have paſſed there. The brave, choleric character, he calls Achilles; the general, Agamemnon; the chief of the enemies, Hector, &c. To inſinuate himſelf into his readers, he accommodates himſelf to their manners, genius, views, &c. and to render his *fable* more intereſting,

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reſting, makes his chief perſons, and thoſe who remained victorious, to be Greeks, the fathers of thoſe very people. The courſe of the work is filled up and extended with other uſeful leſſons and inſtructions.

That the epopœia in all its glory is juſtly and ſtrictly a mere *fable* in the ſame ſenſe as the fictions of Æſop are, is ſhewn by F. Boſſu, in a parallel between the *fable* of the Iliad and that of Æſop already mentioned. The moral inſtruction is viſibly the ſame in both; ſo is the fiction. All the difference lies in the names and qualities of the perſons.

Homer's are kings; he calls them Achilles, Patroclus, &c. and the general good to be preſerved, he calls the Greeks. Æſop, after his manner, gives his perſons the names of beaſts: the dogs are confederated, the wolf is their enemy; and what Homer calls Greeks, Æſop calls ſheep. One ſays, that while the confederate princes were at variance, Hector ruſhes on the Greeks, and makes them pay dear for the folly of their ſovereigns *(delirant reges, plectuntur Achivi)*; but that the allies, brought by misfortunes to themſelves again, re-unite, repulſe Hector, and kill him. The other, that while the dogs are together by the ears the wolf falls on the ſheep; and that the dogs ſeeing the havock he makes, join together, drive him away, and kill him.

The two *fables* were capable of a ſtill nearer reſemblance. Homer has extended his by long ſpeeches, deſcriptions, compariſons, and particular actions; that of Æſop might be amplified after the like manner, without corrupting or altering it. It is neceſſary only to relate what cauſe ſet the dogs at variance, and ſhew the riſe of the fatal wrath in all its circumſtances; to make fine deſcriptions of the plain wherein the ſheep fed, and of ſome neighbouring wood where the wolf was ſheltered; to give this enemy whelps to rear, make them follow their ſire in ſearch of prey, and deſcribe the carnage they made at divers expeditions. Nor ſhould the genealogy of the heroes be forgotten; the wolf ſhall boaſt himſelf a deſcendant of Lycaon, and one of the dogs be ſprung in a direct line from Canicula: which laſt would be the proper hero of the poem, as being hot, and apt to be enraged. He would repreſent the perſon of Achilles to admiration; and the folly of ſome Ajax, his couſin, would afford a good proof of ſo divine an extraction. Nothing more were required to engage heaven in the cauſe, and divide the gods; which, no doubt, have as much right in Æſop's republic as in the ſtates of Homer. Witneſs Jupiter taking care to give a king to the nation of the frogs.

The reader has here field enough for an epopœia; if he have any thing of fancy and expreſſion, and do but take care to repeat as often as Homer does,

Τον δ' απαμειβομενω προσεφη ποδας ωκυς.

FABRIC, the ſtructure or conſtruction of any thing, particularly of a building.

The word is formed of the Latin, *fabrica*, which originally ſignifies a *ſmith's ſhop*, or *forge*.

In Italy the word *fabric* is applied to any conſiderable building; in France it rather ſignifies the manner of building.

FABRIC *lands*, are lands given towards the maintenance, rebuilding, or repair of cathedrals or other churches, mentioned in the Act of Oblivion, 12 Car. II. cap. 8.

In ancient time almoſt every one gave by his will more or leſs to the *fabric* of the cathedral or pariſh-church where he lived.

FABULOUS, denotes ſomething that has a relation to FABLE. Varro divides the duration of the world into two earlier ſtates or periods, called the *dark* and *fabulous*. See AGE.

FACE, the ſurface or firſt ſide which a body preſents to the eye. See SURFACE.

FACE is particularly uſed for the viſage of an animal, and eſpecially of a man, as being in him the only part of the body that ordinarily appears to the eye.

The Latins call it *facies*, *vultus*, *os*, &c.

The great variety obſervable in men's *faces*, voices, and hand-writings, furniſhes a noble argument of a Providence.

The human *face* is called the image of the ſoul, as being the ſeat of the principal organs of ſenſe; and the place where the ideas, motions, &c. of the ſoul are chiefly ſet to view. Pride and diſdain are ſhewn in the eye-brows, modeſty on the cheeks, majeſty on the forehead, &c. It is the *face* which ſhews the ſex, age, temperament, health, or diſeaſe, &c.

The *face*, conſidered as the index of the paſſions, habits, &c. of the perſon, makes the ſubject of phyſiognomy.

Anatomiſts uſually divide the *face* into two parts, the upper and lower: the upper is the front, or forehead; the lower includes the eyes, noſe, ears, mouth, cheeks, and chin. See each part deſcribed under its reſpective article.

FACE, or FAÇADE, in *Architecture*, is ſometimes uſed for the front of a building, or the ſide on which the chief entrance is; as alſo for the ſide it preſents to a ſtreet, garden, court, &c. and ſometimes for any ſide oppoſite to the eye.

FACE, FACIA, or FASCIA, alſo denotes a flat member having a conſiderable breadth, and but a ſmall projecture.

Such are the bands of an architrave, larmier, &c. See FASCIA.

FACE *of a ſtone*, is the ſurface or plain part which is to lie in the front of the work. The *face* is eaſily known when the ſtone is ſcalped, as being always oppoſite to the back, and the back going rough as it comes from the quarry.

The workmen generally chooſe to make one of thoſe ſides the *face*, which, when in the quarry lay perpendicular to the horizon, and conſequently the breaking, and not the cleaving way of the ſtone.

FACE *of a gun*, in the *Artillery*, the ſurface of the metal at the extremity of the muzzle of a piece.

FACE, in *Aſtrology*, is uſed for the third part of a SIGN. Each ſign is ſuppoſed to be divided into three *faces*: the ten firſt degrees compoſe the firſt *face*; the ten following ones the ſecond; and the laſt ten the third. Venus is in the third *face* of Taurus; that is, in the laſt ten degrees thereof.

FACE *of a plant*, in *Botany*, a word uſed by Tournefort and many botaniſts to convey an idea of that general appearance of plants, which ſhew a ſameneſs in thoſe of the ſame *genus*, and a diverſity from other genuſes, though not eaſily characterized in words, yet very obvious to an eye accuſtomed to theſe reſearches. Thus, all the ſpecies of wormwood have the ſame *face*, by which they may be taken to be the ſpecies of the ſame *genus*, and ſo of many more; nay, in ſome caſes, whole *genera*, and even claſſes, have the ſame kind of *family-face*, as it may be called, by which they may be known; as the umbelliferous plants, except the *perfoliata*, and a few other inſtances.

It has been attempted by many to make this general *face* an indicatory note of the virtues of the plant which wears it; and there would certainly be this great advantage in it if it could be brought to any degree of certainty, that the moſt obvious of all diſtinctions would be applied to the moſt valuable office; but though an abſolute certainty cannot be arrived at in an attempt of this kind, yet allowing for the poſſibility of a few exceptions, general conjectures may be made on the following rules, which will rarely fail. The umbelliferous plants beforementioned make a very large claſs; and it is their general and obvious character to have their ſeveral flower-branches ariſe from one center, and expand into an umbrella, every one having a tuft of flowers at the end: theſe flowers conſiſt of five leaves, and the ſeeds are naked and double, and the leaves of the plants are generally deeply divided, as in parſley, carrots, and the like.

This is a general *face* of a plant not eaſy to be miſtaken; and all the plants which have this *face* are endowed with the virtues of carminative medicines. They expel wind, and are good in the colic, and other the like diſeaſes. The ſeeds of moſt of theſe are uſed, and ſome of the roots. The ſeeds of aniſe, caraway, cummin, and the like, are all ſeeds of umbelliferous plants; and the root of *angelica* is another inſtance of their efficacy. But as an exception to this general rule, the hemlock, and hemlock-dropwort may be produced, which are poiſons.

The *verticillate plants* are another claſs, which are eaſily known by their general face; their flowers ſtanding in ringlets round the ſtalks, and being labiated, or of ſome ſuch form. The leaves alſo in moſt of theſe plants ſtand in pairs, and they have generally an aromatic ſmell. As the virtues of the *umbelliferæ* lie in the roots and ſeeds, ſo do theſe in the huſks of the flowers. It has been a common opinion, that the flowers of theſe plants contained their virtues, but this is erroneous. The flowers of ſage are almoſt inſipid, but the huſks taſte very ſtrongly. Theſe plants in general are poſſeſſed of the ſame virtues, and are all of a middle degree between the carminatives before mentioned and the ſpices. They are properly aromatics, and are all good in nervous diſeaſes, as epilepſies, palſies, and the like: one of them, which is called mother of thyme, is alone a remedy for the nightmare, a troubleſome diſeaſe, that often baffles other medicines; and the flowers of roſemary, lavender, ſage, and the like, may ſtand as inſtances of the virtues of this claſs; and mint, pennyroyal, hyſſop, &c. in their leaves are of great virtue, and a pleaſant flavour.

The *ſiliquoſe plants* have alſo a general *face*. Their flowers

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flowers are compoſed of four leaves, and their ſeeds contained in long pods, or in ſhort and thick ſiliculæ. In theſe plants the ſeeds are found to contain the principal virtue in ſome, and in others the leaves; ſome have alſo virtue in their roots, but the flowers of all are neglected. Muſtard, creſſes, and the like, have their virtue in the ſeeds, and ſcurvy-graſs in its leaves, horſe-radiſh in the roots; yet all have the ſame general virtue; they are hot like the two laſt tribes, but they exert their power in a very different manner; as it conſiſts in a diuretic volatile ſalt; and they are all good in the ſcurvy, dropſy, jaundice, &c. and have been uſed in theſe caſes at all times. Philoſ. Tranſ. N° 255, p. 200. See BOTANY.

FACES *of a baſtion*, in *Fortification*, are the two foremoſt ſides reaching from the flanks to the point of the baſtion where they meet.

Theſe are commonly the firſt undermined, becauſe they reach fartheſt out, and are the leaſt flanked, and therefore weakeſt. They are repreſented by the lines B C and S C, *Tab. Fortif. fig.* 1.

FACE *of a place*, denotes the interval between the points of two neighbouring baſtions, containing the curtain, the two flanks, and the two *faces* of the baſtions that look towards one another.

This is otherwiſe called the TENAILLE of the place.

FACE *prolonged*, in *Fortification*, is that part of a line of defence raſant, which is between the angle of the epaule or ſhoulder of a baſtion and the curtain; or the line of a defence raſant diminiſhed by the *face* of the baſtion.

FACE, *external*, *Facies externa*, in *Ichthyology*, is uſed to expreſs a general form or figure in certain fiſhes, by means of which they agree with ſome and diſagree with others; and according to which likeneſs or diſſimilitude ſome authors of the late ages have arranged them into *genera*.

This general figure in fiſhes conſiſts in the ſhape of the head and body, and the ſhape, ſize, and proportion of the fins and tail, and though very obvious, is very indiſtinct; it being in many caſes, where two fiſhes have the ſame general *external face*, yet hard to ſay, on a cloſe examination, in what it is that the likeneſs conſiſts. The authors who founded the diſtinction of the *genera* of fiſhes on theſe external reſemblances ran into very great errors; for it is not enough in a generical diſtinction for the character to be obvious, but it muſt alſo be preciſe and determinate. What this *facies* had in the firſt of theſe requiſites is often wanted in the laſt; and in general, it has been found to be no true baſis of diſtinction.

Many fiſh have the *facies externa*, or general appearance ſo much alike, as to be eaſily coupled at ſight into the ſame genus; and that juſtly, as they really belong to the ſame when more preciſely referred to it, according to their natural and more eſſential character. Of this kind are the gadi, the clupeæ, the ſalmons, the *petromyzæ*, the *coregones*, the *pleuronectæ*, the rays, and many of the *cyprini*. In theſe the *facies externa* is of real uſe, as it is an obvious mark, and leads to the road of truth; but there are beſide theſe many other fiſhes, which, though they are truly of the ſame *genus*, yet differ extremely in their ſeveral external appearances, ſo that any method founded on the *facies externa* muſt ſeparate them, though nature had really joined them in their real characters. The tench and the trutta lacuſtris, or lake-trout, are in regard to their *facies externa* extremely alike one to the other, yet here this obvious character deceives us; for the tench is a ſpecies of the cyprinus, and the other a true and genuine ſalmon, two *genera* of fiſhes eſſentially and very widely different, though this method of judging by the external appearance would have coupled together fiſh belonging to them both. In the ſame manner the *ſcorpæna* and *cottus* are very like one to the other in their external appearance; but when nicely examined, according to the rules of ichthyology, they are found to belong to two very different genera, and to have very little real likeneſs. From theſe, and numerous other examples of a like kind, it evidently appears, that as the *facies externa* cannot be depended on for eſtabliſhing the genera of fiſhes, ſome more eſſential characters muſt be enquired after for the regular and natural completion of this neceſſary buſineſs. Therefore, the generical characters of fiſh are to be ſought after in their external and invariable parts, and they are to be arranged into families and *genera*, according to the agreement of theſe in number, ſituation, figure, and proportion. Among all theſe, the characters taken from the number of the parts, where that is certain and invariable, are moſt valuable, as they moſt readily offer themſelves to the eye, and are leaſt of all liable to errors.

FACE, in the *Manege*. See CHANFRIN.

FACE, in the *Military Language*, a word of command: thus, *face to the right*, is to turn upon the left heel a quarter round to the right; *face to the left*, is to turn upon the right heel a quarter round to the left.

FACE, among *Painters* and *Artiſts*, is uſed to denote a certain dimenſion of the human body, adopted for determining the proportion which the ſeveral parts ſhould bear to one another; for this purpoſe they commonly divide the height of the body into ten equal parts, called *faces*; becauſe the human *face* is the firſt model of theſe meaſures. Though the Apollo and Venus of Medici have more than ten *faces*. They again ſubdivide each of theſe *faces* into three equal parts; and this ſubdiviſion is founded on the conſideration, that the *face* is made to contain three equal parts; e. g. the firſt commencing above the forehead at the root of the hair, and ending at the root of the noſe, the noſe forming the ſecond part, and the third part ending juſt below the chin. See PROPORTION.

FACET, or FACETTE, a little face or ſide of a body, cut into a great number of angles.

Multiplying-glaſſes are cut in *facets*, or *facet-wiſe*. Diamonds are alſo cut in *facets* or tables.

In brilliants there are two ſorts, *ſkew*, or *ſkill-facets*, and *ſtar-facets*. *Skill-facets* are divided into upper and under.

Upper ſkill-facets are wrought on the lower part of the bezil, and terminate in the girdle.

Under ſkill-facets are wrought on the pavillions, and terminate in the girdle.

Star-facets are wrought on the upper part of the bezil, and terminate in the table. Jeffries on Diamonds. See DIAMONDS.

FACETANUS *Lacertus*, in *Zoology*, the name of a peculiar ſpecies of lizard, called at Rome and Naples the TARANTULA.

FACIA, in *Architecture*. See FASCIA.

FACIES *Hippocratica*, in *Medicine*, is when the noſtrils are ſharp, the eyes hollow, the temples low, the tips of the ears contracted and cold, the forehead dry and wrinkled, and the complexion pale or livid.

The *facies Hippocratica* is chiefly obſerved towards the period of phthiſes and other conſumptions, and is held a ſure prognoſtic of death. If it appears within three days after the attack of an acute diſeaſe, it is deemed to indicate death.

FACK, in a *Ship*. See FAKE.

FACTION, a cabal or party formed in a ſtate to diſturb the public repoſe.

The moſt celebrated *factions* are that of the Guelphs and Gibelins, who kept Italy in alarm for many ages; and with us that of the Whigs and Tories.

FACTION was originally an appellation given to the divers troops or companies of combatants in the games of the CIRCUS.

Of theſe there were four, viz. the *green faction*, the *blue faction*, the *red faction*, and the *white faction*. The emperor Domitian is ſaid to have added two others, viz. the *purple* and the *yellow*.

Theſe *factions*, with their liveries and badges, were at length aboliſhed; the emulation which was at firſt between them growing to ſuch a height, that in Juſtinian's time 40,000 men were killed in a conteſt between the *green* and *blue factions*.

FACTITIOUS, ſignifies any thing made by art, in oppoſition to what is the produce of nature.

De FACTO, ſee the article DE *facto*.

FACTOR, in *Commerce*, an agent or perſon who acts and negociates for a merchant by commiſſion; called alſo commiſſioner, and on ſome occaſion broker, and throughout the Levant, coagis.

Factors are either charged with the buying or the ſelling of goods, or with both.

Thoſe of the firſt kind are uſually eſtabliſhed in places of conſiderable manufactories, or cities of great trade. Their office is to buy up commodities for merchants reſiding elſewhere; to ſee them packed, and ſend them to the perſons for whom they were bought.

FACTORS *of ſale* are uſually fixed in places where there is a great vent. To theſe, merchants and manufacturers ſend their goods to be ſold for them according to the price and other conditions expreſſed in the orders delivered them.

The wages or allowances for ſelling are uſually clear of all expences of carriage, exchange, remittances, &c. excepting poſtage of letters, which are never put to account.

Factors ſhould ſtrictly obſerve the orders of their principals, or elſe they are liable to the damage accruing from the neglect of them. When *factors* have unlimited commiſſion to do for their conſtituents the beſt they can, they are excuſable, though their tranſactions are attended with loſs to their principals; but no *factor*, who has merely a commiſſion to ſell, &c. for another, is excuſable for entruſting another perſon beyond the uſual time allowed in the ſale of the commodities which he diſpoſes of: in ſuch a caſe he is anſwerable to the principal out of his own eſtate. If a *factor* ſells on the uſual truſt

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truſt to a perſon of good credit who afterwards becomes inſolvent, he is diſcharged; but not if the man's credit was bad at the time of ſale. A *factor* ſhould always be punctual in the advices of his tranſactions, ſales, purchaſes, freights, and draughts by exchange; he ſhould never deviate from the orders he receives in the execution of a commiſſion for purchaſing goods, either with reſpect to price or quality: if goods that are bought are ſent to a different place from that to which they were ordered, they become the *factor*'s, unleſs the merchant allows them. A *factor* that ſells a commodity under the price ordered by his principal ſhall be obliged to make good the difference; and if he purchaſes goods for another at a limited price, and they riſe in value, and he ſecures to himſelf the advantage, he is obliged to ſatisfy his principal for damages; or if he makes any advantage of the ſale of goods which his principal directed him to purchaſe, the principals ſhall recover it from him, and he is liable to be amerced for the fraud. When *factors* have obtained a profit for their principal, they muſt be cautious how they diſpoſe of it; for if they act without commiſſion they are reſponſible; and if a merchant remits goods to his *factor*, and about a month after draws a bill on him, and the *factor* having effects in his hands, accepts the bill, but the principal breaks, and the goods are ſeized in the *factor*'s hands on behalf of the creditors, it has been judged that the *factor* muſt anſwer the bill, and come in as a creditor for ſo much as he was obliged by reaſon of his acceptance to pay. If one employs a *factor*, and intruſts him with the diſpoſal of merchandiſe, and the *factor* receives the money, and dies, indebted to debts of a higher nature, and it appears by evidence that this money was veſted in other goods, and remains unpaid, thoſe goods ſhall be taken as part of the merchant's, and not of the *factor*'s eſtate; but if the *factor* has the money, it ſhall be conſidered as the *factor*'s eſtate, and muſt firſt anſwer the debts of ſuperior creditors, &c. If a perſon employs a *factor* to ſell goods, who ſells them on credit, and before the money is paid dies indebted more than his eſtate will pay, this money ſhall be paid to the principal merchant, and not to the *factor*'s adminiſtrator, deducting his commiſſion. A *factor* who has money in hand belonging to his principals, and who neglects to inſure a ſhip and goods according to order, ſhall make good the damage if the ſhip miſcarry; and if he make any compoſition with the inſurers after inſurance without orders, he is anſwerable for the whole inſurance. As fidelity and diligence are required from the *factor*, ſo the law requires the like from the principal: if, therefore, a merchant remits counterfeit jewels to his *factor*, who ſells them as true ones, and ſuſtains loſs or damage by impriſonment or other puniſhment, the principal ſhall not make ſatisfaction to the *factor* but to the party who purchaſed them. Buſineſs of this kind is called commiſſion-buſineſs; and traders in this way have current as well as commiſſion accounts conſtantly between them, and draw on, remit to, and ſend commiſſions to each other only by the intercourſe of letters, which, among men of honour, are as obligatory and authoritative as all the bonds and ties of law.

FACTORS, in *Arithmetic*, is a name given to the two numbers which are multiplied one into another; that is, the multiplicand and multiplier; ſo called becauſe they are to *facere productum*, make or conſtitute the product.

FACTORAGE. The *factorage* or wages, called alſo commiſſion, is different at different places, and for different voyages: at a medium it may be fixed at about three *per cent.* of the value of the goods bought, beſide the charge of package, which is paid over and above.

At Virginia, Barbadoes, and Jamaica, the *factorage* is about eight *per cent.* and the like throughout the greateſt part of the Weſt Indies. In Italy it is two and a half; in Holland one and a half: in Spain, Portugal, France, &c. it is two *per cent.*

FACTORY, a place where a conſiderable number of factors reſide, to negociate and officiate for their maſters or principals.

The term is chiefly uſed in ſpeaking of the Eaſt Indies, and other parts of Aſia, Turky, Italy, Portugal, &c. whither the European nations ſend their ſhips every year, and where they keep factors to buy the commodities of the country, and ſell thoſe brought from Europe.

FACTUM, in *Arithmetic*, the product of two quantities multiplied by each other.

FACULÆ, in *Aſtronomy*, a name given by Scheiner, and others after him, to certain ſpots on the ſun's diſk that appear brighter and more lucid than the reſt of the body.

The word is pure Latin, being a diminutive of *fax*, *torch*, and ſuppoſed to be here applied from their appearing and diſſipating by turns.

The *faculæ* or bright ſpots differ very conſiderably from the maculæ or dark ſpots, both in light, colour, figure, magnitude, and duration.

Hevelius aſſures us, that July the 20th, 1634, he obſerved a *facula* that took up a third part of the ſun's diameter; and from the obſervations of the ſame Hevelius we learn, that the maculæ frequently change into *faculæ*; but the *faculæ* into maculæ rarely, if ever. Some authors even contend that all the maculæ degenerate into *faculæ* before they quite diſappear.

Huygens, however, declares he was never able to diſcover any *faculæ*, though the *maculæ* occurred to him very frequently. All the foundation he could ſee for the notion of *faculæ*, he ſays, was, that in the darkiſh clouds which frequently ſurround the maculæ, one ſometimes diſcerns little points or ſparks brighter than the reſt.

Many authors after Kircher and Scheiner have generally repreſented the ſun's body full of bright, fiery ſpots, which they conceive to be a ſort of volcanos in the body of the ſun; but Huygens, and others of the lateſt and beſt obſervers, finding, that the beſt teleſcopes diſcover nothing of the matter, agree to explode the phenomena of *faculæ*. Their cauſe theſe authors attribute to the tremulous agitation of the vapours near our earth; the ſame as ſometimes ſhews a little unevenneſs in the circumference of the ſun's diſk when viewed through a teleſcope. Strictly, then, the *faculæ* are not eructations of fire and flame, but refractions of the ſun's rays in the rarer exhalations, which, being condenſed in the neighbourhood of that ſhade, ſeem to exhibit a light greater than that of the SUN. See SPOTS.

FACULTY, a power or ability of performing an action.

The term is much uſed by the ancient philoſophers, and ſtill retained in the ſchools for explaining the actions of natural bodies.

Thus, to account for the act of digeſtion, they ſuppoſe a digeſtive *faculty* in the ſtomach; to account for motion, they imagine a motive *faculty* in the nerves, &c. which is only a ſubſtituting of one name of an unknown phenomenon for another.

Yet this practice of attributing effects to their reſpective virtues or *faculties* ſtill obtains in divers things, which our philoſophy has not yet afforded us a better account of. Thus, ſay our medicinal writers, ſenna and rhubarb have a purgative *faculty*, barberries a cooling *faculty*, &c. which amounts juſt to this, that ſenna purges, and barberries cool.

The FACULTIES or *powers of the ſoul* are commonly reputed two, viz. the underſtanding and will.

The FACULTIES *of the body* are uſually diſtinguiſhed with regard to their ſeveral functions, into *vegetative* and *animal*.

Under the *vegetative faculty* are comprehended the divers ſubaltern ones, whereby nutrition and generation are effected.

Under the *animal faculties* are comprehended thoſe relating to ſenſe and motion.

The *vegetative faculty* is ſubdivided into *nutritive* and *generative*, and the nutritive is again ſubdivided into *natural* and *vital*.

To the firſt belong the functions of the lower belly, relating to the preparation of the food; to the latter, the actions of the heart and lungs, wherein life is chiefly concerned.

Others ſubdivide the *vegetative faculty* into *attractive*, *retentive*, *concoctive*, and *expulſive*.

The *animal faculties* being thoſe whereby an animal perceives and moves, become divided into *ſenſitive* and *locomotive*.

FACULTY is alſo applied in the *Schools*, to the divers parts or members of an univerſity, divided according to the arts or ſciences taught or profeſſed there.

There are four *faculties* in moſt univerſities; that of arts, which includes the humanities and philoſophy, and is much the moſt ancient and extenſive; the ſecond is that of theology; the third, medicine; and the fourth, juriſprudence, or laws. See each under its proper article.

The degrees in the ſeveral *faculties* in the univerſities are thoſe of Bachelor, Maſter, and Doctor.

The FACULTY is frequently uſed abſolutely, and by way of eminence, for that chiefly ſtudied and taught in that place.

Thus, the *Faculty* of London and Montpelier is medicine; that of Paris, theology; that of Orleans, law, &c.

FACULTY, in *Law*, denotes a privilege or ſpecial power granted to a man by favour, indulgence, and diſpenſation, to do that which regularly by law he cannot; as to eat fleſh upon days prohibited, or to marry without banns firſt aſked, &c.

FACULTIES, *the Court of*. See COURT *of Faculties*.

FACULTY *of Advocates*, in Scotland. See ADVOCATE.

FÆCES, or FECES, the dregs, ſediment, or impurities, remaining

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remaining of a mixt body, after the purer, more volatile, and fluid, have been ſeparated from it by evaporation, diſſolution, decantation, derivation, or the like.

Thus we ſay the *fæces* of wine, of oil, &c. Thoſe of wines are properly called *lees*; thoſe of oil, *amurca*; thoſe of malt-liquors, *grounds*.

FÆCES, in *Chemiſtry*, denotes the lees, refuſe, dirt, mud, impurities, and heterogeneous matters, remaining in the alembic after the diſtillation of any body: what remains in the retort, inſtead of *fæces*, is properly denominated *caput mortuum*, or *terra damnata*.

FÆCES is particularly uſed in *Medicine*, &c. for the groſs, impure mattters found at the bottom of the compoſitions and preparations of either pharmacy.

FÆCES is alſo uſed for the EXCREMENTS of an animal voided by ſtool.

The *fæcal* matter is become famous for a chemical operation thereon, by M. Homberg, related at length in the Mem. de l'Acad. R. An. 1711. He had a notion ſuggeſted to him, that the *human fæces* by diſtillation yielded an oil clear as water, without any ſmell, and which had the property of fixing mercury into fine ſilver. Upon this, becauſe he would have as laudable and promiſing a matter as he could, he hired four robuſt healthy young fellows, whom he ſhut up for three months, and agreed with them, that they ſhould eat nothing but the fineſt bread, with which he ſupplied them freſh every day, and drink the beſt Champaign wine as long as they could. After a long proceſs, and numerous eſſays on the excrements they made, he at length got the clear, inodorous oil; but it had no effect at all on mercury, which was the great point aimed at. As the method of working on this diſagreeable matter, however, at length furniſhed him with a very fine phoſphorus, it may be worth the attention of the curious.

FÆCULA. See FECULA.

FÆSTING *Men*. See FASTERMANS.

FÆTOR. See FOETOR.

FÆX *Vitri*, in *Chemiſtry*, a name given by Rulandus and ſome other of the writers, to the common nitre or ſaltpetre, and by others to pot-aſh.

FA FINTO, a *feigned F*, in the *Italian Muſic*, is what we commonly call the FLAT of any note.

FAG, is uſed for a knot or excreſency in cloth. Stat. 4 Edw. IV. cap. 1.

FAG-*end*, in the *Sea-language*, denotes the end of any rope or cord which is become untwiſted and looſened by frequent uſe; to prevent which, the ends of ropes are generally well-faſtened by winding a piece of ſmall line or pack-thread around them, which operation is called whipping.

FAGARA, in *Botany*, a genus of the *tetrandria monogynia* claſs. The calyx is cut into four ſegments; the corolla has four petals; and the capſule is bivalve, and contains a ſingle ſeed.

FAGARA, in the *Materia Medica*, the name of a fruit reſembling the cubebs found in the Philippine iſlands. The part of this fruit which contains the principal virtue is the outer rind; this is tender and blackiſh, and of an aromatic and ſomewhat acid taſte. When the berries are ripe they eaſily break, and diſcloſe a black, ſhining, ſolid kernel, void of taſte and ſmell. The berries, according to Aviſenna, are heating and drying, and good for a cold weak ſtomach, to help digeſtion, and are aſtringent to the bowels. They were once much uſed, but of late are ſcarce known in the ſhops.

FAGGOT, in *Agriculture*. There is a thing worth obſerving to the owners of the woods in the article of the making up the underwood into *faggots*. The workmen, when they have bound up the *faggot*, trim off the ſuperfluous branches from the ſides and end to make it more neat, and theſe they add to the middle of the next; but they are of little or no advantage there, and ought to be left on the ground; for being ſmall, they would ſoon rot there, and would manure the ground ſo as to be of more advantage to the next growth than is eaſily imagined. The leaves of the trees falling to the earth, manure it very much; but this is nothing to the advantage of theſe little pieces of wood: any rotten wood, but in a moderate quantity, will turn a common bad earth into good garden mould; and the growth of the young trees is more forwarded by this manure where it is left than by any other means that can be uſed to it. We always ſee the land where wood-ſtacks have ſtood enriched to a ſurpriſing degree by them; and the ſame advantage will be wherever wood of any kind is left to moulder and rot upon the ground.

FAGGOT, or FAGOT, in *Fortification*. See FASCINE.

FAGGOTS *for fuel* are required by 43 Eliz. cap. 14. to contain in compaſs, beſides the knot of the bond, twenty-four inches of aſſize; and every *faggot-ſtick* within the bond ſhall contain full three feet of aſſize, except only one ſtick, which is to be but one foot long, to ſtop or harden the binding.

FAGGOT *of ſteel*, expreſſes the quantity of 120 lb. weight.

FAGGOT, in the times of Popery in theſe kingdoms was a badge wore on the ſleeve of the upper garment by ſuch as had abjured hereſy; being put on after the perſon had carried a *faggot*, by way of penance, to ſome appointed place of ſolemnity. The leaving off this badge was ſometimes interpreted a ſign of apoſtaſy.

FAGGOTS, among the *Military Men*, are ineffective perſons who receive no regular pay, nor do any regular duty, but are hired occaſionally to appear at a muſter, to fill up the companies, hide the real deficiencies thereof, and cheat the king of ſo much pay, which goes into the officer's pocket.

FAGONA, in *Anatomy*, a conglomerate gland, called alſo THYMUS.

FAGONIA, in *Botany*, a genus of the *decandria monogynia* claſs. Its characters are theſe: the flower hath five heart-ſhaped petals which ſpread open, and are narrow at their baſe where they are inſerted in the empalement, and hath ten erect ſtamina. In the center is ſituated a five-cornered germen, which afterwards becomes a roundiſh capſule, having five lobes ending in a point, and five cells, each having a ſingle roundiſh ſeed. There are three ſpecies. Miller's Gard. Dict.

FAGOPYRUM. See *Buck* WHEAT.

FAGOTTINO, in the *Italian Muſic*, a name uſed for the ſingle curtail, which is a muſical inſtrument ſomewhat like the baſſoon.

FAGOTTO, in the *Italian Muſic*, the name of the double curtail, being as big again as the fagottino, and in reality the ſame with a BASSOON.

FAGUS, in *Botany*. See BEECH-*tree*.

FAGUTAL, in *Mythology*, a temple of Jupiter, ſo called from *fagus*, the *beech*, a tree ſacred to Jupiter; becauſe, as ſome ſay, the temple was erected in the neighbourhood of a foreſt of *beech*; and on this account they ſay that part of mount Eſquiline which was formerly called *Mons Appius* was afterwards called *fagutalis*; and that Jupiter *Fagutalis* was the ſame with Jupiter of Dodona.

FAHNELEN, FANELEN, or VANLEHEN, among the Germans, a kind of greater fiefs which the emperor alone could confer.

This was done by the delivery of a ſtandard, whence they had the name of *fahnelen*; i. e. *feuda vexilli*. We find them mentioned in the golden bull of the emperor Charles IV. ann. 1356: *Feudis principum exceptis, & illis quæ* vanlehen *vulgariter appellantur, quorum inveſtituram & collationem ſoli imperatori, vel regi Romano ſpecialiter reſervamus*. Du-Cange Gloſſ. Lat. in voc.

The word is more uſually written *fahnlehn*.

FAIDA, in our *Old Writers*, is uſed for malice or deadly feud. Leg. Hen. I. cap. 88.

FAILIS, in *Heraldry*, a French term, denoting ſome failure or flaw in an ordinary, as if it were broke, and a ſplinter taken from it.

FAILURE, or FAILING, a ſpecies of BANKRUPTCY, popularly called breaking or ſtopping payment.

FAILURE *of record*, in *Law*, is uſed when an action is brought againſt a man who alledges in his plea matter of record in bar of the action, and endeavours to prove it by the record. The plaintiff replies, *nul tiel record*; that is, he denies there is any ſuch record. Upon which the defendant has a day given him by the court to bring it in; and if he fails to do it, he is ſaid to fail of his record, and the plaintiff ſhall have judgment to recover.

FAINT, or FAINT-ACTION, in *Law*, is as much as *feigned action*; that is, ſuch an ACTION as, though the words of the writ be true, yet, for certain cauſes, the party has no title to recover thereby.

By which it differs from falſe-action, which is that where the words of the writ are falſe.

Yet ſometimes the two are confounded.

FAINT *pleader*, in *Law*, a fraudulent, falſe, or colluſive manner of pleading, to the deceit of a third perſon. Againſt which, among other things, was made the ſtatute 3 Edw. I. cap. 29.

FAINTS, in the *Diſtillery*, the weak ſpirituous liquor that runs from the ſtill in rectifying the low wines after the proof-ſpirit is run off.

FAINTS is alſo the laſt runnings of all ſpirits diſtilled by the alembic. The clearing the worm of theſe is ſo eſſential a point in order to the obtaining a pure ſpirit by the ſucceeding diſtillation, that all others are fruitleſs without it.

FAINTING. See LIPOTHYMIA and SWOONING.

Some people are extremely apt to *faint* during the operation of bleeding. In all caſes, therefore, where plentiful bleeding is indicated, it is beſt to do it in bed, in order to prevent the patient's *fainting*. It is likewiſe obſerved,

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obſerved, that a perſon will bear the loſs of a much greater quantity of blood if the ſtream is ſmall than by a large orifice, which ſome think neceſſary, for making a more ſpeedy revulſion. Pringle, Obſerv. on the Diſeaſes of the Army, p. 131.

FAIR, a public place, where merchants, traders, and other perſons, from divers parts, meet, on ſome fixed day in the year, to buy and ſell commodities, and to partake of the diverſions uſually accompanying ſuch aſſemblies: or it denotes the concourſe of perſons aſſembled on ſuch occaſions. See MARKET.

The word *fair* is formed of the French *foire*, which ſignifies the ſame thing; and *foire* ſome derive from the Latin *forum*, *market*; others from the Latin *feriæ*, becauſe *fairs* were anciently always held in the places where the wakes, or feaſts, of the dedications of churches, called *feriæ*, were alſo held. The Romans called them *nundinæ*. Eric Puteanus has a pretty little treatiſe on the *fairs* of the Romans, De Nundinis Romanorum, which he calls *nova faſtorum facula*.

Fairs can only be eſtabliſhed by virtue of the king's grant, or by long and immemorial uſage and preſcription, which ſuppoſes ſuch a grant; he is alſo the ſole judge where *fairs* and markets ought to be kept; and if any perſon ſet up a *fair*, without the king's authority, a *quo warranto* lies againſt him; and the perſons who frequent ſuch *fairs*, &c. may be puniſhed by fine to the king. Every *fair* is ſubject to the regulation of the COURT *of piepowder*. The duration of *fairs* is determined by proclamation; and if a perſon ſhall ſell any goods after the time of the *fair* expires, he ſhall incur a forfeiture of double the value of the goods ſold, one fourth to the proſecutor, and the reſt to the king. 5 Ed. III. cap. 5. Any citizen of London may carry his goods to any *fair* or market in England at his pleaſure. If any perſon is intitled to hold a *fair* or market, and another is ſet up within the diſtance of a third part of twenty miles, either on the ſame day, or a different day, it is a nuiſance, and an action on the caſe lies; and alſo againſt perſons diſturbing ſuch as are coming to buy or ſell in the *fair* or market, ſo that the perſon holding the *fair*, &c. loſes his TOLL, or receives prejudice in the profits ariſing from it.

Fairs abroad are either free, or charged with tolls and impoſitions. The privileges of free *fairs* conſiſt chiefly, 1. In that all traders, &c. whether natives, or foreigners, are allowed to enter the place, and are under the royal ſafeguard and protection in coming and returning, they and their agents, with their goods, &c. 2. In that the ſaid perſons, and their effects, are exempt from all duties, impoſitions, tolls, and ſervitudes. 3. That merchants in going to, or returning from the *fair*, &c. cannot be arreſted, or their goods ſtopped, &c. It is the ſovereign alone that has a right, by his letters patent, to eſtabliſh *fairs*, whether free, or ſubject to duties, and the other ordinary laws and penalties.

Several *fairs* are held in the open fields, or on heaths and commons, under tents, booths, and barracks, erected for the purpoſe; as Stourbridge-*fair*, &c. others in places walled in for the purpoſe, and formed into regular ſtreets, lanes, &c. for the occaſion: as the *fair* of St. Laurence at Paris. Laſtly, others are held in the open places and ſtreets of cities; as Briſtol-*fair*, the *fair* of St. Germains, &c.

Fairs, particularly free *fairs*, make a very conſiderable article in the commerce of Europe, eſpecially that of the Mediterranean or inland parts; as Germany, &c. where the continual paſſage and repaſſage of veſſels is impracticable.

The moſt celebrated *fairs* in Europe are thoſe, 1. of Francfort, held twice a year, in ſpring and autumn; the firſt commencing the Sunday before Palm-Sunday, and the other in September. Each is declared by ſound of bell, and laſts three weeks; the firſt of which is called the week of acceptance, and the ſecond the week of payment; though many bills of exchange are now payable in the third week, but this muſt be mentioned, becauſe every bill payable in the *fair* is, without ſuch a clauſe, deemed payable in the ſecond week. They are famous for the ſale of all kinds of commodities, but particularly an immenſe quantity of curious books, no where elſe to be found; and from whence the booksellers, throughout all Europe, uſed to furniſh themſelves. Before each *fair* there is a catalogue of all the books to be ſold at it, printed and diſperſed, to call together purchaſers; though the learned have generally complained of divers unfair practices therein; as fictitious titles, names of books purely imaginary, &c. beſide great faults in the names of the authors, and the titles of the real books. 2. The *fairs* of Leipſic, which are held thrice a year; one beginning on the firſt of January, another three weeks after Eaſter, and a third after Michaelmas; they laſt twelve days each, and are, at leaſt, as conſiderable as thoſe of Francfort. 3. The *fairs* of Novi, a little city in the Milaneſe, under the dominion of the republic of Genoa. There are four of theſe in the year; commencing on the firſt of February, the ſecond of May, the firſt of Auguſt, and ſecond of November. Though the commodities bought and ſold here be very conſiderable; yet, what chiefly contributes to render them ſo famous, is the vaſt concourſe of the moſt conſiderable merchants and negociants of the neighbouring kingdoms, for tranſacting affairs, and ſettling accounts in matters of bank and exchange. Each of theſe uſually laſt eight days. 4. The *fairs* of Riga, whereof there are two in the year; one in May, and the other in September. They are much frequented by the Engliſh, Dutch, and French ſhips; as alſo by others from all parts of the Baltic. The beſt time for the ſale of goods at Riga, is during the *fairs*. Since the building of the famous city of Peterſburg, theſe *fairs* have ſuffered ſome diminution. 5. The *fair* of Archangel; during which, all the trade foreigners have with that city, is managed. It continues a month, or ſix weeks, at moſt; commencing from the middle of Auguſt. The Muſcovite merchants attend here, from all parts of that vaſt empire; and the Engliſh, Dutch, French, Swediſh, Daniſh, and other ſhips in the port of that city, on this occaſion, ordinarily amount to three hundred. But this is no free *fair*, as the reſt are: the duties of exportation and importation are very ſtrictly paid, and on a very high footing. 6. The *fair* of St. Germain, one of the ſuburbs of Paris, commencing on the third of February, and holding till Eaſter; though it is only free for the firſt fifteen days. It is frequented by traders with various ſorts of cloths and ſtuffs; and the goldſmiths, jewellers, and toy-men of Paris, have well furniſhed and handſome ſhops in it. 7. The *fairs* of Lyons, which Monſ. Du Cheſne, in his Antiquity of Cities, would inſinuate, from a paſſage in Strabo, were eſtabliſhed by the Romans; though it is certain, the *fairs*, as they now ſtand, are of a much later date. There are four in the year, each laſting twenty days, and free for ever. They begin on the firſt Monday after Low Sunday, the fourth of Auguſt, the third of November, and the firſt Monday after Eaſter. 8. *Fair* of Guibray, a ſuburb of the city of Falaiſe, in the Lower Normandy. It is ſaid to have been eſtabliſhed by our William the Conqueror, in conſideration of his being born at Falaiſe. It commences on the ſixteenth of Auguſt, and laſts fifteen days; free by charter, and longer by cuſtom. 9. *Fair* of Beaucaire, held partly in a city of that name, in Languedoc, and partly in the open country, under tents, &c. It commences on the twenty-ſecond of July, and only continues for three days; yet it is the greateſt, and moſt celebrated, of all the *fairs* in that part of Europe, both for the concourſe of ſtrangers from all parts of the world, and for the traffic of all kinds of goods: the money returned, in theſe three days, amounting ſometimes to above ſix millions of livres. Beſides theſe, there are in France ſeveral other *fairs* of conſiderable note; as the four *fairs* of Rheims, the two of Rouen, two of Bourdeaux, two of Troyes, two of St. Dennis, that of Caen, of Dieppe, and of Toulon, &c.

The *fairs* of Porto-Bello, Vera-Cruz, and the Havannah, are the moſt conſiderable of all thoſe in the Spaniſh Weſt Indies. The two firſt laſt as long as the flota and galleons continue in thoſe parts; and the laſt is opened as ſoon as the flota, or galleons, arrive there, upon their return for Spain; this being the place where the two fleets join.

The principal *fairs* in Great Britain are, Stourbridge-*fair*, near Cambridge; the two *fairs* of Briſtol; that of Exeter, Weſt Cheſter, Edinburgh, Weyhill, and Burford *fairs*, for ſheep; Pancraſs *fair*, in Staffordſhire, for ſaddle-horſes; Barnet *fair*, near London, for lean and Welſh black cattle; St. Faith's, in Norfolk, for Scots runts; Yarmouth fiſhing *fair* for herrings; Ipſwich butter *fair*; that of Woodborough Hill, near Blandford in Dorſetſhire, famous for weſt-country manufactures, Devonſhire kerſeys, Wiltſhire druggets, &c. two cheeſe-*fairs* at Atherſton and Chipping Norton; beſides many more *fairs* and weekly markets in different parts of the kingdom.

FAIR, in *Sea Language*, is uſed for the diſpoſition of the wind, when it is favourable to a ſhip's courſe, in oppoſition to that which is contrary or foul. The term *fair* is more comprehenſive than large, and includes about ſixteen or eighteen points of the compaſs; whereas large is confined to the beam or quarter, that is, to a wind which croſſes the keel at right angles, or obliquely from the ſtern, but never to one right a-ſtern. Falconer's Marine Dict.

FAIR-*curve* is a winding line, uſed in delineating ſhips, whoſe ſhape is varied, according to the part of the ſhip which it is intended to deſcribe.

FAIR-*pleading*, in *Law*. See BEAU-*pleader*.

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FAIR-*way*, in *Sea Language*, the path or channel of a narrow bay, river, or haven, in which ſhips uſually advance in their paſſage up and down; ſo that if any veſſels are anchored therein, they are ſaid to lie in the *fair-way*. Falconer.

FAIRY, a term frequently occuring in ancient traditions and romances, denoting a kind of genii, or imaginary deities, converſant on earth, and diſtinguiſhed by abundance of fantaſtical actions and offices, either good, or evil.

The *fairies*, according to theſe traditions, are peculiar ſpecies of divinities, that have but little relation to any of thoſe of the ancient Greeks and Romans; unleſs, perhaps, to the larvæ; though others will not have them ranked among deities, but ſuppoſe them an intermediate kind of beings, neither gods, nor angels, nor men, nor devils.

They are of oriental extraction, and ſeem to have been invented by the Perſians and Arabs, whoſe hiſtory and religion abound with tales of *fairies* and dragons. The Perſians call them Peri, and the Arabs Ginn; having a peculiar country, which they ſuppoſe them to inhabit, called Ginniſtian; and, by us, *Fairy Land*. Our famous countryman Spenſer's maſter-work, the *Fairy Queen*, is an epic poem under the perſons and characters of *fairies*.

FAIRY *circle*, or *ring*, is a phænomenon pretty frequent in the fields, &c. being a kind of round, ſuppoſed, by the vulgar, to be traced by the *fairies* in their dances.

There are two kinds: one of them ſeven or eight yards in diameter, containing a round bare path, a foot broad, with green graſs in the middle; the others of divers ſizes, being encompaſſed with a circumference of graſs, much freſher and greener than in the middle.

Mr. Jeſſop, and Mr. Walker, in the Philoſophical Tranſactions, aſcribe them to the lightning; which is confirmed, by their being moſt frequently produced after ſtorms of that kind; as well as by the colour and brittleneſs of the graſs-roots, when firſt obſerved. It is no wonder that lightning, like all other fires, moves round, and burns more in the extremity than in the middle.

According to thoſe gentlemen, the ſecond kind of circle ariſes originally from the firſt; the graſs burnt up by the lightning uſing to grow the more plentifully afterwards. Phil. Tranſ. abr. vol. ii. p. 182.

It is not improbable that theſe *fairy* rings may be of the ſame kind with thoſe CIRCULAR *ſpots* produced on the ſurface of metal by large electrical exploſions. The chief objection againſt this hypotheſis is, that in theſe rings there is no appearance of any thing correſponding to the central ſpot in ſuch electrical impreſſions; and that they have no regular concentric circles, nor an invariable circular figure. Mr. Walker, however, found one of theſe rings immediately after a thunder ſtorm, which he could aſcribe to no other cauſe but the lightning. Ubi ſupra.

Other authors have aſſerted, that theſe *fairy-rings* are formed by ants; becauſe thoſe inſects are ſometimes found travelling in troops therein; and others, that they are beds of muſt-worms.

FAIT, *Factum*, in *Law*, is uſed for a writing lawfully executed to bind the parties thereto. See DEED.

FAITH, *Fides*, in *Antiquity*, as denoting honeſty or fidelity, was deified by the Romans, and repreſented with an erect open air, and dreſſed in a thin robe, ſo fine, that one might ſee through it. This deity is alſo repreſented as very old and grey-headed; and ſhe appears on medals as giving her hand, and ſometimes only by two hands joined together.

FAITH, in *Philoſophy* and *Theology*, that aſſent which we give to a propoſition advanced by another, the truth of which we do not immediately perceive from our own reaſon or experience; or it is a judgment, or aſſent of the mind, the motive whereof is not any intrinſic evidence, but the authority, or teſtimony, of ſome other, who reveals or relates it.

Hence, as there are two kinds of authorities and teſtimonies, the one of God, and the other of man, *faith* becomes diſtinguiſhed into *divine* and *human*.

FAITH, *divine*, is that founded on the authority of God; or it is that aſſent we give to what is revealed by God.

The objects of this *faith*, therefore, are matters of REVELATION.

FAITH, *human*, is that whereby we believe what is told us by men.

The object hereof is matter of human teſtimony and EVIDENCE.

Faith, again, may be diſtinguiſhed into *implicit*, and *ſcientific*.

FAITH, *implicit*, or *blind*, is that whereby we give our aſſent to a propoſition advanced by another, of whoſe knowlege and veracity we have no certain and evident reaſon, or proof. This is only opinion, under another name.

FAITH, *ſcientifical*, or *ſeeing*, is that by which we give our aſſent to a propoſition advanced by one who can neither deceive, nor be deceived; which may be properly referred to ſcience and knowlege.

Divine faith, *cæteris paribus*, is ſtronger than human. When we are fully convinced, that any propoſition comes from God, *faith* becomes aſſurance, or ſcience; it being an ingredient in our idea of God, that he can neither deceive, nor be deceived; but when there is any doubt, whether the propoſition is declared by God, the *faith* can be no ſtronger, or weaker, than the reaſons on which it is founded; divine *faith*, therefore, may either be ſtrong, weak, or none at all. Again, the reaſons or motives of believing men, may be of ſuch weight and force, that being perfectly underſtood, they may equal a mathematical evidence; and then the human *faith* is ſcarce inferior to the divine; there being, as it were, an equal neceſſity of giving our aſſent on each ſide.

Hence it is eaſily obſerved, that all our *faith* or belief has its foundation on reaſon, which cannot deceive us, if we make a due uſe of our liberty, and do not acquieſce, till that neceſſarily compels us.

All our preſent religious *faith* is really human, as depending on the ſecondary teſtimony of men; of whoſe veracity, however, we have the ſtrongeſt proofs. The prophets, or thoſe to whom God immediately revealed his will, believed him, becauſe they knew he could not deceive. We, at this day, believe them, or rather their writings, for other reaſons; viz. the ſame which oblige us to believe all well-atteſted hiſtories. See EVIDENCE.

Beſides the two ſpecies of *faith*, human and divine, the Romaniſts make a third, or intermediate kind, called

FAITH, *eccleſiaſtical*, which is the aſſent orthodox perſons give to certain events decided by the church, and enjoined to be believed by all.

As, when the church declares, that ſuch a book contains heretical doctrine, &c.

This term, *eccleſiaſtical faith*, was firſt introduced by Mr. Pereſixe, to diſtinguiſh the *faith* whereby we believe matters of divine revelation, from that whereby we believe matters of eccleſiaſtical determination.

FAITH, in *Practical Theology*, makes the firſt of the theological virtues, or graces.

Faith in God, in this ſenſe, denotes ſuch a conviction of his being, perfections, character, and government, as produces love, truſt, worſhip, obedience, and reſignation.

Faith in Chriſt, as it has been defined by ſome, is a mere aſſent to the Goſpel as true; according to others, it ſignifies ſuch a perſuaſion that he is the Meſſiah, and ſuch a deſire and expectation of the bleſſings which he has promiſed in his Goſpel to his ſincere diſciples, as engage the mind to fix its dependence upon him, and ſubject itſelf to him in all the ways of holy obedience; and thus defined it is a very extenſive principle, and includes in its nature and inſeparable effects the whole of moral virtue. In this ſenſe it has been ſaid, that under the Goſpel a man is juſtified by *faith*. *Faith*, likewiſe, in reſpect to futurity, is a moral principle, implying ſuch a conviction of the reality and importance of a future ſtate, as is ſufficient to regulate the temper and conduct.

FAITH, *confeſſion of*. See CONFESSION.

FAITH and *homage*, in the *Feudal Law*. See FEALTY.

FAITHFUL, an appellation which the Mahometans aſſume to themſelves. See MUSSULMAN.

FAITHFULNESS, in *Ethics*, is an agreement between a man's promiſes and his actions.

FAITIERE, in *Natural Hiſtory*, the name of a ſpecies of ſhell-fiſh, called by many authors, by a much leſs determinate name, *concha imbricata*. The French have thus called it, from the word *faitage*, which, in the ſame language, ſignifies the *roof of a houſe*. The ſhell is of the bucardium, or ox-heart kind, and has ſeven longitudinal ribs, and a great many laminæ running tranſverſely acroſs them, ſo that it greatly reſembles the roof of a houſe, where the rafters and croſs-beams are ſeen while it is not covered with tiles.

FAITOURS is uſed in ſtat. 7. Ric. II. cap. 5. for evil doers; and may be interpreted idle livers, from (ſays the author of the Terms de Ley) *faitardiſe*, which ſignifies a kind of ſleepy diſeaſe, proceeding from too much ſluggiſhneſs. In the forementioned ſtatute it ſeems ſynonymous with vagabond.

FAKE, or FACK, in the *Sea Language*, one round or circle of a cable; otherwiſe called a coil.

FAKIR, or FAQUIR, a kind of derviſe, or Mahometan religious, who travels the country, and lives on alms.

The word *fakar* is Arabic, and ſignifies a *poor* or *needy perſon*. It is formed of the word פקר, *fakara*, *to be in need*.

D'Herbelot makes *fakir* and derviſe the ſame thing. The Turks and Perſians uſe the name derviſe for any poor perſon, whether he be ſo out of neceſſity or choice; and the Arabs apply *fakir* in the ſame ſenſe. Whence, in

ſome

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ſome Mahometan countries, the religious are called *derviſes*; and in others, particularly throughout the ſtates of the great Mogul, *fakir*.

The *fakirs* ſometimes travel ſingly, and ſometimes in companies. When they go in companies, they have a ſuperior, who is diſtinguiſhed by his habit. Each *fakir* bears a horn, which he blows at his arrival in any place, as alſo at his departure; and a kind of ſcraper or trowel, to ſcrape the earth in the place where he ſits, or lies down. When they go together, they divide their alms equally amongſt them; give what is left every night to the poor; and never reſerve any thing for the morrow.

There is alſo a kind of idolatrous *fakirs*, who follow much the ſame practice. D'Herbelot reckons in the Indies eight hundred thouſand Mahometan *fakirs*, and twelve hundred thouſand idolatrous ones; to ſay nothing of divers extraordinary ſpecies of *fakirs*, particularly penitents, whoſe mortification and penance conſiſt in very odd obſervances. Some, e. gr. remain night and day, for many years, in certain uneaſy poſtures. Others never ſit or lie down to ſleep, but ſuſtain themſelves by a rope, hung down for that purpoſe. Others bury themſelves in a ditch, or pit, for nine or ten days, without eating or drinking. Others keep their arms lifted up to heaven, ſo long, till they cannot let them down again if they would. Others lay fire on their heads, and burn the ſcalp to the very bone. Others roll themſelves naked on thorns. Tavernier, &c.

Another claſs of *fakirs* retire unto moſques, live on alms, and devote themſelves to the ſtudy of the law, the reading of the Alcoran, &c. to fit themſelves for moulas, or doctors. People of quality ſometimes aſſume the character of *fakirs*. The famous Aurengzeb himſelf, before he aſcended the throne, gave out, that he intended to commence *fakir*.

FALACA, a kind of baſtinado inflicted on the Chriſtian captives in Algiers. The *falaca* is properly a piece of wood, about five feet long, bored with two holes, through which the feet of the patient are put, who is laid on his back on the ground, with his arms tied. Two men are employed to give him fifty or a hundred ſtrokes with a cudgel, or bull's pizzle, on the ſoles of his feet. A very trifling fault often incurs this ſevere puniſhment.

FALACER, in *Mythology*, the name of a Roman deity, recorded by Varro.

FALANG, in our *Old Writers*, is uſed for a jacket or cloſe coat. Blount.

FALANGIE, in the *Materia Medica*, a name given by ſome of the ancients to the ocymum or baſil. The *falangie muſk* is the ſweet-ſcented baſil. Some of the commentators on the works of Avicenna, have ſuppoſed, that the fruit called fel, was the ſeed or fruit of this plant; and that the word was only an abbreviation of *falangie*, but this is by no means right. See FEL.

FALCADE, in the *Manege*. A horſe makes *falcades*, when he throws himſelf upon his haunches two or three times, as in very quick curvets, which is done in forming a ſtop, and half-ſtop. A *falcade*, therefore, is the action of the haunches, and of the legs, which bend very low, as in curvets, when you make a ſtop or half ſtop.

They ſay, this horſe ſtops well, for he makes two or three *falcades*, and finiſhes his ſtop with a peſate. This horſe has no haunches, he will make no *falcades*. The *falcades* are ſo much the prettier, as in making them his haunches are low. Stop your horſe upon the haunches, in making him ply them well, ſo that after forming his *falcades*, he may reſume his gallop without making a peſate, that is, without ſtopping, or making one time. And thus he will make an half STOP. See HAUNCHES and TIME.

FALCANOS, a name given by ſome of the chemical writers to arſenic.

FALCATA, in our *Old Writers*, was uſed for the graſs freſh mowed, and laid in ſwathes.

FALCATED, one of the phaſes of the planets, popularly called horned.

The aſtronomers ſay, the moon, or any planet, is *falcated*, when the enlightened part appears in form of a ſickle, or reaping-hook, by the Latins called *falx*.

The moon is *falcated* whilſt ſhe moves from the third quarter to the conjunction, and from the conjunction, or from new moon, to the firſt quarter; from hence to oppoſition or full, and from full to the third quarter the enlightened part appears gibbous, and the dark *falcated*. See MOON.

FALCATOR, in our *Old Writers*, the ſervile tenant who performed ſervice of falcature.

FALCATURE, *Falcatura*, in our *Old Writers*, ſignifies one day's mowing of graſs; a cuſtomary ſervice to the lord by his inferior tenants. Kennet's Gloſſ. in voc.

FALCINELLUS, in *Zoology*, the name of a bird in ſome ſort reſembling the herons, but with a ſhorter beak. It is of a very beautiful colour, but with a fine gloſſy green, with an admixture of a purpliſh tinge; the head and neck are brown, but the upper part of the throat whitiſh with black ſpots; its beak is like that of the curlew, very long, very ſlender, and crooked; its legs moderately long; as this bird grows older, it becomes of a browner hue. It is called by ſome, *ardea nigra*, the *black heron*, and by the Italians *acion negro*. Ray's Ornithology, p. 218.

FALCON, *Falco*, in the Linnæan ſyſtem of *Zoology*, makes a diſtinct genus of birds of the hawk-kind, the characters of which are, that they have a ſtrong hooked bill, the baſe of which is covered with a *cere*, or naked ſkin; the head is covered with feathers, and the tongue is bifid. Linnæus claſſes no leſs than thirty-two ſpecies under this genus, among which are the eagle, the buzzard, the kaſtrel hawk, the lanner, the goſhawk, &c.

Jo. de Janu, and ſeveral others, take the name *falcon* to have been occaſioned by its crooked talons, or pounces, which reſemble a *falx*, or ſickle. Giraldus derives it *a falcando*, becauſe it flies in a curve.

The *falcon* is a bird of prey of the hawk-kind, much eſteemed for its ſtrength and activity. There are many ſpecies of this bird; but when the word *falco* is uſed ſingly, without any diſtinctive addition, it is meant of that ſpecies, called by authors the *falco peregrinus*, from its travelling into different countries, at different ſeaſons of the year.

It has very long and large wings, reaching when folded to the tip of the tail. Its ſhoulders are very large, its tail very long, and ending like the ſparrow-hawk's in a point, its end being white, variegated with orange-coloured ſtreaks. Its feet are of a greeniſh or bluiſh yellow, its neck is long, and its head and back of a pale dove-colour. There is a variety of this bird, which is of a much blacker colour on the back, and has been erroneouſly eſteemed by ſome a different ſpecies; probably it is only owing to the difference of age or ſex. This bird is caught in France, Germany, and elſewhere; but it is not well known where it builds. It feeds on ducks, geeſe, and other large birds.

This ſpecies builds on the rocks of Llandidno, in Carnarvonſhire, and is very common in the north of Scotland. Mr. Pennant mentions a ſurpriſing inſtance of the rapidity of their flight: one that was reclaimed by a gentleman of the ſhire of Angus, on the eaſt ſide of Scotland, eloped from his maſter with two heavy bells to each foot, on the twenty-fourth of September, 1772, and was killed in the morning of the twenty-ſixth, near Moſtyn in Flintſhire. Zoology, vol. i. p. 179.

The *falcon* is of the long-winged hawk-kind, uſed in the diverſion of hawking. There are ſeveral ſpecies of *falcons*. 1. The *falco peregrinus*, or common *falcon*. 2. The ſacre, called *falco ſacer* by authors. 3. The *jerfalcon* or *gyrfalco*. 4. The *mountain-falcon*. 5. The *gentle falcon* or *falco gentilis*, ſuſpected by Mr. Ray to be the ſame with the common or firſt kind. 6. The *haggard-falcon*, remarkable for the ſhortneſs of its neck. 7. The *white falcon*, all over of a pure ſnow-white. 8. The *ſtone-falcon*, of a deep blackiſh blue. 9. The *Tunis* or *Barbary falcon*, which reſembles the common kind, but is ſmaller. 10. The *red falcon*, much reſembling the common kind, but ſpotted with a reddiſh colour; and the red and creſted Indian *falcon*, which ſeem to be the male and female of the ſame ſpecies. Ray's Ornithol. p. 40 to 48. See GYRFALCON, SACRE, LANNARIUS, &c.

To theſe we may add the *ſpotted falcon*, about the ſize of a buzzard; with a black bill, yellow cere and legs, pale yellow irides; the crown and hind-part of the neck white, ſpotted with light reddiſh brown; back and ſcapulars of the ſame colour, edged with white; the quill feathers duſky, barred with aſh colour; the underſide of the neck, breaſt, belly, and thighs, white, and very ſtrong legs; and alſo the *rough-legged falcon*, a native of Denmark, in length about two feet two inches; with a duſky bill, yellow cere; the head, neck, and breaſt, of a yellowiſh white, marked in ſome parts with oblong brown ſtrokes; the belly of a deep brown; the thighs and legs of a pale yellow, marked with brown; the extreme half of the tail brown, tipt with dirty white; that next to the body white; the legs covered with feathers as low as the feet, and the feet yellow. Pennant's Britiſh Zoology, vol. i. p. 190; and vol. ii. p. 623.

It muſt be added, that the name *falcon* is reſtrained to the female; for as to the male, it is much ſmaller, weaker, and leſs courageous, than the female; and is denominated a *taſſel* or *tirecelet*.

The gentle *falcon*, with yellow legs, aſh-coloured body ſpotted with brown, and four or five blackiſh bars on the tail, is the moſt valuable of all theſe, as being the moſt tame and manageable, and the moſt hardy, enduring all weathers without hurt. It makes its neſt in rocks, and inhabits the north of Scotland. This kind of *falcon* has a natural inclination to make the heron fly every way, and is

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moſt excellent at the brook or river fowling, and eſpecially at the larger birds, as at the ſhovel, wild-gooſe, and the like. If ſhe be an eyeſſe ſhe may be ventured at the crane, otherwiſe ſhe will not be ſo hardy.

Hawks in general prove courageous or cowardly all their lives, as they are firſt quarried; and if they are taken out of the eyrie before they are fully ſummed and well penned, their wings will never grow to perfection. Their legs, alſo, will grow crooked, and their train will be full of taints. *Falcons* of one and the ſame kind are called by the ſportſmen by very different names, and eſteemed of ſeveral different kinds according to the places and time of their reclaiming, and the countries from whence they came. Thus the names mewed-hawk, ramaged hawk, ſoar-hawk, and eyeſſe, firſt commenced; and theſe are again divided into large hawks, wean hawks, and ſlender hawks. All theſe have different mails and plumes, according to the country from whence they come; ſome are black; ſome brown; they have alſo each its different diſpoſition, ſome being beſt for the field, and others for the brook or river. Different names are alſo given to *falcons*, according to their different age and time of taking. The *falcon* is called an eyeſſe, as long as ſhe remains in the eyrie; theſe are always troubleſome in their feeding; they cry very much, and they are not entered without great difficulty; but being once well entered, they prove excellent hawks for the heron and all the large fowl, and are very hardy and full of courage. The ſecond name given this bird is the *ramage-falcon*. This name ſhe retains from the time of her leaving the eyrie, during the months of June, July, and Auguſt. Theſe are always hard to be manned; but being reclaimed, they are not inferior to any hawk. The third is the ſoar-hawk, ſo called in September, October, and November. Theſe birds keep for a whole twelvemonth the firſt feathers, which they have on when they leave the eyrie, and do not molt them. Theſe are therefore called the ſoar-feathers. The fourth is termed the murzarolt or carviſt, *quaſi* carry-fiſt; for they muſt at this time be almoſt continually carried on the fiſt. They are thus called from January to the middle of May. Theſe are uſually great baters, and very little eaters; they are ſubject to ſeveral troubleſome diſorders, particularly to the filanders, more than any other hawk, and they are very ſeldom brought to be good for any thing. The fifth name is the entermew. They are called by this name from May till December, becauſe all that time they are caſting their coats. Theſe would be excellent hawks if they could be truſted; but they are unſteady. They muſt be kept hard under, and the falconer muſt make his fiſt their perch. The hawk newly taken muſt be ſeeled, have all new furniture, and muſt be often ſtroked with a ſtick to accuſtom her to be gentle. She muſt alſo have two good bells, that ſhe may be well heard when ſhe ſtirs or ſcratches; and her beak and talons muſt be cut a little, but not ſo near as to make them bleed. If there be a ſoar-*falcon* taken that has already croſſed the ſeas, ſhe is uſually very hard to be broken; but that being well done, ſhe is the beſt of all hawks. Her food muſt be good and warm, and it muſt be given her at leaſt three times a day. It ſhould be pigeons, larks, or other live birds; for ſhe muſt be broke by degrees from her accuſtomed manner of feeding. The hawk muſt always be fed with hoop and lure, that ſhe may always know when you will give her meat. She muſt then be gently unhooded, and two or three bits being given her, ſhe muſt be hooded again; and in the night let her rooſt on a perch near ſome perſon's bed, that ſhe may be often waked in the night. When by theſe means ſhe becomes tame and gentle, her uſual food may be changed, and a ſheep's heart given her. After this ſhe may be unhooded in the day-time, but not in company; and after giving her a bit or two, ſhe muſt be hooded again, and then a little more given her. After this, by degrees, ſhe will be taught to eat before company, and then the buſineſs of taming her will be ſoon accompliſhed. Till ſhe is thoroughly manned, ſhe muſt be borne continually on the fiſt, and fed in company, giving her in the morning about ſun-riſe the wing of a pullet, and every evening the foot of a hare or rabbit cut off above the joint, ſlead and laid in water, which having ſqueezed give it her with the pinion of a hen's wing. It is beſt to give the hawk waſhed meat, and after this plumage, according as ſhe ſeems to be foul within. She is then to be hooded, and nothing more ſhould be given her till ſhe gleams after caſting; but when ſhe has gleamed and caſt, ſhe ſhould then have ſome hot meat given her, toward evening eſpecially, and be made to eat it in company. When ſhe is well reclaimed, manned, and ſharp-ſet, ſhe may be fed on the lure.

But three things are to be conſidered before your lure be ſhewed her. 1. That ſhe be bold and familiar in company, and not afraid of dogs and horſes. 2. Sharp-ſet and hungry, having regard to the hour of morning and evening when you would lure her. 3. Clean within, and the lure well garniſhed with meat on both ſides. When you intend to give her the length of a leaſh, you muſt abſcond yourſelf; ſhe muſt alſo be unhooded, and have a bit or two given her on the lure, as ſhe ſits on your fiſt. That done, take the lure from her, and ſo hide it that ſhe may not ſee it; when ſhe is unſeeled, caſt the lure ſo near her, that ſhe may catch it within the length of her leaſh; and as ſoon as ſhe has ſeized it, uſe your voice as falconers do, feeding her upon the lure on the ground.

After having lured your *falcon*, in the evening give her but little meat, and let this luring be ſo timely, that you may give her plumage, &c. next morning on your fiſt; when ſhe has caſt and gleamed, give her a little beaching of warm meat about noon, tie a creance to her leaſh, go into the field, there give her a bit or two upon the lure, and unſeel her. If you find ſhe is ſharp-ſet, and has eagerly ſeized on the lure, let a man hold her, to let her off to the lure; then unwind the creance, and draw it after you a good way, and let him who has the bird hold his right hand on the taſſel of her hood ready to unhood her as ſoon as you begin to lure; to which if ſhe come well, ſtoop roundly upon it, and haſtily ſeize it; let her caſt two or three bits thereon; that done, take her off the lure, and deliver her again to the perſon that held her; and, going farther off the lure, feed her as before; and ſo daily farther and farther off the lure. Afterwards you may lure her in company, but do not fright her; and having uſed her to lure on the foot, do it alſo on horſeback; which may be ſooner accompliſhed, by cauſing horſemen to be about you, when you lure her on foot: it is alſo ſooner done, by rewarding her upon the lure on horſeback among horſemen. And when ſhe is grown familiar this way, let ſomebody a-foot hold her, and he that is on horſeback muſt call, and caſt the lure about his head, while the holder takes off the hood by the taſſel; and if ſhe ſeize eagerly on the lure, without fear of a man or horſe, then take off the creance, and lure at a greater diſtance. Laſtly, if you would have her love dogs as well as the lure, call dogs when you give her plumage. See HAWKING.

FALCON, in *Gunnery*. See FAUCON.

FALCONE, in *Zoology*, a name by which ſome authors have called the *milvus*, or FLYING-*fiſh*.

FALCONER, a perſon who brings up, tames, and makes, that is, tutors and manages birds of prey; as falcons, hawks, &c. The grand ſeignor uſually keeps ſix thouſand *falconers* in his ſervice. The French king has a grand *falconer*, which is an office diſmembered from that of great hunt, grand veneur. The duke of St. Alban's is hereditary grand *falconer* of England.

Hiſtorians take notice of this poſt as early as the year 1250. One great buſineſs of the *falconer* is to conſider the quality and mettle of the birds, to know which to fly early, and which late. He muſt alſo be buſy and cleanly in freeing them of lice, nits, and vermin. Every night after flying, he ſhould give his bird caſting; nor muſt he forget to water her, unleſs ſhe have been bathed. After this, ſhe muſt be put in a warm room, having a perch, with a candle burning by her; where ſhe is to ſit unhooded, that ſhe may prune and pick herſelf. Next morning ſhe ſhould be weathered, &c.

FALCONET, in *Gunnery*. See FAUCONET.

FALCONRY, or FAUCONRY, the art of taming, managing, and tutoring, birds of prey, particularly falcons and hawks; and employing them with advantage in the purſuit of game; called alſo hawking.

The word is formed of *falco*, *falcon*, or *faucon*, the bird of moſt uſe and eſteem in this kind of ſport.

Falconry, though the principal amuſement of our anceſtors, was unknown among the Greeks and Romans. All their writings do not furniſh ſo much as a proper name to call it by; ſo far are they from teaching us the terms. It is the French language alone, that has particular words for all the parts of *falconry* and hunting; and from them moſt of our terms, as well as what we know of the art itſelf, are borrowed.

This diverſion was in ſuch repute ſo late as the reign of James I. that Sir Thomas Monſon is ſaid to have given a thouſand pounds for a caſt of hawks; and the laws were very rigorous that tended to preſerve this pleaſure. In the 34th of Edw. III. it was made felony to ſteal a hawk; and to take its eggs, even in a perſon's own ground, was puniſhable with impriſonment for a year and a day, beſides a fine at the king's pleaſure; and in the reign of queen Elizabeth, the impriſonment was reduced to three months; but the offender was to find ſecurity for his good behaviour for ſeven years, or to remain in priſon till he did. According to Olearius, the

diverſion

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diverſion of *falconry* is more followed by the Tartars and Perſians than ever it was in any part of Europe. Tom. i. p. 217. 328. See Pennant's Britiſh Zoology, vol. i. p. 171, &c.

The writers of reputation on *falconry*, are Deſparon, Franchiere, Tardiffe, Artelouche, Dalagona, Latham, &c. M. de S. Martha has put the principles of the art into fine Latin verſes, in his Hieracoſophion, ſive De Re Accipitraria, libri tres.

There is alſo a treatiſe on hunting, hawking, and heraldry, printed at St. Alban's by Caxton, and attributed to dame Julian Barnes.

FALD-*fee*, or FALD-*fey*, was anciently uſed for a rent or fee paid by ſome cuſtomary tenants, for liberty to fold their ſheep upon their own land.

FALDAGE, an ancient privilege, which ſeveral lords reſerved to themſelves of ſetting up ſheep-folds, or pens, in any fields within their manors, the better to manure them; and this not only with their own, but with their tenants ſheep.

This was alſo termed *ſecta faldæ*; and in ſome old charters *fold-ſoca*; in ſome place a fold courſe, or free-fold.

FALDELLA, a word uſed by ſome of the writers in ſurgery for a ſort of compreſs made of liſt contorted together in ſeveral doubles.

FALDUSTOR was anciently uſed to ſignify the higheſt ſeat of a biſhop, incloſed round with a lattice.

FALDWORTH, among our *Old Writers*, was uſed to ſignify a perſon of age, ſufficient to be reckoned of ſome decennary.

FALL, *Deſcent*, in *Phyſics*, the tendency of any heavy body towards the center of the earth.

Galileo firſt diſcovered the ratio of the acceleration of *falling* bodies; viz. that dividing the whole time of *falling* into equal parts, the body will *fall* thrice as far in the ſecond moment, as in the firſt; five times as far in the third; ſeven times in the fourth, &c. and ſo on in the order of the uneven numbers. See ACCELERATION.

FALL *of bodies, for the cauſe of the.* See GRAVITY.

FALLING *bodies, for the laws of.* See DESCENT.

FALL, *water.* See CATARACT.

FALL is alſo uſed in a moral ſenſe: as, the *fall* of Adam. See ORIGINAL SIN; the *fall* of the Roman empire, &c. Authors contend, that Plato had a notion of Adam's *fall*, which he had learnt from Moſes. Euſeb. De Præparat. Evangel. lib. xii. cap. 11. quotes a fable from Plato's Sympoſ. wherein he thinks he finds the whole hiſtory allegorically related.

FALL, in *Muſic* and *Poetry.* See CADENCE.

FALL, a meaſure of length uſed in Scotland, containing ſix of the ells of that country, each of which is equal to $37\frac{2}{10}$ Engliſh inches. See MEASURE.

FALL, among *Seamen*, denotes that part of the rope of a TACKLE which is haled upon. They ſay alſo that a ſhip hath *falls* when ſhe is not *fluſh*, but hath riſings of ſome parts of her decks more than others. Alſo a ſhip is ſaid to *fall off*, when being under ſail ſhe keeps not ſo near the wind as ſhe ſhould do.

FALL *not off*, at ſea, a word of command from him that conds the ſhip, ſignifying as much as keep the ſhip near the wind.

To FALL *aboard of*, is to ſtrike or encounter another ſhip, when one or both are in motion; or to be driven upon a ſhip by the force of the wind or current.

To FALL *a-ſtern*, is to be driven backwards, or to retreat with the ſtern foremoſt; and is expreſſed of the motion of a ſhip either under ſail, or at anchor.

To FALL *calm*, expreſſes a total ceſſation of the wind.

To FALL *down*, is to ſail or be conducted from any part of a river, towards ſome other part nearer its mouth or opening.

Cat-FALL. See CAT-*heads.*

FALLACY, FALLACIA, a deception, or falſe appearance, or report.

The Epicureans deny, that there is any ſuch thing as a *fallacy* of the ſenſes. According to them, all our ſenſations, and all our perceptions both of ſenſe and phantaſy, are true; they add, that ſenſe itſelf is the firſt grand criterion of truth. That the ſenſes are never deceived, they argue from their being incapable of all ratiocination and remembrance: hence they can neither add, take away, couple, nor disjoin; they cannot, therefore, infer, conclude, or invent; and conſequently they cannot deceive by any inference or invention. This the mind may do, but not the ſenſe, whoſe buſineſs is only to apprehend what is preſent, e. gr. colours; not to diſcern or diſtinguiſh between this body and that. But a thing that barely apprehends, without pronouncing any thing, cannot deceive: add, that there is nothing to convict our ſenſes of falſhood. The right eye, e. gr. cannot convict the left; nor Plato's eyes, thoſe of Socrates; ſince the reaſons or pretenſions of each are equal; and the purblind perſon ſees what he ſees as much as the lynceus. Nor can a ſenſe of one kind convict another; as the ſight the ſmell; becauſe their objects are different, and conſequently their reports or judgments are not of the ſame things. Thus, again, if I ſee a ſtick ſtrait when out of the water, but when in it crooked, my perception is altogether as true in the latter, as in the former caſe; i. e. it is as true that I have the perception or idea of the crooked ſtick, as of the ſtrait one; and this idea is all that the ſenſe ſuggeſts, ſo that it does not deceive. Laſtly, reaſon cannot ſhew our ſenſes miſtaken, ſince all reaſoning depends on previous ſenſations, and the ſenſes muſt firſt be true, before any reaſoning, founded thereon, can be ſo. Thus the Epicureans, whoſe ſyſtem is ſtrongly confirmed by what we have already laid down from Dr. Berkeley, concerning EXISTENCE.

The Carteſians, on the other hand, are continually exclaiming againſt the ſenſes, as the great ſources of all deception. Every thing with which our external ſenſes preſent us, they ſay, ſhould be ſuſpected as falſe, or, at beſt, dubious, till our reaſon has confirmed the report. They add, that our ſenſes, as being fallacious, were never given us by nature for the diſcovery of the truth, but only to point out what things are convenient or hurtful to our bodies.

The Peripatetics keep a middle courſe: they hold, that if a ſenſible object be taken in its common or generical view, the ſenſe cannot be deceived about it; for the ſight can ſee nothing but what is viſible, nor can it err in perceiving what is viſible, *quatenus* ſuch. But they add, that if the object be taken under its ſpecific view, the ſenſe may be miſtaken about it; viz. from a want of the diſpoſitions neceſſary to a juſt ſenſation; as a diſorder in the eye, or ſomething uncommon in the medium, &c.

FALLACY, in *Logic*, or *ſyllogiſtic fallacy*, is a captious argument, called alſo a SOPHISM.

Fallacies either ariſe from words, or things: the foundation of an illuſion and *fallacy* in words, is ambiguity, which is of two kinds; viz. ſimple homonymia, and amphibology.

The kinds of *fallacy* in things are very numerous; but they may be reduced to ſeven general heads; viz. *ignoratio elenchi, petitio principii, falſa cauſa, interrogatio multiplex, limitatio vitioſa, accidens, & conſequens.*

FALLING-*off*, in *Sea-Language*, denotes the movement or direction of the ſhip's head to leeward of the point whither it was lately directed, particularly when ſhe ſails near the wind, or lies by. See FALL *not off.*

FALLING-*off* is alſo the angle contained between her neareſt approach towards the ſource of the wind, and her fartheſt declination from it when TRYING.

FALLING *evil* is a diſeaſe to which horſes are ſubject, proceeding from ill blood and cold thin phlegm collected in the fore-part of the head, between the panicle and the brain; which being diſperſed over the whole brain, cauſes the horſe ſuddenly to fall, and bereaves him for a time of all ſenſe. Spaniſh, Italian, and French horſes, are more ſubject to this diſeaſe than the Engliſh.

For the cure of this diſorder, bleed the horſe in the neck, and again in the temple-veins and eye-veins, four or five days after; anoint his body all over with a comfortable friction, and bathe his head and ears with oil of bay, liquid pitch and tar mixed together, and keep his head warm, by covering it with a canvas cap, quilted with wool, and give him a purging or ſcouring.

FALLING-*ſickneſs.* See EPILEPSY.

Dr. Tuberville, in the Philoſophical Tranſactions, gives the hiſtory of a patient much troubled with the *falling*-ſickneſs, in whoſe urine he obſerved a great number of ſhort worms, full of legs, and like millepedes. While theſe continued lively, and full of motion, the fits returned daily; but upon preſcribing her half an ounce of oxymel helleboratum in tanſy-water, the worms and the diſtemper were both effectually deſtroyed.

FALLOPIAN *tubes*, in *Anatomy*, two ducts ariſing from the womb, one on each ſide of the *fundus*, and thence extended to the ovaries; having a conſiderable ſhare in conception.

They are called *tubæ*, i. e. *trumpets*, in reſpect of their form; becauſe in their riſe, or opening into the womb, they are exceedingly ſmall, ſo as ſcarce to admit a knitting-needle; but in their progreſs towards the ovaries, they grow much bigger, and at length are capable of receiving the finger; from whence they contract again, and at the extremity next the ovaries are expanded into a ſort of foliage, which is fringed round with innumerable little fibres, bearing ſome reſemblance to the mouth of a trumpet.

The *Fallopian* tubes are four or five inches long; they conſiſt of a double membrane, derived from the outer and

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and inner membranes of the uterus. The extremity next the ovary, at the time of impregnation, at which time the whole tube is expanded, reaches to, and embraces the ovary; though at other times it ſeems to fall a little ſhort of it, and is only ſlightly tied by the fringe to the under ſide of the ovary.

The uſe of the tubes is, to convey the ſeed, or rather *ova* of women, and other animals, from the teſticles or ovaries, into the *uterus*. See OVARY, and UTERUS.

Their inner ſubſtance is compoſed, in good meaſure, of ramifications of veins and arteries, which form a kind of reticular or cavernous body, not unlike that of the clitoris. This ſtructure makes them capable of dilatation and contraction, according to the quantity and ſtop of the blood; and conſequently of being, as it were, erected *in coitu*, and of embracing the ovary at that time, which in their ſtate of flaccidity they did not. See GENERATION.

They take their denomination, *Fallopian*, from Gabriel Fallopius, a Modeneſe, who died in 1562, and who is commonly reputed the firſt obſerver of them; though we find them deſcribed long before him by Rufus of Epheſus.

The *ova*, or embryoes, are ſometimes detained in the *tubæ Fallopianæ*, and cannot make their way into the womb. Inſtances of this kind have been frequently met with in diſſections. One of the moſt remarkable is that related by Abraham Cyprianus, a celebrated phyſician of Amſterdam, in a letter addreſſed to Sir Thomas Millington, wherein he deſcribes the manner in which he drew a fœtus, twenty-one months old, out of the tuba of a woman, who lived and had ſeveral children after the operation. See *Tab. Anat. (Splan.) fig.* 9. *c c*, and *fig.* 11. *e e*.

FALLOPII *ligamentum*, called alſo *ligamentum Poupartii*, is the lower border of the tendon of the external oblique muſcle of the belly, ſtretched from the fore-part of the *os ileum* to the pubis.

FALLOW, a colour of a paliſh red, like that of a brick half burnt: ſuch is that of a *fallow* DEER, &c.

FALLOW-*field*, or *fallow-ground*, is land laid up, or that has lain untilled for a conſiderable time.

To *fallow*, is to prepare land by ploughing, long before it be ploughed for ſeed. To do this twice, is to *twifallow*, and thrice, to *trifallow*. See PLOUGHING *of fallows*.

FALLOW-*finch*, or FALLOW-*ſmick*, in *Zoology*, a name of the oenanthe, more commonly called the WHEAT-*ear*, and by ſome authors *octiflora*.

FALLOW-*cleanſing machine*, in *Agriculture*, was invented by Mr. Aaron Ogden, a ſmith, at Aſhton-under-Line, near Mancheſter, in Lancaſhire. It is intended for cleanſing *fallows* from weeds, &c. which exhauſt the riches of the ſoil. The conſtruction and uſe of this machine will be underſtood from the following deſcription, and the figure in *Tab. Agriculture, fig.* 1. A, A, is the frame; B, the firſt roller; C, the ſecond ditto, in which laſt are two cranks to move the arms D, D, which work the rake up the directors fixed on the plank E. The under ſide of the lower ends, or ſhares, of theſe directors, are ſharp to cut the clods, and let them come on the upper ſide. Each alternate heel of the ſhare is longer than the intermediate one, that they may not have more than one half to cut at once. At the back of the plank E, are two ſcrews to let it looſe, that the directors may be ſet higher or lower. The ſhares are to penetrate the ground two or three inches, to raiſe the quicks till the rake I, I, fetches them into the cart H, where a man muſt be ready with a muck-hook to clear them backward when gathered. In the rake I, are two teeth for every ſpace of the directors, that ſtones, &c. may be gathered without damage. K, K, are two ſtaples, by which the machine is drawn: under them at *h*, are two hooks, placed low to raiſe the machine in turning, by the help of the traces; and the axle-tree of the cart ſhould be fixed upon a pin, that it may turn like a waggon. F, F, are the triggers to throw the rake behind the roots. The long teeth at G, G, are to cleanſe the roller C. I, I, is the rake which gathers up the weeds into the cart H, and is drawn above the trigger F, by the working of the arms D, expreſſed by the dotted lines at *d d*, *i i i*. The triggers F, of which there is one on each ſide, move on the pivots *a*; ſo that when the points *b*, of the rake I, have been drawn up by the directors E, to the part marked *c*, the trigger, giving way, permits the rake to paſs; but immediately falling, the rake returns along the upper ſurface of the trigger marked *e*, *e*, and of courſe falls on the weeds when it comes to the end, a little beyond the pivot *a*. The reader will obſerve, that the boarding is taken away on one ſide, in the plate, in order to give a more perfect view of the inner parts of the machine; and, in fact, it would, perhaps, be better if all the boarding, marked L, L, L, was taken away, and frame work put in its ſtead. The cart H, might undoubtedly alſo be made lighter. The wheels M, M, appear, in the plate, to be made of ſolid wood; but there is no neceſſity they ſhould be ſo. At N, is another view of the roller C, by which the diſpoſition of the ſpikes may be eaſily comprehended. Suppoſe the circle O, deſcribed by the end of the roller N, to be divided by four ſtrait lines into eight equal ſegments, as repreſented at P. Let the ſame be done at the other end of the roller, and parallel lines be drawn from one correſponding point to the other, the length of the roller; mark the points with figures 1, 2, 3, 4, 5, 6, 7, 8; afterwards draw oblique lines, as from 1, at the end O, to 2, at the other end, and from 2 to 3, &c. on theſe oblique lines the ſpikes are to be fixed, at equal diſtances, in eight circles, deſcribed on the circumference of the roller. The ſpikes of the ſmall roller B, are fixed in the ſame manner, except that the diameter being ſmaller, there are only ſix inſtead of eight rows. R, is another view of the directors, with the plank E, on which they are fixed; and S is a ſection of a part of the plank, with one of the directors as fixed, in which may be ſeen the heel *m*, from whence to the point of the ſhare *n*, is a ſharp cutting edge. See the ſame letters in figure R. At T, is one of the long teeth to be ſeen at G; it is bent towards the roller C, which it ſerves to cleanſe. When the end of the rake *b*, after riſing above *c*, is puſhed, by the motion of the arms D, D, along the upper part *e*, *e*, of the trigger F, and comes to the end beyond *a*; as it falls, the part of the arm, marked *o*, reſts in the notch *p*, till it is again raiſed by the motion of the roller C, with the rake. The roller C, is to be one foot diameter, the ſpikes nine inches long, that they may go through the furrow (if the ſoil ſhould be looſe) into the hard earth, the more effectually to work the rake, which otherwiſe might be ſo overcharged as to cauſe the roller to drag without turning. In the rake-ends *b*, there ſhould be pivots, with rollers or pullers on, to go in the groove, to take off the friction; and they would likewiſe take the triggers more ſurely as the rake comes back. The rake ſhould alſo be hung ſo far backwarder, that when it is fallen, the arms of it may lie in the ſame plane, or parallel, with the directors, on which it comes up (which will require the frame to be two inches longer in the model). This will cauſe the rake to fall heavier, and drive the teeth into the roots, and bring them up without ſhattering. Theſe teeth muſt be made of ſteel, very fine, and ſo long as to reach down to the plank on which the directors are fixed, that is to ſay, ſix inches long (the directors are alſo to be made ſix inches broad above the plank). The rake-head ſhould alſo fall a little before the crank is at its extremity, which will cauſe the rake to puſh forward to let the teeth come into the roots. The rake-teeth muſt drop in the ſame plane with the roller and wheels, or on the ſurface of the earth. No more ſpace ſhould be given from the roller C, to the long teeth at G G, than that the rake may juſt miſs the ſpikes of the roller C, and fall on the places before mentioned. As the firſt roller B, was intended to cleanſe the ſecond C, more than for any other uſe, it may be omitted when the machine is made in large, as Mr. Ogden has lately found that the long teeth at G, G, anſwer the end alone, and this renders the machine about a ſixth part ſhorter. Now, to ſuit any ſort of earth, there ſhould be to each machine three planks, with directors at different ſpaces, to uſe occaſionally; in the firſt, the ſpaces between the directors ſhould be eight inches wide, in the ſecond ſix, and the third four. This will anſwer the ſame end as having ſo many machines.

As there may be ſome objections to the rake not leaving the roots when it has brought them up, Mr. Ogden has ſeveral methods of cleanſing it; but as he would make it as ſimple as poſſible, he chuſes to let it be without them at preſent; but ſuppoſe it ſhould bring ſome roots back again with it, it will probably loſe them before it gets back to the extremity; whence they will lie light, and be of but little detriment to the others coming up.

Mr. Ogden would have the firſt machine made four feet ſix inches wide, the teeth divided into equal ſpaces, the outſides into half ſpaces.

FALLOW-*hounds*. See HOUNDS.

FALLUM, in ſome of our *Law Lexicographers*, is ſaid to be a ſort of land; and for proof of this they quote the Monaſticon Anglicanum. *De duobus acris & viginti fallis in*, &c. Jacob. But from this paſſage it would rather ſeem that *fallum* ſignified a meaſure of land, as well as *acra*. And to this day a FALL is a meaſure of length in Scotland.

FALSE *alarm*, in *War*, a feigned, or a miſtaken ALARM.

FALSE *arms*, in *Heraldry*, are thoſe wherein the fundamental rules of the art are not obſerved: as if metal be put on metal, or colour on colour. See ARMS.

FALSE *attack*, in *War*. See ATTACK, *falſe*.

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FALSE *braye*, in *Fortification*. See FAUSSEBRAYE.

FALSE *claim*, in the *Foreſt Laws*, is where a man claims more than his due, and is amerced or puniſhed for the ſame.

FALSE *conception*. See CONCEPTION.

FALSE *flower*, a flower which does not ſeem to produce any fruit, as thoſe of the hazel, mulberry-tree, &c.

A FLOWER of this kind does not ariſe from any embryo, and does not knit; ſuch are the male flowers of the melon, cucumber, &c.

FALSE *galena*. See BLIND and GALENA.

FALSE *gallop*, in the *Manege*. See GALLOP.

FALSE *impriſonment*, is a treſpaſs committed againſt a man, by impriſoning him without ſufficient authority; which authority may ariſe either from ſome proceſs from the courts of juſtice, or from ſome warrant from a legal officer, having power to commit, under his hand and ſeal, and expreſſing the cauſe of ſuch commitment; or from ſome other ſpecial cauſe, warranted, on account of the neceſſity of the thing, either by common law, or act of parliament; ſuch as the arreſting of a felon by a private perſon without warrant, the impreſſing of mariners for the public ſervice, or the apprehending of waggoners for miſbehaviour in the public highways. Stat. 7 Geo. III. cap. 42. *Falſe* impriſonment alſo may ariſe by executing a lawful warrant or proceſs on an unlawful day, as on a Sunday, ſtat. 29 Car. II. cap. 7. or in a place privileged from arreſts, as in the verge of the king's court. The means of removing the actual injury of *falſe* impriſonment are fourfold; viz. by a writ of MAINPRIZE, by writ *de* ODIO *& atia*, by writ *de* HOMINE *replegiando*, and by writ of HABEAS *corpus*. The ſatisfactory remedy for this injury is by an action of treſpaſs, *vi & armis*, uſually called an action of *falſe* impriſonment; which is generally, and almoſt unavoidably, accompanied with a charge of aſſault and battery alſo; and therein the party ſhall recover damages for the injury he has received; and alſo the defendant is, as for all other injuries committed with force, or *vi & armis*, liable to pay a fine to the king for the violation of the public peace.

FALSE *judgment*. See FALSO *judicio*.

FALSE *keel*, in a ſhip, is a ſecond keel, which is ſometimes put under the firſt, to make the veſſel deeper, and to preſerve the lower ſide of the main keel. In our largeſt ſhips of war, the *falſe* KEEL is generally compoſed of two pieces, which are called the upper and the lower *falſe* keels. See *Tab. Ship. fig.* 2. *n.* 54. and *n.* 118.

FALSE *muſter*, is when ſuch men paſs in review, as are not actually liſted as ſoldiers. See FAGGOT, &c.

FALSE *news, ſpreading of*, in order to make diſcord between the king and nobility, or concerning any great man of the realm, is puniſhable by common law with fine and impriſonment; which is confirmed by ſtatutes Weſtm. 1. 3 Edw. I. cap. 34. 2 Ric. II. ſtat. 1. cap. 5. & 12 Ric. II. cap. 11.

FALSE *oath*. See PERJURY.

FALSE, or *falſe poſition*, in *Arithmetic*. See POSITION.

FALSE *prophecies*. See PROPHECIES.

FALSE *quarters of a horſe*. See *Falſe* QUARTERS.

FALSE *ribs*. See *Spurious* RIBS.

FALSE *roof of a houſe*, is that part between the upper room and the covering.

FALSE *return*. On a *falſe* return by a mayor, &c. to a mandamus, or by a ſheriff, &c. to a writ, a ſpecial action on the caſe will lie.

FALSE *root*, is that of which the value is negative. E. gr. in the equation $a^2+b^2=x^2$, if x be a negative quantity as -5, the *root* is ſaid to be *falſe*; if it be a poſitive quantity it is called a real or true *root*; if it be the *root* of a negative quantity, it is ſaid to be imaginary; as $\sqrt{-5}$.

FALSE *ſheat*, on board a ſhip. See SHEAT.

FALSE *ſtem*, in a ſhip. See STEM.

FALSE *tokens*, in *Law*, is uſed where perſons get money or goods into their hands by forged letters, or other counterfeit means. This is puniſhable by impriſonment by ſtat. 33 Hen. VIII. cap. 1. By 30 Geo. II. cap. 24. a farther penalty is inflicted on thoſe who obtain money or goods by falſe tokens and pretences. See CHEATS.

FALSE *tone*, in *Muſic*. Some call the INTERVAL of two ſemi-tones major by this name; but others more properly call it a diminiſhed third.

FALSE *verdict*. See ATTAINT.

FALSE *weights*. See WEIGHTS.

FALSHOOD, FALSITY, in *Philoſophy*, an act of the underſtanding, repreſenting a thing otherwiſe than it is, as to its accidents; or a falſe enuntiation, or judgment of any thing.

The circumſtance, as to its accidents, is of abſolute neceſſity in the definition, becauſe a thing cannot be repreſented otherwiſe than it is as to eſſentials; for in ſuch caſe the eſſence of the thing would not be repreſented; and ſince the eſſence is the thing itſelf, it would not be that thing which is repreſented, but another.

There is no *falſhood* in apprehenſion or ſenſation; our ideas of ſenſe are all juſt and true, ſo far as they go; and all our deluſions ariſe from our reaſonings and concluſions from them.

FALSI, *Crimen*, in the *Civil Law*, is a fraudulent ſubornation or concealment, with deſign to darken or hide the truth, and make things appear otherwiſe than they are.

The *crimen falſi* is committed three ways. By words, as when a witneſs ſwears falſly. By writing, as when a man frames or alters ſomething, antedates a contract, or the like. See FORGERY. And by deed, as when he ſells by falſe weights and meaſures, debaſes the coin, &c.

FALSIFY, in *Law*, is uſed for proving any thing to be falſe. Hence we find

FALSIFYING *a record*, for ſhewing it to be erroneous. Thus lawyers teach, that a perſon purchaſing land of another, who is afterwards outlawed of felony, &c. may *falſify* the record, not only as to the time wherein the felony is ſuppoſed to have been committed, but alſo as to the point of the offence. But where a man is found guilty by verdict, a purchaſer cannot *falſify* as to the offence; though he may for the time where the party is found guilty generally in the indictment, becauſe the time is not material upon evidence. 2 Hawk. Pl. Crown, 459. We alſo meet with

FALSIFYING *a recovery*. Thus, it is ſaid, the iſſue in tail may *falſify* a recovery ſuffered by a tenant for life, &c.

FALSO *bordone*, in the *Italian Muſic*, is uſed to denote the burden or ground-baſs of a ſong, when it is not exact to the rules of harmony, i. e. when the notes move all the ſame way, as is often the caſe in the Pſalms, and other parts of divine office. The name is more particularly given to a certain harmony produced by the accompanyments of ſeveral ſixths following one another, which make ſeveral fourths between two higher parts; becauſe the third part is obliged to make thirds with the baſs.

FALSO *judicio*, a writ which lies for falſe judgment, given in the county-court, court-baron, or other court, not of record.

FALSO *retorno brevium*, a writ which lies againſt the ſheriff, who has execution of proceſs, for making falſe returns of writs.

FALUN, a word uſed in many parts of France, as the name of a particular ſort of manure of lands, which is dug out of the earth, and is no other than fragments of ſea-ſhells buried at conſiderable depths, and amaſſed in prodigious ſtrata in many parts of that kingdom. Theſe they ſpread upon the lands in the manner of dung; and being as it were calcined and very friable, they readily diſſolve, and are the fineſt manure of any for ſome ſoils.

FALX, in *Anatomy*, a part of the dura mater, deſcending between the two hemiſpheres of the brain, and ſeparating the fore-part from the hinder.

It is called *falx*, i. e. *ſickle*, becauſe of its curvature, occaſioned by the convexity of the BRAIN. It divides the brain as low as the corpus calloſum.

FALX, the *ſickle-fiſh*, in *Ichthyology*, a ſmall fiſh of the tænia kind, common about the ſhores of the Mediterranean, but ſeldom brought to ſale, becauſe of its glutinous nature, being wholly converted into a ſort of glue, when dreſſed. It is a ſoft and ſmooth oblong fiſh, and has its name from reſembling a ſickle in figure. It is often found an ell long, and with that length is not above the breadth of one's hand. It is of a ſilvery colour, but its back-fin is red. Its eyes are large, and its head very ill ſhaped. The common people call it the marmot-fiſh.

FAMES *canina*, by the Greeks called *cynodes orexis*, q. d. *dog-appetite*, is ſuch an inſatiable hunger, as is not to be ſatisfied with eating, but continues even when the ſtomach is full.

This is a caſe much talked of by the ancients, and ſometimes met with amongſt us. It may be ſuppoſed to ariſe from ſharp fretting juices in the ſtomach, which by their continued vellications excite a ſenſe like that of hunger. See BULIMY.

FAMILIA, FAMILY, commonly implies all the ſervants belonging to a particular maſter.

In another ſenſe, *family* is taken for a portion of land, viz. ſo much as is ſufficient to maintain one *family*.

The term HIDE is by our writers ſometimes rendered a manſe, ſometimes a *family*, and ſometimes *carucata*, or plough-land; containing as much as one plough and oxen could cultivate in a year.

FAMILIA, in *Natural Hiſtory*, a term uſed by authors to expreſs a certain order of animals, or other natural productions, agreeing in their principal characters, and containing numerous individuals, not only different from one another, that in whole ſets, ſeveral numbers being to be collected out of the ſame family, all of which

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have the *family* character, and all ſome ſubordinate diſtinction peculiar to that whole number; or though found in every individual of it, not found in thoſe of any others.

It has been too common to confound the words, claſs, *family*, order, &c. in natural hiſtory. But the determinate meaning of the word *familia* ſeems to be that larger order of creatures, under which claſſes and genera are ſubordinate diſtinctions. Among the quadrupedes, the ſeveral genera of the unguiculated creatures agree one with another in many general characters common to all; and in which they differ from the ungulated animals, which have alſo their ſeveral peculiar characters common to all, and yet different from all thoſe of the others. Theſe naturally conſtitute certain larger diviſions into *families*, and no one would ever break through theſe, or bring the cat and the horſe into the ſame *family*.

In the ſame manner, in *Ichthyology*, there are ſeveral genera of fiſhes, which agree perfectly in certain common characters, and diſagree from all others in them.

The arrangement of natural bodies into theſe *families*, or general and larger claſſes, is of the utmoſt uſe to natural hiſtory, when it is properly done, and the diviſions are genuine and natural; when otherwiſe, it is hurtful.

Theſe diviſions of animals into *families* are of two kinds, the one artificial or hypothetical, the other natural.

FAMILIARS *of the Inquiſition*, perſons who aſſiſt in apprehending ſuch as are accuſed, and carrying them to priſon. They are aſſiſtants to the inquiſitor, and called *familiars*, becauſe they belong to his family. In ſome provinces of Italy they are called croſs-bearers, and in others the ſcholars of St. Peter the Martyr; and they wore a croſs before them on the outſide garment. They are properly bailiffs of the inquiſition; and the vile office is eſteemed ſo honourable, that noblemen in the kingdom of Portugal have been ambitious of belonging to it. Nor is this ſurpriſing, when it is conſidered that Innocent III. granted very large indulgences and privileges to theſe *familiars*; and that the ſame plenary indulgence is granted by the pope to every ſingle exerciſe of this office, as was granted by the Lateran council to thoſe who ſuccoured the Holy Land. When ſeveral perſons are to be taken up at the ſame time, theſe *familiars* are commanded to order matters, that they may know nothing of one another's being apprehended; and it is related, that a father and his three ſons, and three daughters, who lived together in the ſame houſe, were carried priſoners to the inquiſition without knowing any thing of one another's being there till ſeven years afterwards, when they that were alive were releaſed by an act of faith. Geddes's Tracts, vol. i. p. 425—429. Limborch's Hiſt. of the Inquiſ. by Chandler, p. 187.

FAMILY *of curves*. See *Family of* CURVES.

FAMILY *of love*, in *Eccleſiaſtical Hiſtory*, the name of an anabaptiſt ſect, founded in Holland, in 1555, by Henry Nicholas, a Weſtphalian. This deluded fanatic maintained, that he had a commiſſion from heaven to teach men, that the eſſence of religion conſiſted in the feelings of divine love; that all other theological tenets, whether they related to objects of faith, or modes of worſhip, were of no moment; and that it was a matter of perfect indifference what opinions Chriſtians entertained concerning the Divine nature, provided their hearts burned with the pure and ſacred flame of piety and love. Dr. Henry More wrote againſt this ſect, in his Grand Explanation of the Myſtery of Godlineſs, book vi. cap. 12—18. George Fox, the founder of the ſect of quakers, alſo expoſed them, and called them a motley tribe of fanatics, becauſe they took oaths, danced, ſung, and made merry. The principles of this ſect were propagated in England, and produced no ſmall confuſion. The form of abjuration tendered to them, and the ſevere proclamation iſſued againſt them by queen Elizabeth, in 1580, may be ſeen in Wilkins's Concilia Magnæ Brit. &c. vol. iv. p. 296, 297.

FAN, *Flabellum*, a machine uſed to raiſe wind, and cool the air, by agitating it.

The effect of fanning ourſelves when warm, in order to cool us, though the air is itſelf warm which we drive with the *fan* upon our faces, may be thus explained: the atmoſphere round, and next to our bodies, having imbibed as much of the perſpired vapour as it can well contain, receives no more, and the evaporation is therefore checked and retarded till we drive away that atmoſphere, and bring drier air in its place, that will receive the vapour, and thereby increaſe and facilitate the EVAPORATION, and thus contribute to cool us.

That the uſe of the *fan* was known to the ancients is very evident from what Terence ſays,

Cape hoc flabellum, *& ventulum huic ſic facito*;

and from Ovid, Art. Amand. i. 161.

Profuit & tenues ventos moviſſe flabello.

The *fans* of the ancients were made of different materials; but the moſt elegant were compoſed of peacock's feathers, or perhaps painted, ſo as to repreſent a peacock's tail.

The cuſtom which now prevails among the ladies, of wearing *fans*, was borrowed from the Eaſt, where the hot climate renders the uſe of *fans* and umbrellas almoſt indiſpenſable.

In the Eaſt they chiefly uſe large *fans* made of feathers, to keep off the ſun, and the flies. In Italy and Spain they have a large ſort of ſquare *fans*, ſuſpended in the middle of their apartments, and particularly over the tables: theſe, by a motion at firſt given them, and which they retain a long time, on account of their perpendicular ſuſpenſion, help to cool the air, and drive off flies.

In the Greek church, a *fan* is put into the hands of the deacons in the ceremony of their ordination, in alluſion to a part of the deacon's office in that church, which is to keep the flies off the prieſts during the celebration of the ſacrament.

Wicquefort, in his tranſlation of the embaſſy of Garcias de Figueroa, gives the name *fans* to a kind of chimneys or ventiducts in uſe among the Perſians, to furniſh air, and wind, into their houſes; without which the heats would be inſupportable. What is called a *fan* amongſt us, and throughout the chief parts of Europe, is a thin ſkin, or piece of paper, taffaty, or other light ſtuff, cut ſemicircularly, and mounted on ſeveral little ſticks of wood, ivory, tortoiſe-ſhell, or the like.

If the paper be ſingle, the ſticks of the mounting are paſted on the leaſt ornamental ſide: if double, the ſticks are placed betwixt them. Before they proceed to place the ſticks, which they call *mounting the fan*, the paper is to be plaited in ſuch manner, as that the plaits may be alternately inward and outward.

It is in the middle of each plait, which is uſually about half an inch broad, that the ſticks are to be paſted; and theſe again are to be all joined and rivetted together at the other end; they are very thin, and ſcarce exceed one third of an inch in breadth; and where they are paſted to the paper, are ſtill narrower, continuing thus to the extremity of the paper. The two outer ones are bigger and ſtronger than the others. The number of ſticks rarely exceeds twenty-two. The ſticks are uſually provided by the cabinet-makers or toy-men; the *fan*-painters plait the papers, paint, and mount them.

The common painting is either in colours or gold-leaf, applied on a ſilvered ground, both prepared by the gold-beaters. Sometimes they paint on a gold ground, but it is rarely; true gold being too dear, and falſe too paltry. To apply the ſilver leaves on the paper, they uſe a compoſition, which they pretend is a great ſecret, but which appears to be no other than gum Arabic, ſugar-candy, and a little honey melted in common water, and mixed with a little brandy. This compoſition is laid on with a ſponge; then laying the ſilver leaves thereon, and preſſing them gently down with a linen ball ſtuffed with cotton, they catch hold, and adhere together. When, inſtead of ſilver, gold ground is laid, the ſame method is obſerved.

The ground being well dried, a number of the papers are well beaten together on a block, and by this means the ſilver or gold get a luſtre, as if they had been burniſhed.

FAN is alſo an inſtrument to winnow corn. See WINNOW.

FAN, *ſea*. See GORGONIA.

FANATIC, a wild, extravagant, viſionary, enthuſiaſtical perſon; who pretends to revelation and inſpiration, and believes himſelf poſſeſſed with a divine ſpirit.

The word is formed of the Latin *fanum*, a *heathen temple*; for which reaſon the Chriſtians called all the Gentiles *fanatics*; and accordingly, the ancient chronicles of France call Clovis, *fanatic* and pagan.

Among the heathens themſelves, there were a ſort of prophetic prieſts, called *fanatici*; from whom the denomination ſince paſſed to all the reſt. They had their name from the Latin *fanum*, *temple*, becauſe they lived all together in temples. Struv. Antiq. Rom. Synt. cap. 6. p. 312.

Of this kind, particularly, were the prieſts of Iſis, of the mother of the gods, of Bellona, and ſome others, who were called *fanatici*. In Gruter, p. 312. n. vii. we have an inſcription, wherein one L. Cornelius Januarius is is called *Fanaticus*, AB. ISIS. SERAPIS. ABAEDEM BELLONE. And, p. 645. n. vii. *Fanaticus de æde Bellonæ*.

What might give occaſion to the appellation of *fanatics* was, that they performed their ſacrifices in a wild, enthuſiaſtical manner; and the appellation has been generally applied in modern times to thoſe who have made pretences to inſpiration, and who have conducted their worſhip or practice in an extravagant and licentious manner. Such were ſome of the German anabaptiſts and

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Engliſh quakers, at their firſt riſe, and the modern prophets, Muggletonians, Behmeniſts, &c. And the name *fanatics*, as well as ſectaries, has been generally and indiviſiouſly applied to diſſenters from the church of England.

FANATIO, in our *Ancient Cuſtoms*, the fawning time, or FENCE-months in foreſts.

FANCY. See PHANTASY, and IMAGINATION.

FANIONS, in *Military Language*, ſmall flags carried along with the baggage. See FLAG.

FANTASIA, in the *Italian Muſic*, ſignifies *fancy*, and is uſed for a compoſition, wherein the compoſer ties himſelf to no particular time, but ranges according as his fancy leads, amidſt various movements, different airs, &c. This is otherwiſe called the *capricious ſtyle*: before ſonnatas were uſed there were many of this kind, ſome of which remain even now.

FANTASTICAL *colours*, are the ſame with thoſe called EMPHATICAL *colours*.

FANTOME *corn*, in *Huſbandry*, a term uſed by the farmers in ſome of our counties for lean, light, and lank corn; as they call in the ſame places *fantome* fleſh, that which is lean and poor, and can hardly hang on the bones.

FANUM, among the Romans, a temple or place conſecrated to ſome deity. The deified men and women among the heathens had likewiſe their *fana*; even the great philoſopher Cicero erected one to his daughter Tullia. Mem. Acad. Inſcrip. vol. i. p. 488, ſeq.

FAPESMO, in *Logic*, one of the moods of ſyllogiſms. A ſyllogiſm in *fapeſmo* has its firſt propoſition an univerſal affirmative, the ſecond an univerſal negative, and the third a particular negative.

FAQUIR. See FAKIR.

FAR, in *Horſemanſhip*, an appellation given to any horſes right ſide: thus the *far* foot, the *far* ſhoulder, &c. is the ſame with the right foot, right ſhoulder, &c.

FARAND-MAN, in our *Old Writers*, a traveller or merchant ſtranger, to whom by the law of Scotland juſtice ought to be done with all expedition, that his buſineſs or journey be not hindered.

FARCE was originally a droll, petty ſhew, or entertainment, exhibited by charletans, or quacks, and their buffoons, in the open ſtreet, to gather the croud together. The word is French, and ſignifies literally, *force-meat* or *ſtuffing*. It was applied on this occaſion, without doubt, on account of the variety of jeſts, jibes, tricks, &c. wherewith the entertainment was interlarded. Some authors derive *farce* from the Latin *facetia*; others from the Celtic *farce, mockery*; others from the Latin *farcire, to ſtuff*.

At preſent, *farce* is of a little more dignity. It is removed from the ſtreet to the theatre; and inſtead of being performed by merry-andrews, to amuſe the rabble, is now acted by our comedians, and become the entertainment of the politeſt audiences.

The poets have reformed the wildneſs of the primitive *farces*, and brought them to the taſte and manner of comedy. The difference between the two on our ſtage, is, that the latter keeps to nature and probability; and, in order to that, is confined to certain laws, unities, &c. preſcribed by the ancient critics.

The former diſallows of all laws, or rather ſets them all aſide on occaſion. Its end is purely to pleaſe, or to make merry; and it ſticks at nothing which may contribute thereto, however wild and extravagant. Hence the dialogue is uſually low, the perſons of inferior rank, and the fable or action trivial or ridiculous; and nature and truth are every-where heightened and exaggerated to afford the more palpable ridicule.

FARCIMINALIS *Tunica*, the ſame with ALLANTOIS.

FARCIN, FARCY, or FASHIONS, a diſeaſe in horſes, and ſometimes in oxen, &c. ſomewhat of the nature of a ſcabies or mange.

Geſner derives the word from *varices*, by changing the *v* into a digamma or *f*.

The *farcin* is infectious, and ſpreads like a true plague. Vegetius calls it *morbus farcinimoſus*. It conſiſts in a corruption of the blood, which ſhews itſelf in eruptions of hard puſtules, knots, or ſtrings along the veins, and in ulcers, which are not cured without great difficulty, by running hot irons into them.

There is a *ſpreading farcin* which diffuſes itſelf over the whole body; an *inner farcy*, a *ſtringed farcy*, &c.

The *farcy* is ordinarily occaſioned by exceſſive heats and colds, ſometimes by ſpur-galling with ruſty ſpurs, ſnaffle-bit, or the like; or by the bite of another horſe infected with it; or if in the leg, by cutting or interfering.

For the cure, firſt bleed the horſe well; then give him four ounces of cream of tartar and lenitive electary made into balls every other day for a week; and then give him three ounces of nitre every day for three weeks or a month; and anoint the buds and ſwelling twice a day with the following ointment, viz. ointment of elder, four ounces; oil of turpentine, two ounces; ſugar of lead, half an ounce; white vitriol powdered, two drams; and let theſe ſeveral ingredients be mixed together in a galley-pot. By this proceſs the tumours will ſometimes diſperſe; but if they break and diſcharge a well-digeſted matter, they will ſoon be well, by giving liver of antimony in the quantity of two ounces a day for a fortnight, and one ounce a day for another fortnight. This will be the caſe when the diſeaſe affects only the ſmaller veſſels; but if it affects the larger blood-veſſels, the cure will be more difficult. When the plate, thigh, or neck-veins appear chorded, bleed immediately on the oppoſite ſide, and apply to the diſtempered vein the following compoſition, viz. ſix ounces of oil of turpentine, and three ounces of oil of vitriol: the oil of vitriol muſt be dropped gently into the turpentine-oil, or elſe the bottle in which it is contained will burſt. Let the diſeaſed parts be firſt rubbed with a woollen cloth, and then apply ſome of this mixture twice a day. Let the cooling phyſic and nitre, and liver of antimony be uſed, as above directed; and let the ſores be dreſſed with bees-wax and oil.

If the diſeaſe is ſituated near the flanks and lower belly, and does not yield to the compound oil, it may be neceſſary to bathe the parts with the following mixture as far as the center of the belly, and to give a courſe of antimonial medicines. Take four ounces of ſpirits of wine; oil of vitriol and turpentine, of each two ounces; white-wine vinegar, or verjuice, ſix ounces. When the diſtemper becomes inveterate, notwithſtanding the preceding application, Gibſon recommends the following mixture, viz. half a pint of linſeed oil; oil of turpentine and nitre, of each three ounces; tincture of euphorbium and hellebore, of each two drams; the ſoldier's ointment, or oil of bays, two ounces; oil of origanum, half an ounce; double aqua fortis, half an ounce: when the ebullition is over, add two ounces of Barbadoes tar. With this mixture rub the tumours and chorded veins once in two or three days, opening a paſſage to the matter iſſuing from the ulcers if they are choaked up, with a ſmall hot iron, and deſtroying with vitriol the proud fleſh, which may be kept down by touching with oil of vitriol, aqua fortis, or butter of antimony. Dr. Bracken recommends the mercurial ointment for rubbing the chords and tumours before they break, in order to diſperſe them; and when they are broke, to dreſs the ſores with equal parts of Venice turpentine and quickſilver. Mercurials have been likewiſe given internally in various ways; two ounces of quickſilver divided with an ounce of turpentine, and made up into four balls with diaperite and gum guaiacum, of each two ounces, and a ſufficient quantity of honey, have been ſucceſsfully given in the quantity of one ball twice a week; but when mercurials are adminiſtered either internally or externally, gentle purgatives ſhould be interpoſed to prevent a ſalivation.

The *water-farcin*, which is a kind of dropſy, proceeds from a horſe's feeding on low watry grounds, and in pits or holes where the graſs grows above the water; for the horſe in picking out the graſs licks up the water, which occaſions him to ſwell under the belly or chaps.

The *water-farcin* is of two kinds; one produced by a feveriſh diſpoſition, terminating on the ſkin; and the other a true dropſy, in which the water is not confined to the belly and limbs, but is found in different parts of the body, where a great number of ſoft ſwellings appear, which yield to the preſſure of the finger. The firſt ſpecies may be relieved by ſlight ſcarifications in the inſide of the leg and thigh with a ſharp penknife; but in the other ſpecies the water muſt be diſcharged and the craſis of the blood recovered by a purge given every week or ten days, and immediately after the firſt the following balls: take of nitre, two ounces; ſquills powdered, three drams, or half an ounce; camphor, one dram, and a ſufficient quantity of honey to bring them of a due conſiſtence for balls. This ball ſhould be given once a day, and waſhed down with a horn or two of the following drink: take of black hellebore, freſh gathered, two pounds; waſh, bruiſe, and boil it in ſix quarts of water till it is reduced to four; ſtrain off the liquor, and pour on the remaining hellebore two quarts of white-wine; place it in a gentle heat, and let it infuſe forty-eight hours; ſtrain it off, and mix both together, and give the horſe a pint night and morning. When the horſe begins to recover, complete the cure by giving him half a pint of the following infuſion every night and morning for a fortnight, and let him faſt two hours after it: take gentian-root and zedoary, of each four ounces; chamomile-flowers and the tops of centaury, of each two handfuls; of Jeſuit's bark, powdered, two ounces; of juniper-berries, four ounces; of filings of iron, half a pound; infuſe the whole in two gallons of ale for a week, ſhaking the veſſel often.

We have in the Philoſophical Tranſactions an account of a horſe

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a horſe being cured of this diſeaſe by hemlock. The diſcovery was accidental; the maſter of the horſe riding near a place where hemlock grew abundantly, ſuffered his horſe to eat greedily of it, and he became better from that time, and in a few days was wholly cured. We generally eſteem hemlock a poiſon; but beſide this proof of its ſalutary effect, it is well known that its ſeeds are eaten by ſome birds, particularly by the buſtards, in very great quantities, without any harm.

FARDEL *of Land*, is, according to ſome authors, the fourth; according to Noy, only the eighth part of a yard-land. See YARD-LAND.

Decem acræ faciunt ferdellam, *quatuor ferdellæ faciunt* virgatam, & *quatuor virgatæ faciunt* hidam, & *quatuor hidæ faciunt* feudum *militare*.

FARDING-*Bag*, the firſt ſtomach of a cow or other ruminating animal.

FARDING-*deal*, or FARDING-LAND, in our *Ancient Cuſtoms*, ſignifies the fourth part of an acre, now called a *rood*. In the regiſter of writs we have alſo *denariata*, *obolata*, *ſolidata*, and *librata terra*, which muſt probably riſe in proportion of quantity from the *farding-deal*, as an half-penny, penny, ſhilling, and pound, riſe in value; on which footing *obolata* muſt be half an acre; *denariata*, an acre; *ſolidata*, twelve acres; and *librata*, twelve-ſcore acres.

Yet we find *viginti libratas terræ*, *vel reditus*. Reg. fol. 94. *a*, and 284 *b*. where *librata terra* ſhould ſeem to be as much as yields xx *s. per annum*; and *centum ſolidatas terrarum, tenementorum, & redituum*, fol. 249. *a*. Others hold *obolata* to be but half a perch, and *denariata* a perch.

FARDINGDEL was the fourth part of a yard-land, or of a plough-land, according to Spelman.

FARE, a voyage or paſſage, or the money paid for paſſing by water, &c.

For the *fares* of hackney-coachmen, watermen, &c. ſee *Hackney*-COACHES.

FARE *of pigs*, the number which a ſow brings forth at one time.

FAREN, in *Ichthyology*, a name given by the Swedes to a fiſh peculiar to their country. It is of the genus of the *cyprini*, and is diſtinguiſhed by Artedi by the name of the *yellow eyed cyprinus*, with twenty-ſeven bones in the *pinna ani*.

FARFARA, a name given by ſome of the ancient *Botaniſts* to the plant we call COLT'*s-foot*, from the river Farfarus, mentioned by Ovid as remarkable for its ſhady banks, which afforded a very large quantity of this plant. Pliny mentions this plant with much confuſion, calling it alſo *farfano* and *farfugio*, and forgetting that he had before deſcribed it under the name of *tuſſilago* or belchion.

FARFRUGUM, in *Botany*, a name by which ſome authors have called the caltha paluſtris, or *marſh*-MARYGOLD.

FARFUGIUM, in *Botany*, a name by which ſome authors call COLT'*s-foot*.

FARINA, the flour or powder of ſome ſort of grain or pulſe, ground and ſifted from the bran.

The word is formed of *far*, *corn-wheat*; and *far*, according to Guichard, comes from the Hebrew, בר, *bar*, ſignifying the ſame thing.

FARINA *fœcundans*, or *pollen*, among *Naturaliſts*, is a fine duſt prepared in the male flowers, or the male parts of flowers of plants; which, being afterwards ſhed on the female, does the office of a ſperm or ſemen, by impregnating the ſame.

The *farina fœcundans*, called alſo the *male duſt* and *male ſeed*, is formed and ſecreted in the apices or antheræ of the ſtamina; where, when it becomes mature and copious enough, burſting its capſula, it is ſplit on the head of the piſtil, and thence conveyed to the matrix or utricle thereof, to fecundify the ova or female ſeed contained therein.

This duſt in any one plant being viewed with a microſcope, every particle thereof appears of the ſame ſize and figure; but in different plants the figure, ſize, colour, &c. of the duſt are very different.

It may be obſerved, however, that the colour of the *farina* varies in the ſame ſpecies, according to the colour of the flower; and even ſometimes the *farina* of the ſame flower is of different colours, as is eaſily obſerved in the caryophyllus arvenſis.

The figures of the divers kinds of *farinæ* are much harder to deſcribe. The moſt general figure is the oval, more or leſs ſharp at the ends, with one or more channels or furrows running lengthwiſe; ſo that through the microſcope they look not unlike the ſtone of a date, a grain of wheat, a coffee-berry, or an olive.

The manner of gathering and preſerving the *farinæ* of plants for microſcopic obſervations is this: gather the flowers in the midſt of a dry ſunſhiny day, when the dew is perfectly off; then gently ſhake off the *farina*, or lightly bruſh it off with a ſoft hair-pencil upon a piece of white paper; then take a ſingle talc or iſinglaſs between the nippers, and breathing on it, apply it inſtantly to the *farinæ*, the moiſture of the breath will make that light powder ſtick to it. If too great a quantity be found adhering to the talc, blow a little of it off; and if there be too little, breathe on it again, and take up more. When this is done, put the talc into the hole of a ſlider, and applying it to the microſcope, ſee whether the little grains are laid as you deſire; and if they are, cover them with another talc, and fix the ring; but be careful that the talcs do not preſs upon the *farina*, ſo as to alter its form. Baker's Microſcope, p. 249.

For the appearances of the *farinæ* of a great many plants, ſee *Tab. of Microſcopical Objects*, *Claſs* 2.

Of *farinæ* ſome are very hard, others ſoft, and eaſily broken. They all contain a great deal of ſulphureous matter more than the other parts, whence they are very odorous. Thoſe of the lily are ſo full of oil that they greaſe the paper they are put in as if it had been oiled. The *farinæ* of moſt aromatic plants ſwim in an eſſential oil, or ſort of liquid turpentine; others are involved in a dry reſin, as thoſe of the lycopodium or muſcus terreſtris clavatus. Others, as thoſe of fumitory, are incloſed in a little, viſcid, mucilaginous matter; and all, in effect, have ſomething ſo glutinous, that they ſtick to any thing that touches them, ſo that it is difficult to ſeparate the grains from each other.

Mr. Bradley ſuppoſes a magnetic virtue lodged in the *farina fœcundans*, or *male duſt*, by means whereof, when depoſited in the utricle of the female, it draws the nouriſhment from the other parts of the plant into the ova or rudiments of the fruit, and makes them ſwell. The reality of this virtue, he argues, from the ſame being found in wax, which is chiefly or wholly gathered hence by the bees.

The *farina* of plants has been ſometimes found to have an effect on neighbouring plants. Thus, we read of ruſſetings changed by the *farina* of a neighbouring tree; and we have obſervations of peaſe of different colours infecting one another in the like manner. Phil. Tranſ. N° 477. § 7.

This duſt was for many ages looked upon as an excrement of the plant; but it has of later times been found to conſiſt wholly of organical bodies, which are in reality the embryo-plants; and entering into the ſeeds into the capſules, while yet buried in the ſtyle, they fecundate them, and put them in a ſtate to vegetate and produce their ſpecies. On the moſt accurate examination, however, with microſcopes, the *farina* or *pulvis fœcundans* of plants has never been found to carry any likeneſs to a *plantula ſeminalis*, or the rudiments of the plants which was to be produced by it. All that the microſcope does in this caſe is but increaſing the apparent magnitude of the particles of the powder; but they are found, when thus viewed, to be no other than a congeries of globules, which are all alike in the ſame ſpecies, and compoſed of fibres and vaſicules wrought together in ſuch a curious manner to the keeping whole as long as neceſſary, and burſting when neceſſary, that it appears evident they are deſtined for ſome very great uſes.

Verdreſius, in the Acta Eruditorum, has given a very curious detail, and has figured and deſcribed fifty kinds of this duſt, moſt of which are conſiderably different from one another, though ſome are nearly alike. He obſerves, that in all the number of flowers that he examined he found no *farina* or *pulvis fœcundans* that did not reſemble one of theſe fifty; and that, therefore, whoever engages in this curious reſearch, ſhould firſt obſerve theſe, and then refer the others to one or other of them as they next approach them, and mention their differences, if any, by way of characters by which they might always be known. Act. Erudit. ann. 1724. p. 410.

The author of theſe curious obſervations has given good figures of theſe and of the other of the fifty of his *farinæ*, to which we refer the reader. See *Generation of* PLANTS.

FARINAGIUM, in our *Old Writers*, denotes toll of meal or flour.

FARIO, in *Zoology*, a term for SALMON when about half grown, after it is paſt the ſtate in which it is called a *ſalar*, and before it is of the full growth.

FARLEU, money paid by tenants in the weſt of England in lieu of a heriot. In ſome manors of Devonſhire, *farleu* is often diſtinguiſhed to be the beſt goods, as heriot is the beſt beaſt payable at the death of a tenant.

FARM, or FERM, FIRMA, in *Law*, ſignifies a little country meſſuage or diſtrict, containing houſe and land, with other conveniencies, hired or taken by leaſe, either in writing or by word, under a certain yearly rent.

This in divers parts is called differently; in the North, it is a *tack*; in Lancaſhire, a *fermeholt*; in Eſſex, a *wike*. In the corrupted Latin, *firma* ſignified a place incloſed or ſhut in; whence, in ſome provinces, Menage obſerves,

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ſerves, they call *cloſerie* or *cloſure*, what in others they call *farm*.

Spelman and Skinner derive the word *farm* from the Saxon, *fearme*, or *feorme*; that is, *victus*, or *proviſion*, becauſe the country-people and tenants anciently paid their rents in victuals and other neceſſaries, though this was afterwards converted into the payment of a ſum of money. Whence a *ferm* was originally a place that furniſhed its owner or lord with proviſions. And among the Normans they ſtill diſtinguiſh between *farms* that pay in kind; i. e. proviſions; and thoſe which pay in money, calling the former ſimply *fermes*, and the latter *blanche ferme*, *white ferm*.

Spelman ſhews, that the word *firma* anciently ſignified not only what we now call a *farm*, but alſo a feaſt or entertainment which the farmer gave the proprietor or landlord for a certain number of days, and at a certain rate, in conſideration of the lands, &c. he held of him.

Thus *fearm*, in the laws of king Canutus, is rendered by Mr. Lombard, *victus*; and thus we read of *reddere* firmam *unius noctis*, and *reddebat unam diem de* firma, which denote proviſion for a night and day, the rents about the time of the Conqueſt being all reſerved in proviſions; the cuſtom whereof is ſaid to have been firſt altered under Henry I.

It is commonly allowed that a *farm* ſhould make three rents, as they expreſs it, one for the landlord, one for the charges, and one for the farmer to live upon; but it is very ſeldom that a *farm* will conſtantly do this, or is to be maintained at that charge. In a *farm* of one hundred pound a year, if the land is worth twenty ſhillings an acre, a hundred pound may defray the charges of it; but if in a *farm* of the ſame rent the land be worth but ten ſhillings an acre, a hundred and thirty pounds a year muſt be allowed for the charges of this, or nearly ſo, and two hundred and fifty acres of ſuch land muſt be reckoned to a *farm* of a hundred pounds a year, or elſe the farmer will be ruined if it be not very improveable land.

By ſtatute no parſon or ſpiritual perſon ſhall take *farms* or leaſes of land, on pain of forfeiting 10*l.* per month, &c. 21 Hen. VIII. cap. 18. And no perſon whatſoever ſhall take above two *farms* together in the ſame pariſh, under the forfeiture of three ſhillings and four-pence a week. 25 Hen. VIII. cap. 13. 32 Hen. VIII. cap. 28.

We alſo ſay, to *farm* duties, impoſts, &c.

FARMER, he that tenants a farm, or is leſſee thereof.

Alſo generally every leſſee for life, years, or at will, is called *farmer*.

As this word implies no myſtery, except it be that of huſbandry, huſbandman is the proper addition for a *farmer*.

FARMER, in *Mining*, is the lord of the field, or one that *farms* the lot and cope of the king.

FARNIA, or FARNIA *Italorum*, a name by which ſome authors have called the bitter oak; the *cerrus*, *ægylops*, and *aſpris* of other writers.

FARNOVIANS, in *Eccleſiaſtical Hiſtory*, a ſect of *Socinians*, ſo called from Staniſlaus Farnovius, who ſeparated from the other Unitarians in the year 1568, and was followed by ſeveral perſons eminent for their learning. This ſect did not laſt long; for having loſt their chief, who died in 1615, it was ſcattered abroad and reduced to nothing. Farnovius was engaged by Goneſius to prefer the Arian ſyſtem to that of the Socinians, and conſequently aſſerted, that Chriſt had been produced out of nothing by the Supreme Being before the creation of this terreſtrial globe. His ſentiments concerning the Holy Ghoſt are not certainly known; however, it appears that he warned his diſciples againſt paying the tribute of religious worſhip to the Divine Spirit.

FARRA, in *Ichthyology*, a name given by authors to a ſpecies of the *coregonus*, not differing eſſentially from the *lavaretus* or *bezola*. This ſpecies has had a great number of different names, and been deſcribed as five or ſix different fiſh. But all the deſcriptions of the ſeveral authors agree to prove it to be that ſpecies only of the *coregoni*, which Artedi has diſtinguiſhed by the name of the *coregonus*, with the upper jaw longer and flat, and with fourteen rays in the back-fin. This name equally agrees with the ſeveral deſcriptions of the *farra* or *ferro*, *bezola*, *lavaretus*, &c. and they agree in all the eſſential characters with one another. See LAVARETUS.

FARREATION, FARREATIO, in *Antiquity*, the ſame with CONFARREATION.

FARRIER, a perſon whoſe office is to ſhoe horſes, and cure them when diſeaſed or lame.

FARRIER's *pouch*, in the *Manege*, a leathern bag, in which they carry drivers, nippers, ſhoes for all ſizes of feet, good ſharp nails, and all that is proper for new-ſhoeing a horſe that has loſt his ſhoe upon a road.

FARTHEL, or FARTHELLING, among *Seamen*, was uſed for the ſame with what they commonly call *furl*, or *furling*, which is taking up the ſails, and binding them cloſe to the yards.

FARTHING, a ſmall Engliſh copper coin, amounting to one-fourth of a penny.

It was anciently called *fourthing*, as being the fourth of the integer or penny.

FARTHING *of gold*, a coin uſed in ancient times, containing in value the fourth part of a noble, or 20*d.* ſilver, and in weight the ſixth part of an ounce of gold. It is mentioned in the ſtat. 9 Hen. V. cap. 7. where it is enacted, that there ſhall be good and juſt weight of the noble, half-noble, and *farthing of gold*.

FARTHING *of land* ſeems to differ from FARDING-*deal*.

For in a ſurvey-book of the manor of Weſt-Hapton in Devonſhire, there is an entry thus: A. B. holds ſix *farthings of land* at 12*6l. per ann.* Blount. So that the *farthing of land* muſt have been a conſiderable quantity, far more than a rood.

FARUNDEL *of Land*, the ſame with FARDING-*deal*.

FASCE, *Faſcia*, in *Heraldry*. See FESSE.

FASCES, in *Antiquity*, axes tied up together with rods or ſtaves, and borne before the Roman magiſtrates as a badge of their office and authority.

Florus, lib. i. cap. 5. aſſures us, that the uſe of *faſces* was introduced by the elder Tarquin, the fifth king of Rome, and that they were then the mark of the ſovereign dignity. In after-times they were borne before the conſuls, but by turns only, each his day; *ne, ſi ambo faſces haberent, duplicatus terror videretur*. Livy, lib. ii. cap. 1. They had each of them twelve, borne by ſo many uſhers, called lictors. See LICTOR. Dionyſ. Halicarn. lib. iii. cap. 84.

Others will have Romulus the author of the inſtitution, and aſcribe the number twelve to the number of birds which foretold him his kingdom. Others hold that he borrowed it from the Hetrurians, and that the number twelve anſwered to the twelve nations of Hetruria, who, in creating him king, gave him each an officer to ſerve him as lictor. Silius Italicus aſcribes their firſt invention to a city of Hetruria, called Vetulonia.

Theſe *faſces* conſiſted of branches of elm; in the middle whereof was a ſecuris or ax, the head whereof ſtood out beyond the reſt. Plutarch relates the reaſons of this diſpoſition. Publicola took the ax out of the *faſces*, as Plutarch aſſures us, to remove from the people all occaſion of terror. After the conſuls the prætors aſſumed the *faſces*. Cenſorin. De Die Natal. obſerves, that the prætors had only two, though Polybius and Plutarch give them ſix.

In the government of the decemviri it was the practice at firſt for only one of them to have the *faſces*; afterwards each of them had twelve, in the ſame manner as the kings.

In funeral proceſſions it was the cuſtom to carry the *faſces* reverſed, as a token of grief.

FASCETS, in *Glaſs-making*, the irons thruſt into the mouths of the bottles when made to remove them into the annealing-tower.

FASCIA, in *Architecture*, by the workmen called FACIA, FACIO, or FACE, a broad liſt, fillet, or band, particularly uſed in architraves and pedeſtals.

The architrave conſiſts of three *faſciæ* or bands; thus called by Vitruvius, as reſembling ſwaths, called in Latin *faſciæ*.

That author admits no *faſciæ* in the Tuſcan and Doric architrave; i. e. he makes it all plain, without any diviſion or cantoning into parts or *faſciæ*; but the modern architects take the liberty to differ from him in this particular. See *Tab. Archit. fig.* 25. N° 25.

In brick-buildings, the jutting out of the bricks beyond the windows in the ſeveral ſtories, except the higheſt, are called *faſcias* or *faſciæ*.

Theſe are ſometimes plain, and ſometimes moulded; but the moulding is only a *cima reverſa*, or an ogee, at the bottom, with two plain courſes of bricks over it; then an aſtragal; and laſtly a boultine.

FASCIA *lata*, in *Anatomy*, a large membranous, tendinous, or ligamentary covering, very conſiderable both for its extent and ſtrength, being made up chiefly of two planes of fibres, of which the external are more or leſs longitudinal, the internal more or leſs tranſverſe. It is farther ſtrengthened in ſome places by a great number of other fibres, which augment its thickneſs, and form particular expanſions. The tranſverſe fibres are much ſtronger than the longitudinal. It is fixed above to the edge of the criſta of the os ilium from the large tuberoſity to the anterior ſuperior ſpine, to the ligamentum fallopii, and to the aponeuroſis of the obliquus externus of the abdomen, on which it runs up by a thin lamina. It is likewiſe fixed in the lateral inferior part of the os ſacrum, and to the neighbouring parts of the ligaments, by

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which that bone is connected to the offa ilium and ifchium; from whence it advances over the glutæi and thigh, between the membrana adipofa and mufcles, all the way to the anterior and outer parts of the knee. It is very thin on the patella, but may be feparated from it. It is alfo continued over the external anterior part of the tibia, covering the mufcles which lie there, and is ftrongly inferted in the head of that bone, and in the upper part of the fibula. It fends off elongations, which, like fo many fepta, run in between the mufcles, and fometimes meet in fuch a manner as to form vaginæ. It is ftrongeft on the anterior and outer parts of the thigh, growing gradually thinner on the inner and back parts. It is ftrongly inferted in the linea femoris afpera, between the vaftus externus and biceps, forming a fort of feptum between thefe mufcles. It furnifhes particular vaginæ to the mufcles which lie on the infide of the thigh; and though thefe vaginæ are thin, they are pretty ftrong, being chiefly made up of tranfverfe fibres. The *fafcia lata* more or lefs furrounds all the mufcles that ferve to move the os femoris on the pelvis, and alfo the pelvis on the os femoris. This name has been fometimes erroneoufly given to a fmall anterior fuperficial mufcle, more properly called *mufculus fafciæ latæ*, or *mufculus* MEMBRANOSUS. Winflow's Anatomy, p. 204.

FASCIA, in *Surgery*, is a fillet, roller, or bandage. It is extremely difficult to form an idea of bandages without feeing them made. See BANDAGE.

FASCIÆ, in *Aftronomy*, two rows of bright fpots obferved on Jupiter's body, appearing like fwathes or belts.

The *fafciæ*, or belts of Jupiter, are more lucid than the reft of the difk, and are terminated by parallel lines. They are fometimes broader, and fometimes narrower; nor do they always poffefs the fame part of the difk.

M. Huygens likewife obferved a very large kind of *fafcia* in Mars; but it was darker than the reft of the difk, and took up the middle part thereof. See BELTS.

FASCIALIS, in *Anatomy*, a mufcle of the leg, called alfo SARTORIUS.

FASCIATION, in *Surgery*, is the binding of fwathes about a limb that is to be cured.

FASCICULATA *Folia*, among *Botanifts*. See LEAF.

FASCICULUS, in *Medicine*, a term fometimes ufed to expreſs a certain quantity or meafure of herbs.

By *fafciculus* is meant fo much as may be held in the arm when bent, and refted on the top of the hip. Phyficians note it in prefcription by *fafc*.

FASCINATION denotes a fort of WITCHCRAFT, fuppofed to operate by the influence either of the eye or the tongue.

The word is formed from the Greek, βασκαινειν, which fignifies the fame.

Ancient writers diftinguifh two forts of *fafcination*, one performed by looking, or the efficacy of the eye. Such is that fpoken of by Virgil in his third eclogue:

Neſcio quis teneros oculus mihi faſcinat *agnos.*

The fecond by words, and efpecially malignant praifes. Such is that mentioned by the fame poet in his feventh eclogue:

Aut, ſi ultra placitum laudârit, baccare frontem
Cingite, ne vati noceat mala lingua futuro.

Horace touches on both kinds in his firft book of epiftles:

Non iſtic obliquo oculo mea commoda quiſquam
Limat, non odio obſcuro, morſuque venenat.

FASCINES, in *Fortification*, *faggots*, are fmall branches of trees, or bavins, bound up in bundles, which, being mixed with earth, ferve to fill up ditches, to fcreen the men, make the parapets of trenches, &c. See *Tab. Fortif. fig.* 4.

Some of them are dipped in melted pitch or tar; and, being fet on fire, ferve to burn the enemy's lodgments or other works.

A pitched *fafcine* is about a foot and a half, or two foot long. Thofe that are ufed for making epaulements or chandeliers to raife works or to fill up ditches are 10 feet long, and 1 or 1¼ foot in diameter. They are formed by fixing fix fmall pickets in the ground by pairs, fo as to make little croffes, and well faftened in the middle with willow bindings. On thefe treftles the branches are laid, which are bound round with withes at the diftance of every two feet.

In the corrupt Latin they ufe *fafcenina*, *fafcennia*, and *fafcinata*, to fignify the pales, *fafcines*, &c. ufed to inclofe the ancient caftles, &c.

FASHION. The word is French, *façon*, which fignifies *making*.

FASHION is particularly ufed among *Artificers* for the trouble, time, and labour, employed in a piece of work, particularly of filver or gold.

It is by the *fafhion* that the workmen's wages or falary is regulated.

The word is alfo ufed to denote the prevailing mode or tafte.

FASHIONS, a name fometimes given to the FARCIN.

FASHION-*pieces*, in the *Sea language*, two pieces of timber which form the breadth of a fhip at the ftern, and are the outmoft timbers of the STERN on each fide, forming its fhape, and united to the ftern-poft and to the extremity of the wing-tranfom by a rabbit, and a number of ftrong nails or fpikes driven from without.

FASSETS, among *Jewellers*. See FACETS.

FASSUS, in our *Old Writers*, is ufed for a faggot of wood. It feems to come from the French, *faiſſeau*.

FAST, a fpace of time wherein a perfon takes little or no food.

For the advantages of *faſting* with regard to health, fee ABSTINENCE.

The Bramins never bleed their fick, but make them *faſt*.

FAST is peculiarly ufed for an abftinence on account of religion, or a fpace of time wherein the church prohibits the ufe of food, or at leaft reftrains it to certain kinds, and to certain hours.

Faſting has been practifed by moft nations from the remoteft antiquity.

The Jews obferved *faſts* from their firft eftablifhment. Mofes appointed one folemn *faſt* before the feaft of expiation; and others were inftituted by the following prophets on different occafions; fo that in the time of Zacharias there were four regular *faſts*, viz. in the months June, July, September, and December. To thefe they have fince added three others, in memory of fore diftreffes they have at different times fuffered. Befides thefe, there are various kinds of *faſts*, fome for devotion, others for the new moons; and fome among them kept an anniverfary *faſt*, in memory of the tranflation of the Septuagint, in order to expiate the bafe compliance of their doctors for a foreign prince, and the outrage offered to the dignity of their law, which, in their opinion, was only deſigned for themſelves: *Non fecit taliter omni nationi.*

There is no occafion to defcribe exactly the various obfervances that accompanied thefe acts of humiliation, as being generally known. Their abftinence lafted twenty-feven or twenty-eight hours, beginning before fun-fet, and not ending till fome time after fun-fet the next day. On thefe days they were obliged to wear white robes, in token of their grief and repentance; to cover themfelves with fackcloth, to lie on afhes, to fprinkle them on their head, and on great occafions cover the ark of the covenant. In order to complete their abftinence, they eat nothing at night but a little bread dipped in water, feafoned with falt, or bitter herbs and pulfe. Some of them continued the following day and night praying in the temple or fynagogue, bare-footed, and occafionally fcourging themfelves.

Thofe that would be particularly informed of thefe auſterities may conſult Maimonides, Leo of Modena, and Buxtorf.

The Egyptians, Phœnicians, and Affyrians, neighbours to the Jews, had alfo their *faſts*. The *faſt* of the Ninivites, occafioned by the preaching of the prophet Jonas, is too well known to be inſiſted on.

Nor were the Greeks without their *faſts*. Ariftotle informs us, that the Lacedæmonians having refolved to fuccour a city of the allies, ordained a general *faſt* through the whole extent of their dominions, without excepting the domeftic animals; and this they did for two ends, one that they might fpare provifion in favour of the befieged, and the other to draw the bleffing of heaven on their enterprize. The Athenians, among others, had the Eleufinian and Thefmophorian *faſts*, the obfervation of which was accompanied with ſtrict *faſting*, particularly among the women, who fpent one whole day fitting on the ground in a mournful dreſs, without taking any nourifhment; on which account this day was called νηστεια.

In a word, all the Pagan deities, whether of the male or female ſex, required this duty of thofe that deſired to be initiated into their myſteries, of their prieſts and prieſteſſes that gave the oracles, and of thofe that came to conſult them.

In Italy *faſting* was obferved much in the fame way. The inhabitants of Tarentum being befieged by the Romans, demanded fuccours from their neighbours of Reggium, who immediately ordained a *faſt* throughout their whole territories, with the fame intention as the Lacedæmonians, viz. to render the gods favourable, and to fpare provifions for their allies. Their enterprize having had good fucceſs by their throwing a convoy with provifions into the town, the Romans were obliged to raife the fiege: and the Tarentines, in memory of this de-

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livery, instituted a perennial *fast*. So that here we have two *fasts* for the same event; that observed by those who were the means of obtaining the deliverance, and that observed by them who received it. The Roman senate, Livy tells us, being alarmed by many prodigies happening in a train one after another, ordered the decemviri to consult the Sibylline books; who having executed his commission, declared, that to prevent the fatal consequences it was necessary to establish a *fast* in honour of Ceres, to be observed every fifth year. That Jupiter had stated *fasts* at Rome, appears from the following passage of Horace, where a mother is introduced praying to Jupiter for the recovery of her son from a quartan ague, and promising that the patient should purify himself in the Tiber on the morning of the *fast-day* sacred to that god:

Frigida si puerum quartana reliquerit, illo
Mane die quo tu indicis jejunia, nudus
In Tiberi stabit.

Fasting must have been very sacred at Rome, since we find it practised by kings and emperors. Numa Pompilius, Julius Cæsar, Augustus, Vespasian, and others, we are told, had their stated *fast-days*; and Julian the apostate was so exact in this observance as even to outdo the priests themselves, and the most rigid philosophers.

In a word, every country, nation, and religion, have had at all times their priests, druids, gymnosophists, and philosophers, who distinguished themselves by their frugality, austerity, and abstinence. The practice of the Pythagoreans is well known; their whole life was a continued lent, but with this difference between them and us, that they believed the use of fish equally unlawful with that of flesh. They lived entirely on bread, fruits, and pulse, with great sobriety, in imitation of their master Pythagoras; though in this respect they must have fallen far short of him, if we may believe Diogenes Laertius, who says, that he continued his *fasts* for no less than forty days. Apollonius Thyaneus, one of his most famous disciples, could never by all his endeavours equal his master in this point, though his *fasts* greatly exceeded the ordinary intervals.

The gymnosophists or brachmans reckoned *fasting* among their religious duties. Father Le Compte, in his Memoirs, tells us, that the Chinese have at all times had regular *fasts*, with forms of prayer, for preserving them from barrenness, inundations, earthquakes, and such like public calamities. The Mahometans too, who possess so large a part of Asia and Africa, have times of *fasting*, called by them *ramadan*, as regular as we have lent; and their dervises are remarkable for their mortification and *fasting*. Comte, Mem. tom. ii. p. 142.

The Turks are so scrupulous on the point of *fasting*, that they will not at those times so much as take the smell of any perfume by the nose. They hold that odours themselves break *fast*. If they bathe, it is forbid to put the head under water for fear of swallowing any of it; and as for women, they are forbid to bathe at all on *fast-days*, for a reason peculiar to the sex.

It was not unusual among the ancients to *fast* on account of dreams.

Mr. Bayle observes, that whole books have been written on long *fasting*. Cyriacus Lentulus has composed one, De Prodigiosis Inediis. Fortunius Liceti, professor of medicine at Padua, besides a great many others, has published one book in folio, De iis qui diu vivunt sine Alimento, or De Feriis Altricis Animæ.

Though *fasting* is not positively enjoined by Christ or his apostles, a custom prevailed among the first Christians of joining abstinence with their prayers, especially when they were engaged in affairs of extraordinary importance. But in the most ancient times we find no mention of any public and solemn *fasts*, except upon the anniversary of Christ's crucifixion. However, in process of time, days of *fasting* were gradually introduced, first by custom, and afterwards by positive appointment; though it is not certain what those days were, nor whether they were observed in the first century. Mr. Mosheim acknowledges, that those who affirm, that in the time of the apostles or soon after, the fourth and sixth days of the week were observed as *fasts*, are not destitute of specious arguments in favour of their opinion. Eccles. Hist. vol. i. p. 106. 8vo.

Towards the close of the third century *fasting* was held in much greater esteem, from a notion that it served as a security against the power of dæmons, who directed their stratagems principally against the luxurious. About the end of the fourth century this notion still more generally prevailed; and *fasting* was also considered as the most effectual means of appeasing the anger of an offended deity. Hence proceeded the establishment of this practice as an indispensable duty, by express laws enacted by the rulers of the church. The Quadragesimal or Lent *fast* was held more sacred than all the rest, though it was not yet confined to a certain number of days. But as *fasting* became more general, it was contrived to render it more easy; and therefore a mere abstinence from flesh and wine was judged sufficient; which opinion prevailed from this time, and became universal among the Latins. Ib. vol. i. p. 237. 324.

The strict canonical *fast* only allows of one meal in twenty-four hours. F. Thomassin observes, that the ancient *fast* was to sup without dining; i. e. only to take one meal, and that not till after noon: adding, that to dine without supping was a breach of the *fast*. The practice of the Latin church was to *fast* thirty-six days in the year; which is, as it were, the tithe of the year.

Tertullian wrote an express Treatise De Jejuniis, of *fasts*, to support the new laws of *fasting*, which the Montanists were for imposing.

The ancient catholics allowed of no obligatory or commanded *fasts* beside that preceding Easter, since called *Lent*; the terms of which were to forbear eating till the evening.

The other *fasts* observed were only of devotion; such were the fourth and sixth ferie; i. e. Wednesdays and Fridays.

This Lent *fast* was called *station*. Beside these, there were occasional *fasts* enjoined by the bishops, &c. See ABSTINENCE and LENT.

Some introduced the xerophagy into *fasts*; that is, the use of dried fruits for their meals; and made a practice of abstaining not only from all meats and wines, but also from succulent fruits, for the whole twenty-four hours; and some reduced themselves to bread and water: but this was more than was commanded.

FAST-*days* are those appointed by public authority, to be observed by *fasting* and humiliation. See ABSTINENCE.

FAST-*ground*, or FAST-*country*, a term used by some of our *Miners* to express what others call the SHELF.

FASTERMANS, or FASTING-MEN, q. d. *homines habentes*, was used in our ancient customs for men in repute and substance; or rather for pledges, sureties, or bondsmen, who, according to the Saxon polity, were *fast* bound to answer for one another's peaceable behaviour.

FASTI, in *Antiquity*, the Roman CALENDAR; wherein the several days of the year, with their feasts, games, and other ceremonies were expressed.

The Romans had their *greater* and *lesser fasti*. The *great fasti* were called the *fasti* of the magistrates; and the *lesser*, the *fasti calendares*.

The *fasti calendares*, which were what was properly and primarily called *fasti*, are defined by Festus Pompeius to be books containing a description of the whole year; i. e. ephemerides, or diaries, distinguishing the several kinds of days, FESTI, PROFESTI, FASTI, NEFASTI, &c. The author hereof was Numa, who committed the care and direction of the *fasti* to the *pontifex maximus*, whom the people used to go and consult on every occasion. This custom held till the year of Rome 450, when C. Flavius, secretary to the pontifices, exposed in the *forum* a list of all the days whereon it was lawful to work; which was so acceptable to the people, that they made him curule ædile. Liv. lib. ix. cap. 46. Ed. Crevier, tom. i. p. 573.

These *lesser fasti*, or *fasti calendares*, were of two kinds, *urbani* and *rustici*. The *fasti urbani*, or *fasti* of the city, those which obtained, or were observed in the city. Some will have them thus called because they were exposed publicly in divers parts of the city; though by the various inscriptions or gravings thereof on antique stones, one would imagine that private persons had them likewise in their houses. Ovid undertook to illustrate these *fasti urbani*, and comment on them, in his Libri Fastorum, whereof we have the six first books still remaining; the six last, if ever they were written, being lost. Beside Ovid, several other authors had undertaken the same subject, particularly L. Cincius Alimentatus, Fulvius Nobilior, Masurius Sabinus, Cornelius Labeo, C. Licinianus, and Nisus; of all whom Macrobius makes mention in his Saturn. and preserves fragments of each; beside a work of one Bæbius Marcus, intituled, De Fastis Diebus, quoted by Fulgentius, De Prisco Sermone.

In the *greater fasti*, or *fasti* of the magistrates, were expressed the several feasts, with every thing relating to the gods, religion, and the magistrates; the emperors, their birth-days, offices, days consecrated to them, and feasts and ceremonies established in their honour, or for their prosperity, &c.

With a number of such circumstances did flattery at length swell the *fasti*, when they became denominated *magni*, to distinguish them from the bare calendar, or *fasti calendares*.

In the *fasti rustici*, or *country fasti*, were expressed the several

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ſeveral days, feaſts, &c. to be obſerved by the country people; for as theſe were taken up in tilling the ground, fewer feaſts, ſacrifices, ceremonies, and holidays, were enjoined them than the inhabitants of cities; and they had alſo ſome peculiar ones not obſerved at Rome.

Theſe ruſtic *faſti* contained little more than the ceremonies of the calends, nones, and ides; the fairs, ſigns of the zodiac, increaſe and decreaſe of the days, the tutelary gods of each month, and certain directions for rural works to be performed each month.

FASTI was alſo a chronicle or regiſter of time, wherein the ſeveral years were denoted by the reſpective conſuls, with the principal events that happened during their conſulates; theſe were called alſo *faſti conſulares*, or *conſular faſti*.

Onuphrius Panvinius, Pighius, Sigonius, and Janſſen d'Almelooven, have given us the *faſti conſulares*; the two firſt, with long and learned comments, wherein are expreſſed not only the conſuls, but alſo the dictators, magiſtri equitum, triumphs, and ovations. Pighius even adds as many of the other officers as he could find, viz. prætors, tribunes, &c. J. d'Almelooven confines himſelf to the conſuls alone.

FASTI is ſtill applied to the archives and public records, wherein are kept hiſtorical memoirs of public and remarkable events that have happened to a people.

In the like ſenſe the martyrology is called the *ſacred faſti* of the church.

The Jeſuit Du-Londel has compiled the *faſti* of Louis le Grand, &c.

FASTI, or *dies faſti*, alſo denoted court days. See DAY.

The word *faſti*, *faſtorum*, is formed of the verb *fari*, *to ſpeak*, becauſe during thoſe days the courts were open, cauſes might be heard, and the prætor was allowed *fari*, to pronounce the three words, *do*, *dico*, *addico*; the other days wherein this was prohibited were called *nefaſti*: thus Ovid,

Ille nefaſtus *erit*, *per quem tria verba ſilentur*:
Faſtus *erit*, *per quem lege licebit agi*.

Theſe *dies faſti* were noted in the calendar by the letter *F*: but obſerve that there were ſome days *ex parte faſti*, partly *faſti*, partly *nefaſti*; i. e. juſtice might be diſtributed at certain times of the day, and not at others. Theſe days were called *interciſi*; they were marked in the calendar thus; *F. P. faſtus primo*, where juſtice might be demanded during the firſt part of that day.

FASTIDIUM *Cibi*. See NAUSEA.

FASTIGIATI *Furni*, in *Chemiſtry*, furnaces fitted with ſeveral aludels.

FASTIGIUM, in *Architecture*, the ſame with PEDIMENT.

FASTING *Men*. See FASTERMANS.

FAT, in an *Animal Body*, a white, oily, concrete ſubſtance, collected in little membranous loculi or cells in divers parts of the body, ſerving to keep the parts warm, to ſoften and temper the acids of the aliments in the maſs of blood, and probably for the nouriſhment and reparation of the human body. It is well known that animals become lean and live upon their *fat* when they have too little food; and when they have diſeaſes which prevent digeſtion and production of the nutritive juice; in which caſe the *fat* appears to be abſolved by the veſſels deſigned for this uſe, and to be transformed into nutritive juice: it is alſo a fact, that the *fatteſt* perſons falling into an atrophy, gradually loſe all their *fat*, which is always quite expended in ſuch caſes before the diſeaſe becomes fatal. See ADEPS.

The vapours which riſe from *fat*, either heated in the open air, or diſtilled in cloſe veſſels, conſiſt of acid and attenuated oil: the acid is extremely penetrating, acrid, and volatile; it irritates and inflames the eyes, throat, and lungs; and excites a cough as much as volatile ſulphureous acid does, though its nature be very different: and yet in this natural ſtate this acid is ſo well combined with the oily part, that none of its properties can be perceived. *Fat*, though very mild in good condition, becomes irritating and cauſtic when its acid is partly diſengaged by fire or time. Spirit of wine, which does not affect pure and unchanged *fat*, diſſolves ſome portion of *fat* which has been ſtrongly heated, or which has become rancid; whence it is inferred, that the acid of the *fat* diſengages itſelf in both theſe caſes.

This *fat* (found immediately under the cutis, incloſed in little bags, called *cellulæ adipoſæ*, adhering to the outer ſurface of a membrane, called *adipoſa*, all over the body, except on the forehead, eye-lids, penis, and ſcrotum) is nothing but the oily part of the aliment or chyle which could not enter into the compoſition of the nutritive juices, ſeparated from the arterial blood by the adipoſe glands, and carried by peculiar ducts to the membranous cells, whence it is tranſmitted again to the blood by the veins. Dr. Grew takes it to be a *coagulum* of the oily parts of the blood, made either by ſome of its own ſaline parts, or by the nitrous particles of the air mingled therewith in the lungs; which ſentiment is confirmed by an experiment of that learned perſon, who made an artificial *fat*, by only mixing oil of olives with ſpirit of nitre for ſome days: and hence it is that divers animals, as rabbits, hares, &c. grow *fat* in winter, and particularly in ſevere froſty weather, the air then abounding moſt in nitre. Hence alſo it is that the *fat* of land animals is much firmer than that of fiſhes, the watry element containing leſs nitrous matter than the air.

In ſome ſubjects the cellulæ are ſo full and diſtended that the *fat* is above an inch thick; in others they are almoſt flat; and in emaciated ſubjects, inſtead of *fat*, we find a ſort of flaccid tranſparent ſubſtance, which is nothing but the bare membrane, the cells being all exhauſted.

Too much *fat* is uſually attended with heavineſs and drowſineſs, not only from the unwieldineſs of an overgrown body, but from the ſtuffing of the cavities and thorax alone, which ſometimes obſtructs the expanſion of the diaphragm and lungs, and produces a dyſpnœa, or an orthopnœa; and it is likewiſe probable that the abundance of *fatty* or oily particles returned into the blood, and implicating the more ſubtle and active parts, may hinder the neceſſary ſecretions of the brain. See CORPULENCY.

Mr. Hunauld has the following obſervations on the *fat* of the body: 1. That though fœtuſes and children have much *fat* under the ſkin, yet they have only a ſmall piece or two *(pelotons)* at the baſe of the heart; whereas lean adult bodies have *fat* all round the baſe on the veſſels that go out of the heart, and accompanying the larger coronary veſſels, and at the point of the heart. 2. That the omentum of very young children has no *fat*, and their meſentery very little. 3. That in many people the *fat* under the ſkin is exhauſted, while the bowels are overcharged with it. 4. The exterior part of the tunica cellularis is the firſt filled with *fat*, and the laſt emptied of it; from which, and becauſe aponeuroſes and membranes ſpread over ſo many muſcles, he concludes, the common opinion of muſcles being lubricated by the *fat*, to be ill founded. See Mem. Acad. Scienc. 1732.

The *fat* of different animals has been repreſented by ſome writers as of conſiderable medicinal uſe: thus, *Calves fat* is uſed in pomatums and unguents, being reſolutive and emollient. That of *hogs* and *boars* has the ſame qualities, and is alſo ſtrengthening. *Deers greaſe* is accounted good to fortify the nerves againſt the rheumatiſm, ſciatica, gout, and fractures. *Hares greaſe*, applied externally, promotes digeſtion, and a ſuppuration of abſceſſes. That of *rabbits* is nervous and reſolutive. That of *cocks* and *hens*, reſolves and ſoftens indurations. That of *geeſe* has the ſame qualities; and likewiſe abateth hæmorrhoids, aſſuages pains in the ear, being applied within the ſame; and opens the belly, being taken inwardly. *Eels fat* is eſteemed good againſt the hæmorrhoids and deafneſs, to take away pits of the ſmall-pox, and to make the hair grow. That of the *trout*, beſides its being emollient, is ſaid to be good in diſeaſes of the anus, and in ulcers of the breaſt.

But the ſpecific virtues aſcribed to certain *fats* do not ſeem well warranted; ſome even doubt their being poſſeſſed of any properties different from other ſubſtances of like kind, unleſs what may ariſe out of their different conſiſtencies and degrees of volatility; that of the viper ſeems to have the moſt right to claim ſomething extraordinary upon that account. See ADEPS.

The way of preparing *fat* for medicinal purpoſes is to take out the ſkins, veins, fibres, &c. waſh it till it becomes unbloody; then melt it by a gentle heat, with a little water, till the water is evaporated; ſtrain, put it into an earthen veſſel where it will fix, and preſerve it from air.

FAT *of whales*. See BLUBBER.

FAT, or VAT, is a kind of veſſel uſed for holding wine, ale, beer, cyder, or any other liquor, in the time of its preparation.

FAT, or *vat*, alſo expreſſes a large wooden veſſel, which, among brewers and maltſters, is uſed to meaſure MALT for expedition, containing a quarter or eight buſhels, ſtat. 1 Hen. V. cap. 10. and 11 Hen. VI. cap. 8.

FAT is likewiſe a veſſel or pan of lead, uſed in making ſalt, &c. See SALT.

FAT alſo denotes an uncertain meaſure of capacity: thus, a *fat* of iſinglaſs contains from $3\frac{1}{4}$ hundred weight to 4 hundred weight; a *fat* of unbound books half a maund, or 4 bales; of wire, from, 20 to 25 hundred weight; and of yarn, from 220 to 221 bundles.

FATE, FATUM, in a general ſenſe, denotes an inevitable neceſſity depending on ſome ſuperior cauſe.

Fate is a term much uſed among the ancient philoſophers. It

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It is formed *a fando, from ſpeaking*, and primarily implies the ſame with *effatum*, viz. a word or decree pronounced by God; or a fixed ſentence, whereby the Deity has preſcribed the order of things, and allotted every perſon what ſhall befal him.

The Greeks call it ειμαρμενη, *quaſi* ειρμος, *nexus, a chain*, or neceſſary ſeries of things indiſſolubly linked together.

All things, ſays Plato, are in *fate*; i. e. within its ſphere or ſcheme, but all things are not *fated*; and he thus explains the diſtinction: it is not in *fate*, ſays he, that one man ſhall *do* ſo and ſo, and another *ſuffer* ſo and ſo, for that would be deſtructive of our free agency and liberty; but if any one ſhould chooſe ſuch a life, and do ſuch or ſuch things, then it is in *fate* that ſuch things and ſuch conſequences ſhall enſue upon it. The ſoul, therefore, is αδεσποτον, free and uncontrolled, and it lies within itſelf to act or not; and there is no compulſion or neceſſity here; but what follows upon the action ſhall be accompliſhed, κατ' ειμαρμενην, according to *fate*, or the conſtitution of things; e. gr. that Paris ſhould bear off Helen by force was ſomething dependent on himſelf; but that a war ſhould enſue is the conſequence. Ex Alcinoo de Platon. Dogmat.

The ſame philoſopher, as cited by Hierocles, obſerves to this purpoſe: the choice of action is in our own power; but the juſt award or retribution of good or ill which enſues upon the choice, lies in the breaſt of thoſe etherial judges who are appointed under God.

But beſide this ſenſe of the word wherein it is uſed, ſometimes to denote the connection of cauſes in nature, and ſometimes in the divine appointment, the word *fate* has a farther intention, being uſed to expreſs a certain neceſſity or external deſignation of things, whereby all agents, both neceſſary and voluntary, are ſwayed and directed to their ends. See NECESSITY.

Some authors divide *fate* into *aſtrological* and *ſtoical*.

FATE, *aſtrological*, denotes a neceſſity of things and events, ariſing, as is ſuppoſed, from the influence and poſitions of the heavenly bodies, which give law both to the elements and mixed bodies, and to the wills of men.

In which ſenſe the word is often uſed by Manilius, *Certum eſt & inevitabile* fatum: *materiæque datum eſt cogi, ſed cogere ſtellis.*

FATE, *ſtoical*, or *fatality*, is defined by Cicero an order or ſeries of cauſes, wherein cauſe being linked to cauſe, each produces the other; and thus all things flow from one prime cauſe. Chryſippus defines it a natural invariable ſucceſſion of all things *ab æterno*, each involving the other.

To this *fate* they ſubject the very gods. Thus the poet: the Parent of all things made laws at the beginning, by which he not only binds other things, but himſelf. So Seneca: *Eadem* neceſſitas *& deos alligat. Irrevocabilis divina pariter & humana curſus vehit. Ipſe ille omnium conditor & rector ſcripſit quidem* fata, *ſed ſequitur: ſemel ſcripſit, ſemper paret.*

This eternal ſeries of cauſes the poets call Μοιρα and PARCÆ, or *Deſtinies*.

Fate is divided by ſome later authors into *phyſical* and *divine*.

FATE, *phyſical*, is an order and ſeries of natural cauſes appropriated to their effects.

This ſeries is neceſſary, and the neceſſity is natural. The principle or foundation of this *fate* is nature, or the power and manner of acting which God originally gave to the ſeveral bodies, elements, mixts, &c. By this *fate* it is that fire warms, bodies communicate motion to each other, the ſun and moon occaſion the tides, &c. and the effects of this *fate* are all the events and *phenomena* in the univerſe, except ſuch as ariſe from the human will. See NATURE.

FATE, *Divine*, is what we more uſually call PROVIDENCE. Plato in his Phædo includes both theſe in one definition, as intimating, that they were one and the ſame thing, actively and paſſively conſidered. Thus, Fatum *eſt ratio quædam divina, lexque naturæ comes, quæ tranſiri nequeat, quippe a cauſa pendens, quæ ſuperior ſit quibuſvis impedimentis.* Though that of Boethius ſeems the clearer and more juſt, Fatum, ſays he, *eſt inhærens rebus mobilibus diſpoſitio, per quam Providentia ſuis quæque nectit ordinibus.*

FATHER, *Pater*, a term of relation, denoting a perſon who begot a child, either male or female.

Among the ancient Romans the *fathers* of three children had very conſiderable privileges allowed them as ſuch. By the law of Romulus a *father* had an abſolute and unlimited power over his children. Amongſt the Lacedæmonians, as we learn from Ariſtotle's Politics, the *father* of three children was excuſed from the duty of mounting guard for the ſecurity of the city; and a *father* of four children was exempted from every public burden.

FATHER, *adoptive*, is he who takes the children of ſome other, and acknowleges them as his own. See ADOPTION.

FATHER, *putative*, is he who is only the reputed or ſuppoſed *father*. Joſeph was *putative father* of our Saviour.

FATHER, *natural*, is he who has illegitimate children.

FATHER-*in-law*, is a perſon married to a woman who has children by a former huſband, &c. to which children he is ſaid to be a *father-in-law*.

FATHER is alſo uſed in *Theology* for the firſt Perſon in the TRINITY.

FATHER is alſo uſed in a figurative ſenſe on divers moral and ſpiritual occaſions. Thus, it is applied to the patriarchs; as we ſay Adam was the *father* of all mankind, Abraham the *father* of the faithful, &c.

FATHERS, in an *Eccleſiaſtical Senſe*, denote the ancient prelates and doctors of the church.

The *fathers* aſſembled at the council of Nice; Chryſoſtom, St. Baſil, &c. were Greek *fathers*, and St. Auguſtine, St. Ambroſe, &c. were Latin *fathers*.

The appellation of *fathers* is uſually confined to the theological writers of the firſt ſix centuries.

FATHERS, *apoſtolical*. See APOSTOLICAL.

FATHER is alſo a title of honour given to prelates and dignitaries of the church. The right reverend *father* in God, lord biſhop of, &c. *Ab curæ ſimilitudine patres apellantur.*

FATHER is alſo applied to the ſuperiors of convents, &c. See ABBOT. The *father* general; *father* provincial, ex-provincial; *father* prior, ſub-prior; *father* definitor, in the order of Benedictines; *father* guardian, in that of the Franciſcans; *father* corrector, among the Minims, &c.

FATHERS is alſo applied plurally to all congregations of eccleſiaſtics, whether regular or ſecular; as the *fathers* Cordeliers, Capuchins, Auguſtins, Jacobins, &c. The *fathers* Jeſuits, *fathers* of the Oratory, Barnabites, Theatins of the Miſſion, &c. See each under the proper article.

FATHERS *of the Chriſtian doctrine* is a denomination belonging to two religious orders: one inſtituted in France by Cæſar de Bus, and confirmed in 1597, by Clement VIII. and another in Italy founded by Cuſani, a Milaneſe knight, and eſtabliſhed by the authority of Pius V. and Gregory XIII.

FATHERS *of Somaſquo*, or *regular clerks of St. Maieul*, is the appellation of a religious order deduced from the name of the place where their founder reſided. It was firſt formed into a diſtinct ſociety by Jerome Æmiliani, a noble Venetian, and confirmed by Paul III. and Pius IV. in 1540 and 1563. Their office was the inſtruction of the young and ignorant, and the relief of orphans.

FATHERS is alſo uſed for perſons venerable for their age or quality, or the ſervices they have done the public.

Thus, at Rome the ſenators were called *conſcript fathers*, *patres conſcripti*, &c.

FATHER-*laſher*, in *Ichthyology*, an Engliſh name given to a fiſh, called by ſome authors, though improperly, SCORPÆNA, and *ſcorpius marinus*. It is properly of the COTTUS kind, and is named by Artedi the ſmooth cottus without ſcales, with ſeveral ſpines upon the head, and with the upper jaw a little longer than the under. It more reſembles the ſmall fiſh we call the *bull-head* or *miller's thumb*, than the SCORPÆNA. The head is large and armed with ſpines, which it can oppoſe to any enemy that attacks it, by ſwelling out its cheeks and gill-covers to a large ſize. The noſe and ſpace contiguous to the eyes are furniſhed with ſhort ſharp ſpines, and the covers of the gills are terminated by very long ones, which are ſtrong and ſharp-pointed. The mouth is large; the jaws are covered with rows of very ſmall teeth; and the roof of the mouth is furniſhed with a triangular ſpot of minute teeth. The back is more elevated than that of others of this genus; the belly prominent; the ſide-line rough; the reſt of the body very ſmooth, and growing ſlender towards the tail. This kind is very frequent in the Newfoundland ſeas, where it is called *ſcolping*; and it is common on the coaſt of Greenland in deep water, near the ſhore. It is a principal food of the natives, and ſoup made of it is ſaid to be both agreeable and wholeſome. See *Tab. of Fiſh, fig.* 4.

FATHIMITES, or FATHEMITES, the deſcendants of Mahomet by Fathima, or Fathema his daughter.

The dynaſty of *Fathimites*; i. e. of princes deſcending in a direct line from Ali and Fathima his wife, Mahomet's daughter, commenced in Africa in the year of the Hegira 296, of Jeſus Chriſt 908.

The *Fathimites* afterwards conquered Egypt, and eſtabliſhed themſelves therein in quality of caliphs.

The *Fathimites* of Egypt ended with Abed, in the year of the Hegira 567, 268 years after their firſt eſtabliſhment in Africa, and 208 years after the conqueſt of Egypt.

FATHOM, a long meaſure containing ſix feet, taken from the utmoſt extent of both arms when ſtretched into a right line.

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The *fathom* is uſed at ſea in eſtimating the length of cables and other ſhip-ropes, with the depths and ſoundings of the ſea; as alſo in mines, quarries, wells, and works of fortification.

There are three kinds of *fathoms*, accommodated to the different ranks of veſſels: the firſt, which is that of men of war, contains ſix feet; the *middling*, or that of merchant-ſhips, five feet and a half; and the *ſmall fathom*, uſed in fluyets, fly-boats, and other fiſhing-veſſels, only five feet.

FATHOM is alſo uſed in ſeveral countries, particularly Italy, for the common yard or ell whereby things are ordinarily meaſured in commerce.

In this ſenſe it is more commonly called *brace*, or *braccio*, q. d. arm. In Muſcovy the *fathom* contains ſeven Engliſh feet, and about one-tenth of an inch.

FATNESS, in *Medicine*, CORPULENCY, or the ſtate of a perſon too much loaded with fleſh and fat. See an account of a remarkable caſe of *fatneſs* in the Med. Obſ. &c. vol. iii. p. 69, &c.

FATTENING *of Colours*, among *Painters*, denotes a coagulation of the oil, which frequently happens on its being mixed with ſeveral kinds of pigments; whence, after being kept for ſome time, it is rendered of ſo viſcid or glutinous a conſiſtence as to be wholly incapable of being worked with either bruſh or pencil. This alſo happens ſometimes after the colours have been ſpread or laid on the proper ground; in which caſe one part of the oil will run off in ſmall ſtreams or drops, while the other will remain with the colour, without ſhewing the leaſt tendency to dry. Oils likewiſe will *fatten* by long keeping, or by being expoſed for a conſiderable time to the ſun and air.

FATTENING *of horſes*. See HORSES.

FATUARII, in *Antiquity*, were perſons who appearing inſpired, foretold things to come.

The word is formed of Fatua, wife of the god Faunus, who was ſuppoſed to inſpire women with the knowlege of futurity, as Faunus himſelf did the men. Fatua had her name from *fari*, q. d. *vaticinari*, *to prophecy*.

FATUUS *Ignis*. See IGNIS *fatuus*.

FAUCON, or FALCON, a name formerly given to a ſmall piece of cannon, whoſe diameter was $2\frac{3}{4}$ inches; weight, 750 pounds; length, 7 feet; load, $2\frac{1}{4}$ pound; ſhot, $2\frac{1}{2}$ inches diameter; and $2\frac{1}{2}$ pound weight. See CANNON and GUN.

FAUCONET, or FALCONET, a very ſmall piece of ordnance, whoſe diameter at the bore was $2\frac{1}{4}$ inches; weight, 400 pounds; length, 6 feet; load, $1\frac{1}{4}$ pound; ſhot, ſomething more than two inches diameter; and $1\frac{1}{8}$ pound weight. See ORDNANCE and GUN.

FAVIFORMA, in *Surgery*, a term uſed to expreſs certain ulcers, which, when preſſed upon with the finger, emit a ſanies through ſeveral ſmall holes in the manner in which honey, on preſſing the comb, iſſues out of the cells.

FAVILLÆ *Salis*, in *Natural Hiſtory*, a name given by Vitruvius and ſome of the more ancient writers to the natrum or nitre of the ancients. Our chemical writers, who have been uſed to delight much in hard names, have applied the ſame phraſe to expreſs our nitre; but this is a very different ſalt from the other.

FAVISSA, among *Antiquaries*, a hole, pit, or vault, under-ground, wherein is kept ſomething of great value.

The word ſeems formed of *foviſſa*, a diminutive of *fovea*, *a pit* or *ditch*.

The *faviſſa*, according to A. Gellius and Varro, was much the ſame with what the ancient Greeks and Romans called θησαυρος, *theſaurus*, and what in ſome of the modern churches is called *archives* and *treaſury*. In the Capitol there were divers *faviſſæ*. They were ſubterraneous places, walled and vaulted, having no entrance or light but by a hole at the top, which was uſually ſtopped up with a huge ſtone.

They were chiefly deſtined for keeping the old worn ſtatues and other ancient moveables formerly uſed in the temple; ſo religiouſly did that people reſpect and preſerve whatever was conſecrated. Catullus would have lowered the floor of the Capitol, but that the *faviſſæ* prevented him.

Feſtus, however, gives us a different account of the *faviſſæ*. According to that author they were wells or pits of water near the temples, and for the uſe thereof, the ſame with what the Greeks called ομφαλος, *navel*, as being round, &c. Gellius likewiſe gives them the name of ciſterns, as well as Feſtus; but it is apparently for no other reaſon than that they bore a reſemblance to them in figure.

In effect, the two notions are pretty eaſily reconciled, it being certain that the treaſuries of ſome of the ancient Greek temples were the ciſterns or reſervoirs of water wherein people uſed to waſh themſelves before they entered the temple.

FAUNALIA, in *Antiquity*, feaſts celebrated by the Romans in honour of the god Faunus.

The deity Faunus, to whom the ſolemnity was devoted, and from whom it was denominated, was the ſame among the Romans with the Pan of the Greeks.

The *Faunalia* were held on the day of the nones of December; i. e. on the fifth day of that month. The principal ſacrifice was a roe-buck; or rather, according to Horace, a kid attended with libations of wine, and burning of incenſe.

It was properly a country feſtival, being performed in the fields and villages with peculiar joy and devotion. Horace gives us a very gay deſcription thereof in the eighteenth ode of his third book:

——Tener pleno cadit hœdus anno:
Larga nec deſunt Veneris ſodali
Vina crateræ: vetus ara multo
Fumat odore.

Struvius in his Roman calendar marks the feaſt of Faunus on the day of the ides of February, which is the thirteenth day of that month; and the *Faunalia* he places on the fifth of the ides of December, or the ninth of that month; and in chap. ix. he ſhews, that there really were two *Faunalia*, the one in February, mentioned by Ovid, Faſt. lib. vi. ver. 246. the other on the ninth of December, mentioned by Horace, in the place juſt cited.

FAUNS, FAUNI, among the ancients, were a ſpecies of demi-gods inhabiting the foreſts; called alſo *Sylvans*, *Sylvani*, and little differing from the SATYRS. They delighted more particularly in vineyards, and they generally appear as attendants of Bacchus, in the repreſentations of Bacchanal feaſts and proceſſions. They were repreſented as half men, half goats, having the horns, ears, feet, and tail of a goat, a very flat noſe, and the reſt human.

The Roman *Faunus*, we have obſerved, was the ſame with the Greek Pan. Now, in the poets we find frequent mention made of *Fauns* and Panes in the plural number; in all probability, therefore, the *Fauns* were the ſame with the PANES.

Though the *Fauns* were held for demi-gods, yet they were ſuppoſed to die after a long life. Arnobius ſhews that their father or chief, Faunus himſelf, only lived 120 years.

FAVONIUS, among the Romans, the wind which blew directly from the weſt.

FAVORITO, in the *Italian Muſic*, is an epithet given to ſuch parts of any compoſition as are performed to the greateſt advantage. Thus, *choro favorito* is a chorus in which are employed the beſt voices and inſtruments to ſing the recitativos, play the ritornellos, &c. This is otherwiſe called the *little chorus*, or *choro recitante*.

FAVOUR, in *Commerce*. See DAYS *of grace*.

FAUSSE-BRAYE, in *Fortification*, an elevation of earth, about three feet above the level ground; round the foot of the rampart on the outſide, defended by a parapet about four or five fathoms diſtant from the upper parapet, which parts it from the berme, and the edge of the ditch; its uſe is for the defence of the ditch. The *fauſſe-braye* is the ſame with what is otherwiſe called *chemin des rondes*, and *baſſe eincente*.

It is of little uſe where ramparts are faced with wall, becauſe of the rubbiſh which the cannon beats down into it: for this reaſon engineers will have none before the faces of the baſtions where the breach is commonly made, becauſe the ruins falling, the *fauſſe braye* makes the aſcent to the breach the eaſier; beſides, that which flies from the face often kills the ſoldiers placed to defend it.

For theſe reaſons it is generally diſuſed by modern engineers, more eſpecially ſince the invention of ricochet-firing, which renders it extremely eaſy to enfilade the low works of the *fauſſe-braye* from one end to the other.

FAUSSE *chenille*, in *Natural Hiſtory*, a term uſed by Mr. Reaumur and other of the French writers to expreſs a large claſs of worms produced from the eggs of ſeveral ſpecies of four-winged flies. Theſe worms have greatly the appearance of caterpillars in their general form, ſo that they have deceived many writers on inſects into an opinion that they really were ſo. Their bodies are long, in the manner of the caterpillar, and they are compoſed of ſeveral rings or joints: the ſkin is of the ſame conſiſtence with that of the caterpillar's; and in many ſpecies the creature is variegated with beautiful colours, diſpoſed in the ſame manner as thoſe of the ſmooth caterpillars uſually are. Both theſe kinds of inſects have a great number of legs, and thoſe of two kinds ſome membranaceous, and others ſcaly. Both the worm and the caterpillar have each ſix of the ſcaly legs; but the membranaceous ones are different in number, and are alone ſufficient to conſtitute a difference between them. The caterpillars have never more than ten of theſe, which, with

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with the ſcaly ones, make ſixteen, the utmoſt number of the legs of any caterpillars: but theſe worms have always at leaſt twelve of the latter kind of legs, which, with the ſix ſcaly ones, make the whole number eighteen; and many ſpecies have fourteen, ſixteen, or eighteen of the membranaceous ones alone. The membranaceous legs of the worms differ alſo from thoſe of the genuine caterpillars, in that they are not furniſhed with the hooks at their ends, which thoſe of the latter have. The legs therefore alone give a ſufficient baſis of diſtinction between the caterpillar and the *fauſſe chenille*, or caterpillar worm; but there is yet a more obvious diſtinction between them in the ſhape of their heads; and by this they may always be known from each other at firſt ſight. The heads of the various ſpecies of caterpillars are of ſeveral very different ſhapes; ſome are ſhort, others long; ſome more, ſome leſs flatted; and ſome terminate in a ſharp point, while others are diſtinguiſhed by a ſort of ſlit or diviſion in the back-part. Theſe differences are found in the ſeveral kinds of the genuine caterpillars; but the heads of all the *fauſſe chenilles* are of one ſhape, and that very different from all theſe; they are round and very convex, ſo that they appear a part of a ſmall ſphere. The mouth of theſe, and of the genuine caterpillars are wholly alike, and the ſtigmata are placed in the ſame manner. The eyes, however, of the two kinds ſufficiently diſtinguiſh them, the *fauſſe chenille* having only two, and thoſe very large and prominent, and placed on each ſide of the head; whereas the caterpillar has five eyes on each ſide of its head, and thoſe placed in a circular direction, and too ſmall to be ſeen without the aſſiſtance of glaſſes.

Theſe creatures differ from the common caterpillars in their manner of remaining on the leaves of a plant: the caterpillar is always extended at its full length, whether it is eating or not; but the *fauſſe chenille*, though it extends its body to the full length while eating, always rolls it up into a ſpiral when at reſt, making ſeveral circular turns with it, of which the head is at the end of the outermoſt, and the tail in the very center of the inner one. They give themſelves various odd contortions when they are ſeizing on their food; and it is a very whimſical ſight to obſerve twenty or thirty of them in thoſe kinds which live in ſociety attacking the different portions of the ſame leaf all at once, and each giving its body ſome odd turn at the ſame time. This is a common ſight on the leaves of the oſier, a whitiſh-green kind being very frequent in large companies on that tree, and often ſeen thus feeding in coveys. It is remarkable, that as the caterpillar feeds indifferently on every part of the leaf, this animal uſually attacks only the edges.

The creature, when it finds the time of its change into the nymph ſtate approaching, gives itſelf the trouble of forming a caſe in which it may paſs into that ſtate, and remain in it during the deſtined time without being ſubject to external injuries: it ſpins a web of ſilk for this purpoſe of the ſhape of a little egg. This on the outſide ſhews nothing remarkable; but when cut open, it is found to be compoſed of two different ſubſtances, at leaſt of two ſubſtances of very different workmanſhip, though the materials are the ſame in both. The outer caſe is reticulated, and formed of very ſtrong threads woven into a looſe open net-work; but the inner one is formed of extremely fine threads, and thoſe wove into a cloſer ſtuff than all that the loom can come up to. The outer ſtrong and coarſe web was plainly intended for no other purpoſe but for the better defending and preſerving them from injuries; and theſe two diſtinct caſes do not any where adhere to one another but barely touch; ſo that on pulling aſunder the outer one between the fingers the inner one comes out whole. The ſtrength of this exterior ſhell is extremely neceſſary, as alſo the cloſe texture of the inner one for defending the incloſed animal in the nymph ſtate from ſeveral devouring inſects. The ants in particular are very fond of theſe nymphs, and will hunt out the caſes wherever they are to be found; and if they can eat their way through them, are ſure to make a meal of the incloſed creature.

The flies produced of theſe inſects are of that kind which have no trunks, but have a ſtrong tooth on each ſide of the head, which meeting one with the other in the middle of the mouth, are able to cut any thing to pieces that the creature has occaſion to make its way through. The firſt uſe of theſe is the eating a hole through the double web, in which the creature finds itſelf incloſed at its birth. All the flies of this kind have a general reſemblance one to another, and may be known to belong to the ſame family, though they are very different in colour and other obvious characters. They are never very handſome, and are all as it were ſtupid, having very little motion, and ſtanding readily at any time to be caught between the fingers. Their wings always are croſſed over the body, and form a ſort of raiſed covering over it; they are not ſmooth and even as thoſe of moſt other flies, but have prominencies and cavities, and ſeem as if they had been but ill expanded at the time of the creature's hatching from the nymph ſtate. Reaumur's Hiſt. Inſ. vol. ix. p. 133.

All the females of theſe flies are oviparous, no one ſpecies producing living worms; and as theſe eggs muſt neceſſarily be lodged in cavities or niches made in the ſtalks or leaves of living plants, nature has provided this creature with two inſtruments which are deſtined for this ſole purpoſe, and which are real ſaws made in the niceſt manner, with extremely ſmall teeth. The creature has the power of uſing both theſe at once, and conſequently can make an aperture with great eaſe that ſhall be ſufficient to lodge its eggs in. Notwithſtanding that there are many different ſpecies of flies which have this ſort of inſtrument, and ſeveral of them are extremely frequent on one of the moſt common of all our garden ſhrubs, the roſe-tree; yet no author had obſerved this elegant and wonderful inſtrument till the time of Valliſnieri, who has deſcribed and figured at length the weapons of a roſe-tree fly, produced from a falſe caterpillar of that ſhrub, with two rows of teeth, one on each ſide in the manner of the ſaw of the *ſerra piſcis*, or *ſaw-fiſh*. See ROSE-*fly*.

FAUX-BOURDON, *baſtard humble-bee*, a name given by Reamur and other French naturaliſts to the bees uſually called by us drones, and by the common people of that nation bourdons, confounding them with the common humble-bee under that name. See DRONE.

FAUX PUCERON, in *Natural Hiſtory*, a name given by Reamur and others to a genus of inſects much reſembling the *pucerons* in many things, but differing in ſome material circumſtances. The two principal kinds of theſe are found on the back of the leaves of the fig-trees, and in little hollow balls at the ſummits of the branches of box, formed of the upper leaves vitiated by the bitings of theſe creatures. See FIG-*inſect* and GRUB *of the box*.

To FAY, in *Ship-building*, is to ſet any two pieces of wood ſo as to join cloſe together: the plank is ſaid *to fay* to the timbers when it bears or lies cloſe to all the timbers.

FAWN, among *Hunters*, is a buck or doe of the firſt year, or the young one of the buck's breed in its firſt year.

FEAL was anciently uſed for *faithful*; hence the tenants by knights ſervice uſed to ſwear to their lords to be *feal* and *leal*; that is, *faithful* and *loyal*.

FEALTY, an oath taken at the admittance of every tenant to be true to his lord, while he holds his land.

Fealty is uſually mentioned as ſynonymous with homage; but it differs from it, as homage conſiſts in taking an oath when the tenant comes to his land, and is done but once, being an obligation which is permanent, and binds for ever, which *fealty* does not.

They differ alſo in the manner of the ſolemnity; for the oath of homage is taken by the tenant kneeling, but that of *fealty* is taken ſtanding, and includes ſix things, which are compriſed in the words *incolume*, *tutum*, *utile*, *honeſtum*, *facile*, *poſſibile*.

Incolume, that he do no bodily injury to the lord; *tutum*, that he do him no ſecret injury in any thing which is for his defence, as in his houſe or caſtle; *honeſtum*, that he do him no injury in his reputation; *utile*, that he do not damage him in his poſſeſſions; *facile* and *poſſibile*, that he make it eaſy and not difficult for the lord to do any good which otherwiſe he might do: all which is likewiſe compriſed in Leg. Hen. I. cap. 5.

He that holds land by this only oath of *fealty*, holds in the freeſt manner; for all, even thoſe that have fee, hold *per fidem & fiduciam*; that is, by *fealty* at the leaſt.

This *fealty* is alſo uſed in other nations, as in Lombardy and Burgundy.

Indeed, as the very firſt creation of this tenure grew from the love of the lord towards his followers, ſo did it bind the tenant to fidelity, as appears by the whole courſe of the feuds, and the breach thereof is loſs of the fee.

Hottoman, in his Commentaries de Verbis Feudalibus, ſhews a double *fealty*; the one *general*, to be performed by every ſubject to his prince, anſwering to our oath of ALLEGIANCE; and the other *ſpecial*, required only of ſuch, as in reſpect of their fee are tied by this oath towards their lords. We read of both alſo in the Grand Cuſtomary of Normandy, &c.

Fealty ſpecial was with us performed either by freemen or villains. By 17 Ed. II. ſtat. 2. the form of this oath is appointed, and as now obſerved it is as follows: "I A. B. will be to you my lord C. true and faithful, "and bear to you *fealty* and faith for the lands and te- "nements which I hold of you; and I will truly do and "perform the cuſtoms and ſervices that I ought to do to "you. So help me God." The oath is adminiſtered by the lord or his ſteward; and though it is neglected in ſome manors, yet in copy-hold manors, where courts are kept, and copy-hold eſtate granted, it is generally uſed.

Every

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Every lord, of whom tenements are holden at this day, may, and ought to call upon his tenants to take this oath in his court-baron, becauſe if it be long neglected he may loſe his ſeignory, and the profits ariſing from eſcheats and other contingencies.

Fealty is incident to all ſorts of tenures, except from frank-almoign and tenancy at will.

FEAR, in *Ethics*, is the apprehenſion of ſome evil likely to befal us, attended with a deſire of avoiding it. This paſſion has been found to leſſen PERSPIRATION and urine.

FEAST, or FESTIVAL, a church ſolemnity, or rejoicing in honour of God or a ſaint.

The word is formed of the Latin, *feſtum*, which ſome derive *a feriari, to keep holiday*; others from the Greek, ἑστιάω, *I feaſt* or *entertain*, of ἑστία, *hearth, fire*.

Feaſts, and the ceremonies thereof, have made great part of the religion of almoſt all nations and ſects; witneſs thoſe of the Greeks, Romans, Hebrews, Chriſtians, and Mahometans. *Feaſts* among us are either *immoveable* or *moveable*.

FEASTS, *immoveable*, are thoſe conſtantly celebrated on the ſame day of the year; the principal of theſe are Chriſtmas-day, or the Nativity; the Circumciſion, Epiphany, Candlemas, or the Purification; Lady-day, or the Annunciation, called alſo the Incarnation and Conception; All Saints, and All Souls; beſides the days of the ſeveral apoſtles, St. Thomas, St. Paul, &c. which with us are *feaſts*, though not *feriæ*. See each *feaſt* under its proper article.

FEASTS, *moveable*, are thoſe which are not confined to the ſame day of the year. Of theſe the principal is Eaſter, which gives law to all the reſt, all of them following, and keeping their proper diſtances from it; ſuch are Palm-Sunday, Good-Friday, Aſh-Wedneſday, Sexageſima, Aſcenſion-day, Pentecoſt, and Trinity-Sunday. See EASTER, SEXAGESIMA, PENTECOST, TRINITY, &c.

The four *feaſts* which our laws take ſpecial notice of are the Annunciation of the bleſſed Virgin Mary, or Lady-day, the 25th of March; the Nativity of St. John the Baptiſt, held on the 24th of June; the *Feaſt* of St. Michael the Archangel, on the 29th of September; and that of St. Thomas the Apoſtle, on the 21ſt of December: on which quarterly days rent on leaſes is uſually reſerved to be paid, 5 and 6 Ed. VI. cap. 3. 3 Jac. I. cap. 1. 12 Car. II. cap. 30.

Beſide theſe *feaſts* which are *general*, and enjoined by the church, there are others *local* and *occaſional*, enjoined by the magiſtrate, or voluntarily ſet on foot by the people; ſuch are the days of thankſgiving for delivery from wars, plagues, &c. Such alſo are the vigils or wakes in commemoration of the dedications of particular churches. See VIGIL, &c.

The prodigious increaſe of *feaſt-days* in the Chriſtian church commenced towards the cloſe of the fourth century, and was occaſioned by the diſcovery that was then made of the remains of martyrs and other holy men, for the commemoration of whom they were eſtabliſhed. Theſe, inſtead of being ſet apart for pious exerciſes, were abuſed in indolence, voluptuouſneſs, and criminal practices. Many of them were inſtituted on a pagan model, and perverted to ſimilar purpoſes.

The firſt *feaſts* among the Greeks were celebrated in ſolemn aſſemblies of the whole nation, on occaſion of their games, as the Olympic, the Pythian, the Iſthmian, and Nemæan; in proceſs of time they had many others, the principal of which are enumerated in the courſe of this work. See Potter's Arch. vol. i. cap 19, 20.

The Romans alſo had abundance of ſtated *feaſts* in honour of their deities and heroes: ſuch were the Saturnalia, Cerealia, Lupercalia, Liberalia, Neptunalia, Conſualia, Portumnalia, Vulcanalia, Palilia, Divalia, &c. See SATURNALIA, &c.

They had alſo *feaſts* inſtituted occaſionally; as Carmentalia, Quirinalia, Terminalia, Floralia, Compitalia, Lemuria, Vernalia, beſide other moveable and occaſional ones; as to give thanks to the gods for benefits received; to implore their aſſiſtance, or to appeaſe their wrath, &c. as the Paganalia, Feralia, Bacchanalia, Ambarvalia, Amburbalia, Suovetaurilia, and divers others, particularly denominated *feriæ*; as Sementinæ, Latinæ, &c. See each of theſe *feaſts* and *feriæ* in its proper place.

The *feaſts* were divided into days of ſacrifice, and days of banqueting and feaſting; days of games, and days of reſt, or *feriæ*.

There being but little hiſtory wrote, or at leaſt publiſhed in thoſe days; one end of *feaſts* was to keep up the remembrance of paſt occurrences.

The principal *feaſts* of the Jews were the *feaſts* of trumpets, that of the expiation, of tabernacles, of the dedication, of the paſſover, of pentecoſt, and that of purification.

The modern Jews have other *feaſts* marked in their calendar of modern inſtitution. The Mahometans, beſides their weekly *feaſt*, or ſabbath, which is kept on Friday, have two ſolemn *feaſts*, the firſt of which is called the *Feaſt* of Victims, and celebrated on the tenth day of the laſt month of their year; and the ſecond, called BAIRAM. The Chineſe have two ſolemn *feaſts* in the year, in memory of Confucius, beſides others of leſs note on other days of the year.

FEAST *of the dead*, is a ſolemn religious ceremony in uſe among the ſavages of America, ſome of whom thus teſtify their reſpect for the deceaſed every eight years; and others, as the Hurons and Iroquois, every ten years.

FEAST is alſo uſed for a banquet, or a ſumptuous meal, without any immediate view to religion.

The uſe of the word, in this ſenſe, ariſes hence; that a part of the ceremony of many of the ancient feſtivals, both thoſe of the Heathens and the *agapæ* of the Chriſtians was good eating; though Mr. Huet chooſes to derive the word from *feſtinare*, which, in an ancient Latin verſion of Origen's Comment on Matthew, ſignifies *to feaſt*: *Ut veniens illus Jeſus feſtinet cum diſcipulis ſuis.*

In all antiquity, both ſacred and prophane, ſacrifices were little more than religious *feaſts*.

It has been often obſerved by authors, that there is no nation in the world comes near the Engliſh in the magnificence of their *feaſts*. Thoſe made at our coronations, inſtallments, conſecrations, &c. tranſcend the belief of all foreigners; and yet it is doubted whether thoſe now in uſe are comparable to thoſe of our forefathers.

The Perſians never diſcourſe and deliberate of their moſt important affairs but in the middle of their *feaſts*.

FEATHER, *Pluma*, that part in birds which covers them, and by which they are enabled to fly.

Feathers make a conſiderable article in commerce, particularly thoſe of the oſtrich, heron, ſwan, peacock, gooſe, &c. for plumes, ornaments of the head, filling of beds, writing-pens, &c.

Geeſe are plucked in ſome parts of Great Britain five times in the year; the firſt plucking is at Lady-day for *feathers* and quills; and the ſame is renewed for *feathers* only four times more between that and Michaelmas. See FEN and GOOSE. In cold ſeaſons many geeſe die by this barbarous cuſtom. Thoſe *feathers* that are brought from Somerſetſhire are eſteemed the beſt, and thoſe from Ireland the worſt. Eider down is imported into this country from Denmark, and is furniſhed by thoſe DUCKS that are inhabitants of Hudſon's Bay, Greenland, Iceland, and Norway: Hudſon Bay alſo affords a very fine *feather*, ſuppoſed to be of the gooſe-kind. The down of the ſwan is brought from Dantzick, whence we have alſo a great quantity of cock and hen *feathers*. The beſt method of curing *feathers* is to lay them in a room in an expoſure to the ſun, and when dried to put them in bags, and beat them well with poles to diſcharge the duſt.

Feathers ſeem to be only productions and expanſions of the laſt extreme fibrillæ of the cutis; and hence, upon ſtripping off the cutis, the *feathers* are likewiſe always taken away; juſt as the leaves and fruit follow, upon peeling the bark off a tree: add, that *feathers* as well as hairs ariſe out of pores in the cutis; which pores are not mere apertures or foramina, but a kind of vaginulæ, wove of the fibres of the ſkin, which terminate in the oſcula or anaſtomaſes of the internal fibres of the *feather*.

Feathers, Dr. Derham obſerves, are a very commodious dreſs for the inhabitants of the air, being not only a guard againſt wet and cold, and a means for hatching and brooding their young, but moſt commodious for flight; to which purpoſe they are nicely placed over the body to give an eaſy paſſage, and every-where neatly poſited from the head towards the tail in cloſe uniform order; ſo that being pruned and dreſſed by an unctuous matter ſecreted in a proper gland, and depoſited in an oil-bag placed therein for that purpoſe, they afford as eaſy a paſſage through the air as a boat new cleaned and dreſſed has through the waters. Without all this nicety they would have been apt to be ruffled and diſcompoſed, and would have gathered air, and proved an obſtruction to the paſſage of the body.

Moſt of the *feathers* tend backwards, and are laid over each other in an exact method, armed with a warm and ſoft down next the body, and more ſtrongly made, as well as more curiouſly cloſed next the air and weather; to which purpoſe the *apparatus* nature has made, and the inſtinct ſhe has given them to prune or dreſs their *feathers*, are admirable.

The mechaniſm of the *feather* is wonderful; the ſhaft or rib is exceeding ſtrong, but hollow below, for ſtrength and lightneſs ſake; and above, not much leſs ſtrong, and filled with a *parenchyma* or pith both ſtrong and light.

But the vanes or webs in the flag-part of the wing are nicely gaged, broad on one ſide, and narrower on the

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other, the edges of the exterior vanes bending downwards, and thoſe of the interior or wider upwards; by which means they catch hold and lie cloſe to each other when the wing is ſpread, ſo that not one *feather* may miſs its full force and impulſe upon the air: the tips are all made ſloping; thoſe of the interior vanes ſloping to a point towards the outer-part of the wing, and the exterior vanes towards the body; ſo that the wing, whether extended or ſhut, is as neatly ſloped and formed as if conſtantly trimmed with a pair of ſciſſars.

Dr. Derham has ſeveral new obſervations on the mechaniſm of the vanes or webs of the *feathers* as they preſent themſelves to the microſcope, by which the wonderful care and accuracy of the Creator in ſo ſmall a part are excellently illuſtrated.

The vane conſiſts not of one continued membrane (becauſe, if once broken, it would then be ſcarce reparable), but of many *laminæ*, admirably contrived to hook and hang together. On the under-ſide they are thin and ſmooth; but on their upper outer edge, (repreſented *Tab. Nat. Hiſt. fig.* 3.) they are parted into two hairy edges, each ſide having a different ſort of hairs, laminated or broader at the bottom, and ſlenderer and bearded towards the top. Thoſe bearded hairs on one ſide of the *laminæ* have ſtrait beards, as repreſented in *fig.* 4. thoſe on the other have hooked beards on one ſide of the ſlender part of the briſtle and ſtrait ones on the other, as in *fig.* 5. Both kinds are repreſented as they grow on the upper edge of the lamina in *fig.* 3. in the vane; the hooked beards of one lamina always lie next the ſtrait beards of the next lamina, by which means they lock and lay hold on each other, and by a pretty mechaniſm brace the laminæ cloſe to one another.

FEATHER-*bed*.
FEATHERS, *dry-pulled*.
FEATHERS, *ſcalded*.
} See BED.

FEATHER-*edged boards and planks*, are thoſe which are thicker on one ſide than on the other.

FEATHER, in the *Manege*, a ſort of natural frizling of the hair found in many parts of a horſe's body, but more commonly between the eyes. In ſome caſes it reſembles an ear of barley, and in others an oilet-hole. Many are of opinion, that when the *feather* is lower than the eyes it is a ſign of a weak eye-ſight; but this remark is not certain.

FEATHER, *prince's*, in *Botany*. See AMARANTH.

FEATHER, *Roman*, called in French *epée Romaine*, is a *feather* upon a horſe's neck, being a row of hair turned back and raiſed, which forms a mark like a ſword-blade juſt by the mane.

FEATHER, *mid*, in the *Engliſh Salt-works*. See MID.

FEATHER, *ſea*. See GORGONIA.

FEAZING, at *Sea*, is the ravelling out of the cable or any great rope at the ends.

FEBRIFUGE, in *Medicine*, a remedy efficacious for the cure of FEVERS.

The word is a compound of *febris* and *fugo*, *I drive away*.

The *quinquina*, or Jeſuit's bark, is the greateſt and ſureſt of all the claſs of *febrifuges*.

The little centaury is ſometimes alſo called *febrifugum*, on account of its virtues.

The Chineſe ginſeng is alſo particularly famed as a *febrifuge*. For ſuch as cannot take the Peruvian bark in ſubſtance, Dr. Fuller preſcribes a *febrifuge* clyſter, made of a decoction thereof. The inner bark of the aſh-tree, with a little ſalt of wormwood, taken like the Peruvian bark, is ſaid to equal, or even exceed it, as a *febrifuge*.

The like is aſſerted of the bark of the elm, near the root.

The flowers of *ſal armoniac* are held an excellent *febrifuge*, eſpecially in intermitting fevers. Cold water has been much extolled as a *febrifuge*. Dr. Handcock gives it the emphatical denomination of *febrifugum magnum*.

M. Reneaume, in the Hiſt. de l'Academ. R. Sciences, an. 1711, propoſes a new *febrifuge* of his own diſcovery, viz. galls. From a great number of experiments he has learnt, that galls alone will frequently cure an intermitting fever as well as the *quinquina*, over which this medicine has ſome advantage in other things, in that it is not ſo bitter, does not heat ſo much, is taken in a leſſer doſe, and ſeldomer, and is cheaper. At his motion ſeveral other phyſicians tried it with ſucceſs, particularly M. Homberg, though it did not ſucceed ſo well with M. Boulduc, Lemery, and Geoffroy. If the flowers of antimony, made with ſal ammoniacum and antimony ſublimed together, are expoſed to the air, they produce a liquid called *febrifuge* oil. The Germans call the pulvis ſtypt. Helv. the *febrifuge* powder; and the ſame name is given in England to a mixture of ocul. cancr. 3 ſs. and tart. emet. gr. ij. This is adminiſtered in doſes of gr. iij to vi. The *febrifuge* ſalt is the ſal marin. regen. The *febrifuge* ſpirit of Mr. Clutton is prepared by digeſting together for a month equal parts of oil of ſulphur by the bell, rectified oil of vitriol and ſpirit of ſalt, with three times the whole quantity of rectified ſpirit of wine, and diſtilling them to dryneſs. This ſpirit mixed with water, ſo as to render it agreeably acid, is given with common drink in ardent and inflammatory fevers, and with any cordial or antiſeptic liquors in the nervous and putrid kinds.

FEBRIS, in *Medicine*. See FEVER.

FEBRIS, *ephemera*. See EPHEMERA.

FEBRIS *inteſtinalis*. See *Inteſtinal* FEVER.

FERRUA, or FEBRUATA, in *Mythology*, an appellation given to Juno as the goddeſs of purification, and as preſiding over women in the pains of labour and childbirth.

FEBRUA, in *Antiquity*, a feaſt held by the Romans in the month of February, in behalf of the MANES of the deceaſed. Macrobius tells us that ſacrifices were here performed, and the laſt offices paid to the ſhades of the defunct. Saturn. lib. i. cap. 13. And from this feaſt it was that the month of February took its name.

The deſign of theſe ſacrifices is ſomewhat controverted: Pliny ſays they were performed to render the infernal gods propitious to the deceaſed; though ſome of the moderns have imagined that they were intended to appeaſe the deceaſed themſelves, and were offered immediately to them as a ſort of deities. What confirms the former ſentiment is, that Pluto himſelf is ſurnamed *Februus*. They laſted twelve days.

The word is of an ancient ſtanding in the Latin tongue: from the very foundation of the city we meet with *februa* for *purifications*, and *februare*, *to purge* or *purify*. Varro, De Ling. lib. v. derives it from the Sabines; Voſſius, and others, from *ferveo*, *I am hot*, becauſe purifications were chiefly performed with fire and hot water. Some go higher, and even deduce the words from פור, *phur*, or *phavar*, which, in the Syriac and Arabic, has the ſame ſignification with *ferbuit*, or *efferbuit*, and might probably likwiſe ſignify *to purify*; for *phavar*, in Arabic, denotes a preparation given to women in child-bed to bring away the after-birth, and other impurities remaining after delivery, much as among the Romans, who gave the name *Februa* to the goddeſs ſuppoſed to preſide over the delivery of women. Ovid. Faſt.

FEBRUARY, *Februarius*, in the *Roman Chronology*, the ſecond month of their year, ſo called from FEBRUA, a feaſt held therein.

In the firſt ages of Rome, *February* was the laſt month of the year, and preceded January, till the decemviri made an order that *February* ſhould be the ſecond month of the year, and come after January. See BISSEXTILE.

FECES. See FÆCES.

FECIALES, or FOECIALES, an order of prieſts or officers, conſiſting of twenty perſons, among the ancient Romans, appointed to proclaim war, negociate peace, &c.

Feſtus derives the word from *ferio*, *I ſtrike*, as *ferire fœdus* ſignifies *to conclude a treaty*; and accordingly, inſtead of *feciales* he would have it wrote *feriales*. Others derive it from *fœdus*, which was anciently written *fedus*; or from *fides*, *faith*; others from *facio*, *feci*, *I make*, &c. becauſe they made war and peace. Voſſius chooſes to derive it from *fatu*, of the verb *fari*, *to ſpeak*; in which ſenſe the *feciales* ſhould be the ſame with *oratores*; which ſentiment is alſo confirmed by the authority of Varro, who ſays they were called indifferently, *feciales* and *oratores*. De Vit. Popul. Roman. lib. ii.

The *feciales* were a ſort of heralds or kings at arms, who, when the Romans had any diſpute with their neighbours, were ſent firſt to demand the thing pretended to be uſurped, or require ſatisfaction for the injury alledged to be done. If an anſwer was not returned by them that was ſatisfactory to the people and the ſenate, they were diſpatched again to declare war, and the like in treating of peace, the *feciales* being the only perſons appointed to negociate between the ſenate, &c. and the enemy.

Plutarch, in the Life of Numa, and Halicarnaſſeus, lib. ii. obſerve, that they were firſt inſtituted by that prince. The latter adds, that they were choſen out of the beſt families in Rome; that their office, which was reputed a ſort of ſacerdotium, or prieſthood, only ended with their life; that their perſons were ſacred and inviolable, as thoſe of other prieſts; that they were even charged to ſee the republic did not declare war unjuſtly; that they were to receive the complaints and remonſtrances of nations who pretended to have been any way injured by the Romans; that if thoſe complaints were found juſt, they were to ſeize the criminals, and deliver them up to thoſe they had offended; that they were inveſted with the rights and privileges of ambaſſadors; that they concluded treaties of peace and alliance, and took care they were executed; and laſtly, aboliſhed them, if they were found

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found not to be equitable. Livy, lib. i. cap. 24. aſcribes their inſtitution to Ancus Martius, in the year of Rome 114. See alſo Aul. Gell. lib. xvi. cap. 4.

But Varro aſſures us, that in his time moſt of theſe functions of the *feciales* were ſet aſide; as thoſe of the ancient heralds at arms are among us at preſent; though Plutarch obſerves, that they had ſtill ſome authority in his time.

The *feciales* were crowned with *verbena*, *vervain*, when they went to declare war; their head was covered with a veil, over which the crown was applied; in this equipage they proceeded to the frontiers of the new enemy's country, and threw a bloody dart or javelin into the ground within the ſame. In Livy, and other ancient authors, we have the formula uſed in ſuch declarations.

FECULA, or FÆCULA, in *Pharmacy*, a white, mealy ſubſtance or powder which ſubſides and gathers at the bottom of the expreſſed juices of divers roots; as thoſe of briony, arum, iris, &c.

The word *fæcula* is a diminutive of FÆCES.

This ſubſtance or ſediment they dry in the ſun, after having poured off the liquors, and it ſerves for divers remedies, &c.

FECULENT, or FÆCULENT, is applied to the blood and other humours, when they abound in fæces or dregs, or have not the proper and uſual degree of purity.

FECUNDITY, or FOECUNDITY, *fertility*, or that quality of a thing which denominates it fruitful.

The *fecundity* of divers plants is very extraordinary. M. Dodart has an expreſs diſcourſe on this ſubject, in the Memoirs of the Academy of Sciences; wherein he ſhews, that, at a moderate computation, an elm, one year with another, yields 329,000 grains or ſeeds, each of which, if properly lodged, would grow up into a tree: now, an elm ordinarily lives 100 years, conſequently, in the courſe of its life it produces near 33,000,000 ſeeds, all which ariſe from one ſingle ſeed.

He ſhews farther, that the ſame elm by frequently cutting off its head, &c. might be brought to produce 15,840,000,000 ſeeds, and conſequently that there are ſo many actually contained in it.

FECUNDITY *of fiſh*. See FISH.

FEDOA, in *Zoology*, a name uſed by Geſner and ſome other authors for the GODWIT, more commonly called ÆGOCEPHALUS. See VETOLA.

FEE, FEUD, FEUDUM, FEODUM, or FIEF, an eſtate, land, tenement, lordſhip, or the like, held of a ſuperior lord, on condition of fealty, homage, or other acknowledgment.

The word is derived by ſome authors from *fœdus*, as ariſing from a treaty or allianee made with the lord; but the opinion of Selden ſeems the beſt authoriſed, who brings it from the Saxon, *feoh*, *ſtipendium*, the *fee* being a kind of prebend to live upon; and accordingly we find, that in ancient times it was uſed for the wages and appointments of officers. It is obſerved by Pontopiddan, in his Hiſtory of Norway, that in the Northern languages *odh* ſignifies *property*, and therefore *feedoh*, or *feudum*, will denote *ſtipendiary property*.

The term *fee* is properly applied to lands and tenements, which we hold in perpetual right, on condition of an acknowlegment of ſuperiority in a higher lord. See TENURE.

The writers on this ſubject divide all lands and tenements wherein a man has a perpetual eſtate to him and his heirs into ALLODIUM and FEUDUM.

Allodium is defined to be a man's own land, which he poſſeſſes merely in his own right, without acknowlegement of any ſervice or payment of any rent to another; and this is property in the higheſt degree.

Feudum is that which we hold by the benefit of another, and for which we do ſervice or pay rent, or both to the chief lord.

Originally a *feud* was only an eſtate for life; and thoſe to whom it was granted were called *vaſſalli*, who by ſuch means were brought to a ſtricter diſcipline and obedience to the princes, and were bound to ſerve them in wars.

The origin of *fees* or *feuds* is one of the darkeſt and moſt intricate points in modern hiſtory. Some attribute the invention to the Lombards. Sir Thomas Craig inclines to this opinion, and ſays, that the Lombards, after they were ſubdued by Charlemagne, not only retained their ancient cuſtoms, but at the return of that emperor into France tranſmitted them with him into the remoteſt parts of that kingdom. In reality, the conſtitution of *feuds* had its original from the military policy of the Northern or Celtic nations, the Goths, Hunns, Franks, Vandals, and Lombards, who ſpread themſelves over Europe at the declenſion of the Roman empire. This is rendered probable by the demand which the Cimbri and Teutones, nations of the ſame original, are recorded to have made on the Romans on their firſt irruption into Italy, about a century before the Chriſtian æra. They demanded of the Romans, *Ut martius populus aliquid ſibi terræ daret, quaſi ſtipendium: cæterum, ut vellet, manibus atque armis ſuis uteretur*; i. e. they deſired *feuds* to be allowed them, which they were to hold by military and other perſonal ſervices. L. Florus, lib. iii. cap. 3. Having brought this conſtitution from their own countries, they continued it in their reſpective colonies as the moſt likely means to ſecure their new acquiſitions; and for this purpoſe the victorious general allotted large diſtricts of land to the ſuperior officers of the army; and theſe again diſtributed ſmaller parcels to the inferior officers and more deſerving ſoldiers. However, the *feudal* policy was only brought by degrees into that ſtate, which we find eſtabliſhed in the empire under Conrade the Salic, and in France under Hugh Capet. Sir Thomas Craig has diſtinguiſhed four ſtates of the *feudal* law; its infancy, comprehending the period between the firſt overflowing of the Northern nations and the year 650; its childhood, the time in which *fiefs*, which were before annual, or at moſt for life, were extended to the ſons of the vaſſal, and no farther, viz. from the year 650 to the year 800, when Charlemagne was crowned emperor; its adoleſcence, from the times of Charlemagne to thoſe of Conrade II. or the Salic, who began his reign in the year 1024, and not only confirmed the inheritance of *fiefs* to the ſons and grandſons of the vaſſals, but permitted one brother to ſucceed another in his paternal eſtate: but even after the alteration made by Conrade, it was not uncommon in Germany to grant *fiefs* only for life; a charter of this kind occurs as late as the year 1376; and its maturity from this period forward, when *feuds* were permitted to deſcend to collaterals as far as the ſeventh degree. Others find ſome appearance of the duties of a vaſſal to his lord, in the ancient relations between the patron and his client; and others look for its riſe in the Roman *Beneficia*.

The emperors, it ſeems, diſtributed lands among the ancient legions on condition of their holding themſelves ready at all times to take up arms in defence of the frontiers of the empire, which affords us a good image enough of *feuds*, though in all probability their firſt origin ſhould be traced higher; but in proceſs of time their nature was changed, and duties were annexed to them which originally were not.

Du-Moulin makes no doubt, but that theſe diſtributions of land, called *benefices*, were the firſt matter of *fees*; for which reaſon he uſes the terms *benefice* and *feud* promiſcuouſly, as if they were the ſame thing; and yet there was a good deal of difference between them, as there was neither fealty nor homage, nor the other *feudal* rights annexed to the benefice; and that the benefice was not hereditary.

Probably benefices began then to be called *feuds*, when they became hereditary; and when thoſe of whom the benefices were held began to demand faith or fealty from them. This fealty ſeems to conſtitute the *fee*; the word *fee* itſelf ſignifying, in the ancient Norman language, *faith*.

There is no fixing the preciſe æra when theſe changes commenced; for *fees*, ſuch as they now are, were not eſtabliſhed all at once; but in different countries they took place at different times, and in different manners. The great lords, after the deſtruction of the Roman empire, having in ſeveral parts uſurped the property of their benefices, laid likewiſe hold of the juriſdiction, and made their vaſſals their ſubjects; ſo that each became a ſort of petty ſovereign in his own territory.

Mezeray obſerves, that the donation of *fees* to the nobleſſe of France commenced under the reign of Charles Martel.

Hugh Capet, when he came to the crown, was himſelf ſo little eſtabliſhed that he durſt not oppoſe thoſe uſurpations, and was forced to ſuffer what he could not redreſs. See Le Fevre, De l'Origine des Fiefs, and Altaſerra's Origines Feudorum primoribus Galliæ. See FEUDUM.

The origin of *fees* in England, Camden carries as far back as the time of Alexander Severus. That prince having built a wall in the North of England to prevent the incurſions of the Picts, he ſome time after began to neglect the defence thereof, and gave, as Lampridius, in Vita Alex. Severi, aſſures us, the lands conquered from the enemy to thoſe of his captains and ſoldiers, whom that author calls *limitarios duces*, & *milites*; i. e. captains and ſoldiers of the frontiers; but it was on this condition, that their heirs ſhould continue in the ſervice, and that the lands ſhould never deſcend to private perſons; i. e. to ſuch as did not bear arms. That prince's reaſon was, that people, who in ſerving defended their own, would ſerve with a great deal more zeal than any others. Such, according to Camden, was the riſe of *fees* in our nation. Britan. p. 651.

However,

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However, the *feudal* polity originally derived from the Northern nations, and gradually eſtabliſhed on the continent of Europe, was not univerſally received in England, though ſome traces of it may be diſcerned in the times of the Saxons, who were firmly ſettled in this iſland as early as the year 600, and incorporated with the national conſtitution till the reign of William the Norman; and this was done not by the mere arbitrary will and power of the conqueror, but by the univerſal conſent of the common council of the kingdom, on the ſame principle of ſelf-ſecurity which had before induced the other nations of Europe to adopt it. The æra of formally introducing the *feudal* tenures by law was probably the latter end of the year 1086, when the king was attended by all his nobility at Sarum, and all the principal landholders ſubmitted their lands to the yoke of military tenure, became the king's vaſſals, and did homage and fealty to his perſon. This ingraftment of the *feudal* tenures and other cuſtoms of Normandy upon the ancient Saxon laws of Edward the Confeſſor produced a different political ſyſtem in this country, and changed both power and property in many reſpects; for thoſe hereditary eſtates of the Saxon nobility and gentry which were allodial, and not ſubject to any *feudal* ſervice, were converted into *feuds* and other lands which were of a *feudal* nature, and holden by military ſervice, having been granted only at will, or for a certain number of years, or at moſt for life or lives, and the grants of which were called benefices, were made hereditary *fiefs*. The *feudal* rights claimed in conſequence of this eſtabliſhment by the king over his tenants, and by them over their's, were conſiderably mitigated by the charter of Henry I. See MAGNA *charta*. Lord Lyttleton's Hiſt. of King Henry II. vol. i. p. 59, &c. vol. iii. p. 97, &c. Blackſtone's Comm. vol. ii. chap. 4.

All our lands in England (the crown-land, which is in the king's own hand in right of his crown, excepted) are of the nature of *feud* or *fee*. For though many have land by deſcent from their anceſtors, and others have bought lands, yet land cannot come to any, either by deſcent or purchaſe, but with the burden that was laid on him who had the novel *fee*, or who firſt received it as a benefice from his lord to him, and ſuch as ſhould deſcend from him, or to whom it ſhould be otherwiſe conveyed and transferred; ſo that no man has *directum dominium*; i. e. the very property or demain in any land but the prince in right of his crown. Camd. Britan. p. 93.

Though he who has *fee* has *jus perpetuum* and *utile dominium*, yet he owes a duty for it; ſo that it is not ſtrictly his own. Indeed, as much as is imported by the terms in which we expreſs our higheſt right in lands, &c. the moſt a man can ſay, is, "I am ſeiſed of this land in my "demain or demeſne as of *fee*."

It ſhould be obſerved, that our Engliſh lawyers do very rarely (of late years eſpecially) uſe the word *fee* in this its primary original ſenſe, in contradiſtinction to *allodium* or abſolute property, but generally uſe it to expreſs the continuance or quantity of an eſtate; ſo that a *fee* in general ſignifies an eſtate of inheritance, being the higheſt and moſt extenſive intereſt that a man can have in a *feud*. Blackſtone's Comm. vol. ii. p. 106.

In the ſtat. 37 Hen. VIII. cap. 16. *fee* is alſo uſed for lands veſted in the crown; but it is from ignorance of the import of the word; for *fee* cannot be without fealty ſworn to a ſuperior; but the king owns fealty to no ſuperior but God alone.

Fee is divided in our laws into *fee-abſolute*, called alſo *fee-ſimple*; and *fee-conditional*, alſo called *fee-tail*. See FEUD.

FEE, *frank*. See FRANK.

FEE-*ſimple*, *feudum ſimplex*, is that whereof we are ſeiſed to us and ours heirs for ever. Or it denotes an abſolute inheritance, clear of any condition, limitation, or reſtriction to particular heirs, but deſcendible to the heirs general, whether male or female, lineal or collateral. It is a general rule, that the word *heirs* is neceſſary in the grant or donation, in order to make a *fee* or inheritance: but this rule does not extend to deviſes by will, nor to fines and recoveries conſidered as a ſpecies of conveyance, nor to creation of nobility by writ, though in creations by patent, the word *heirs* muſt be inſerted; nor to grants of lands to ſole corporations and their ſucceſſors; nor finally, to the caſe of the king, in whom a *fee-ſimple* will veſt, without the words *heirs or ſucceſſors* in the grant.

FEE-*tail*, *feudum taliatum*, is that whereof we are ſeiſed with limitation to us and the heirs of our body. See TAIL.

Fee-tail is of two kinds, *general* and *ſpecial*.

Fee tail general, is where lands and tenements are given to a man and the heirs of his body begotten. So that if a man ſeiſed of ſuch land by ſuch gift marry one or more wives, and have no iſſue by them, and at length marry another, by whom he hath iſſue, this iſſue ſhall inherit the land.

Fee-tail ſpecial, is where a man and his wife are ſeiſed of lands to them and the heirs of their two bodies; where, in caſe the wife die without iſſue, and he marry another by whom he have iſſue, this iſſue cannot inherit the land, and therefore it is called *ſpecial tail*.

This *fee-tail ſpecial* has its origin from the ſtat. of Weſtm. 2. 13 Edw. I. cap. 1. Before that ſtatute, all land given to a man and his heirs, either *general* or *ſpecial*, was reputed in the nature of a *fee*; and therefore ſo firmly held to him, that, any limitation notwithſtanding, he might alienate it at pleaſure: for redreſs of which inconvenience the ſtatute provides, that if a man gives lands in *fee*, limiting the heirs to whom it ſhall deſcend, with a reverſion to himſelf and his heirs for default of ſuch former heirs, the form and meaning of the gift ſhall be obſerved.

Eſtates, in *general* and *ſpecial tail*, are farther diverſified by the diſtinction of ſexes in ſuch entails; for both of them may be in tail-male or female: as if lands be given to a man and *his heirs male of a body begotten*, this is an eſtate in tail-male *general*; but if to a man and the *heirs female of his body on his preſent wife begotten*, this is an eſtate in tail-female *ſpecial*; and in caſe of an entail male, the heirs female ſhall never inherit, nor any derived from them; nor *e converſo*, the heirs male, in caſe of a gift in tail-female. The word *body*, or ſome other words of procreation, are neceſſary to make it a *fee-tail*, and to aſcertain to what heirs in particular the *fee* is limited; though in wills and teſtaments greater indulgence is allowed. The incidents to a tenancy in tail, under the ſtatute Weſtm. 2. are chiefly theſe: 1. That a tenant in tail may commit waſte on the eſtate-tail by felling timber, pulling down houſes, or the like, without being impeached or called to account for the ſame. 2. That the wife of the tenant in tail ſhall have her dower or thirds of the eſtate-tail. 3. That the huſband of a female tenant in tail may be tenant by the courteſy of the eſtate-tail. 4. That an eſtate-tail may be barred or deſtroyed by a FINE, by a common RECOVERY, or by lineal warranty deſcending with aſſets to the heir. By ſubſequent ſtatutes, eſtates-tail may be aliened, are liable to forfeiture for high treaſon, and are chargeable with reaſonable leaſes, and with ſuch debts as are due to the crown on ſpecialties, or have been contracted with fellow-ſubjects in a courſe of commerce.

FEE, *baſe*, or *qualified*, is a conditional *fee* that has a qualification ſubjoined to it, and which muſt be determined whenever this qualification is at an end; as in the caſe of a grant to A. and his heirs, *tenants of the manor of Dale*; whenever the heirs of A. ceaſe to be tenants of that manor, the grant is entirely defeated. Blackſtone's Comm. vol. ii. chap. 7. See ENTAIL.

FEE-*expectant*, *feudum expectativum*,. See EXPECTANT.

FEE-*farm*, or FEE-*ferm*, *feudi-firma*, or *feo-firma*, ſignifies lands holden to a man and his heirs for ever, under a certain yearly rent.

Fee-farm ariſes when the lord upon creation of a tenancy reſerves to himſelf and his heirs, either the rent for which it was before lett to farm, or at leaſt a fourth part of the rent, and that without homage, fealty, or other ſervices more than are eſpecially compriſed in the feoffment.

Though by Fitzherbert it appears, that the third part of the value may be appointed for the rent, or the finding of a chaplain to ſay divine ſervice, &c. And the nature of it is this: that if the rent be behind, and unpaid for the ſpace of two years, then the feoffer or his heirs have action to recover the lands as their demeſnes.

FEE-*farm rents of the crown*, are ſuch as iſſue to the kings of England from their ancient demeſnes, many of which were alienated from the crown in the reign of king Charles II.

FEE is alſo uſed for the compaſs or circuit of a manor or lordſhip. Thus Bracton, *in eadem villa, & de eodem feodo*.

FEE is alſo uſed for a perpetual right incorporeal; as to have the keeping of perſons in *fee*, rent granted in *fee*, and office held in *fee*, &c.

FEE alſo ſignifies a reward or ordinary due given a perſon for the execution of his office, or the performance of his part in his reſpective art or ſcience.

Thus, the lawyer, barriſter, and phyſician, are ſaid to have their *fees*; i. e. conſiderations for the pains taken with the client or patient. If a perſon refuſe to pay an officer his due *fees*, the court will grant an attachment againſt him, to be committed till the *fees* are paid; and an attorney may bring an action of the caſe for his *fees* againſt the client that retained him in his cauſe.

FEES alſo denote ſettled perquiſites or allowances paid to public

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public officers by perſons who have buſineſs with them. The *fees* due to the officers of the Cuſtom-houſe are expreſsly mentioned in a ſchedule or table, which is hung up to view in the ſaid office, and in all other places where the *fees* are to be paid; and if any officer ſhall offend, by acting contrary to the regulations therein contained, he ſhall forfeit his office and place, and be for ever after incapable of any office in the Cuſtom-houſe.

The ſmallneſs of the ſalaries of divers of the king's ſervants is compenſated by the perquiſites or *fees* of honour. The *fees* paid to the ſeveral officers by every perſon upon his being knighted amount to 78*l.* 13*s.* 4*d.* And if it be done within the verge of the court, there is 3*l.* more to the ſix pages of the bed-chamber, which brings it to 81*l.*

FEE, *knight's.* See KNIGHT'S *fee.*

FEEDERS, in *Mining*, a term uſed to expreſs the ſeveral ſmall channels in the ſides of a mine ſeeming to open into it, as brooks into rivers in their courſe. The miners in moſt counties call theſe the *feeders* of the load.

FEEDING, *Foul*, in the *Manege.* See FOUL.

FEEL, in the *Manege*, they ſay to *feel* a horſe in the hand; that is, to obſerve that the will of the horſe is in the rider's hand, that he taſtes the bridle, and has a good *appui* in obeying the bit.

To *feel* a horſe upon the haunches, is to obſerve that he plies or bends them, which is contrary to leaning or throwing upon the ſhoulders.

FEELERS, *Antennæ*, in *Natural Hiſtory*, are the horns, as they are uſually called, upon the heads of inſects.

The word *antennæ* is derived from the Latin, *ante*, *before*, and *teneo*, *to hold* or *carry*; or poſſibly may have been given them from ſome ſort of reſemblance to the part of a ſhip known in navigation by the ſame name. The *antennæ* in various inſects are extremely various, and in moſt very beautiful; they not only differ in the inſects of different claſſes, but frequently in the different genera of the ſame claſs, though never in the ſame ſpecies.

The *antennæ* of flies may ſerve to diſtinguiſh ſeveral genera of thoſe inſects: 1. There are ſome which have articulated ones, formed of ſeveral vertebræ of different ſize, joined end to end, like the beads in a necklace: theſe *antennæ* are thicker at their origin than at their extremity. 2. The *antennæ* of others, formed in the ſame manner, are ſmalleſt at their inſertion and increaſe in ſize towards their extremities. 3. Thoſe of others are in form of feathered beards. 4. Others have priſmatic *antennæ*, which are articulated, and leaſt in both their extremes, and largeſt in the middle. 5. The *antennæ* of another claſs are branched or forked, compoſed of two pieces, and appearing double. 6. Others have extremely ſhort and thick *antennæ*, formed of two or three articulations or beads, terminated by a larger one of the figure of a battledore. 7. The *antennæ* of thoſe two-winged flies that ſuck the blood of oxen or horſes, reſemble the battledore *antennæ*; except that the body which terminates them has ſomewhat of the figure of a creſcent, the end of which appears by means of glaſſes articulated. Reaum. Hiſt. Inſects, vol. iv. p. 138, &c.

The ſize of the *antennæ* of ſome flies may alſo ſerve for a diſtinction, as may alſo the manner in which they carry them. The ichneumon flies have theirs in continual motion, making a kind of inceſſant vibrations with them.

The *antennæ* are of very various forms and ſhapes in different genera of the ſame claſs of animals, and are very judiciouſly made by Reaumur the characters of different genera of the butterfly kinds, among which there are almoſt an infinite variety of them.

The *antennæ* of inſects in general differ from horns, in that they are moveable at the baſe; and have beſide that power a number of articulations all along their ſtructure, by means of which they are alſo capable of being turned about any way at the pleaſure of the animal. The differences of their figure and ſtructure in the butterfly claſs, which are made the marks of the different genera, are ſix. Thoſe of the firſt genus are equally thick throughout, of a cylindric form, but terminated by a large head, altogether reſembling a club: ſome have called them clavated *antennæ*; Reaumur calls them buttoned *antennæ:* the buttons by which they are terminated are of a very different figure in the various ſpecies. The *antennæ* of the ſecond genus are, in general, much ſhorter in proportion to the body of the animal than the former: they gradually increaſe in thickneſs from their inſertion towards their extremity, and are terminated by a ſlender ſpine iſſuing from the lower part, and ornamented with a tuft of hairs: Reaumur calls theſe the club *antennæ*. Thoſe of the third genus firſt increaſe in ſize, and then taper to an oval point, unfurniſhed with a cluſter of hairs: ſome ſpecies have their *antennæ* twiſted like the horns of a ram. The *antennæ* of the fourth genus, at a little diſtance from their origin, become very thick, and continue of the ſame ſize through the greateſt part of their length, where they turn a little, and terminate in a ſharp point, which ſometimes ſupports another point, formed of a cluſter of hairs, in the manner of a pencil: Mr. Reaumur has called theſe the priſmatic *antennæ*. Thoſe of the fifth genus are, from their ſhape, called the conic or quadrated *antennæ*. Thoſe of the ſixth genus are denominated the plumoſe or feathered *antennæ:* they appear to be compoſed of a ſtalk or pedicle, which diminiſhes in ſize from the baſis to the extremity; on each ſide of which there iſſue plumes, placed like thoſe on the barrel of a quill, but not ſo cloſe together. The plumes of the males of this genus are larger and more beautiful than thoſe of the females.

The *antennæ* are many of them put together with great artifice and nicety; but we are yet at a loſs to know to what end or purpoſe theſe nice organizations were given them. Different people have formed very different gueſſes as to their uſes. Some have thought them intended to defend the eyes; but though this might ſeem probable in regard to the ſhort plumoſe ones, it can never hold good in the ſlender and ſmooth ones, which can be of no ſuch ſervice. Others have thought them made for wiping and cleaning the eyes; but this is an unneceſſary office, and one they are wholly unfit for; and the forelegs of the creature are always ready for ſuch a purpoſe, and are rendered much fitter for it by the hairs with which they are covered, than the *antennæ*, which in moſt caſes are compoſed of joints, and are by no means adapted to ſuch uſes. Others have called them *feelers*, and ſuppoſed that the creature uſed them as a blind man does his ſtaff, to feel out the way, leſt it ſhould run againſt any thing that would hurt it. But theſe creatures have eyes enough to ſee with; and any one who will obſerve them while they walk, will find that they do not protrude theſe before them, but often keep them erect upon the head. If this were their ſole purpoſe, it is alſo eaſy to ſee that all that beautiful variety in their forms could not have been neceſſary. Poſſibly they may be the organs of ſmelling, ſince we evidently find that many inſects have this ſenſe in a very exquiſite degree; and yet we ſee no external organs, except theſe, to ſerve for it. It is poſſible that this may be their uſe, but it is mere conjecture; and indeed the bodies of inſects are throughout made of parts ſo different from ours, that we can probably form no more idea of the uſe of their organs than a man born deaf can of that of the ear. They may have ſenſes different from ours, and theſe may be the organs of them, or the hearing or ſmell may be performed by them.

The pedicles or ſtalks of the ſeveral *antennæ* of butterflies are always hollow, and many of them are ſmooth and gloſſy, reſembling horn. Of this kind are moſt of the plumoſe *antennæ*; and the buttons of the *antennæ* of thoſe kinds which have ſuch are always fleſhy and juicy; ſo that when preſſed, different fluids are forced out of them, firſt a white, then a yellow one, and finally a black. When the creature is held under water with only the *antennæ* above, it is common to ſee bubbles of air diſcharged from the joints and buttons; how far theſe obſervations may aſſiſt in determining their uſe, is left to farther inquiries.

FEELING, *Touching*, one of the external ſenſes, whereby we acquire the ideas of ſolid, hard, ſoft, rough, hot, cold, wet, dry, or other tangible qualities; as alſo of diſtance, itching, pain, &c.

Feeling is the groſſeſt, but at the ſame time the moſt extenſive of our ſenſes, having more objects than all the reſt taken together; and ſome even reduce all the other ſenſes to this one of *feeling*.

Ariſtotle is expreſs, that all ſenſation is only *feeling*; and that the other ſenſes, as ſeeing, hearing, taſting, and ſmelling, are only the more exquiſite ſpecies, or peculiar modes thereof. De Anim. lib. iv. cap. 3. and lib. iii. cap. 12.

Naturaliſts are divided as to the organ or inſtrument of *feeling*. Ariſtotle takes this ſenſe to reſide in the fleſh, *quatenus, fleſh*, inaſmuch as all fleſh is, in ſome meaſure, capable of *feeling*. Hiſt. Anim. lib. i. cap. 4. Others will have it in all the parts that have nervous fibres, which extends it to the ſkin, fleſh, muſcles, membranes, and parenchymas; others reſtrain it to the ſkin or cutis; it being obſerved, that only thoſe parts covered with a cutis have properly the faculty of touching, or perceiving tangible qualities.

But what part of the cutis to aſſign immediately for this office is again diſputed. Some will have it the membranous parts; others the carnous; and others the medullary part, derived from the nerves.

Malpighi, and after him all our lateſt and beſt authors, hold the immediate organ of the ſenſe of *feeling* to be the pyramidal papillæ under the ſkin.

Theſe papillæ are little, ſoft, medullary, nervous prominences,

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nences, lodged every where immediately under the cuticula. They are formed of the ſubcutaneous nerves, which, for this purpoſe, firſt lay aſide their outer membrane, and are left exceedingly ſoft and ſenſible; are continually moiſtened by a thin ſubtle humour, and only covered over and defended by the cuticle or ſcarf-ſkin. They are largeſt and moſt conſpicuous in thoſe parts chiefly deſigned for the office of *feeling*, viz. the tongue, the tips of the fingers and toes; and are contractile, and again expanſive at pleaſure.

Feeling, then, is thus effected: the tip of the finger, for inſtance, being applied to an object to be examined, by that intention of the mind the papillæ are emitted or elevated, and being lightly rubbed over the ſurface of the object, a motion is impreſſed on them, which being thence propagated by the nerves communicating with them to the common ſenſory, excites the perception of heat, cold, hardneſs, or the like.

Hence we ſee why *feeling* becomes painful when the cuticle is worn off, burnt, macerated, &c. and why, when the cuticle becomes thick, hard, callous, or cicatrized, &c. the ſenſe of *feeling* is loſt; elſe whence the numbneſs impreſſed by the torpedo? why that exquiſite painfulneſs under and at the roots of the nails? &c.

Feeling is, on many accounts, the moſt univerſal of our ſenſes, there being no animal without it. Pliny obſerves, that all animals have the ſenſe of *feeling*, even thoſe that are generally thought to have no other ſenſe, as oyſters and earth-worms. That naturaliſt declares it his own opinion, that all have the ſenſe of taſting likewiſe: *Exiſtimaverim omnibus ſenſum & guſtatum eſſe.* Nat. Hiſt. lib. ii. cap. 71.

Naturaliſts obſerve, that ſpiders, flies, and ants have the ſenſe of *feeling* in a much greater perfection than men, though we have inſtances of perſons who could diſtinguiſh colours by their *feeling*, and others who could perceive what people ſaid by the ſame ſenſe. See DEAFNESS.

FEIGNED *Action*, in *Law*. See FAINT *action*.

FEIGNED *iſſue*. See *Feigned* ISSUE.

FEINT, in *Fencing*, a falſe attack, or a ſhew of making a ſtroke or puſh in one part, with deſign to bring the enemy to guard that part, and leave ſome other part unguarded where the ſtroke is really intended.

Feints are either ſingle or double, high or low, without or within, &c. in prime, in tierce, in quart, in demi, and in the whole circle; of one, two, or three meaſures.

The *ſimple feint*, is a mere motion of the wriſt, without ſtirring the foot, &c.

FEINT, in *Muſic*, a ſemi-tone; the ſame with what we alſo call DIESIS.

FEINT, in *Rhetoric*, a figure whereby the ſpeaker touches on ſomething, in making a ſhew of paſſing it over in ſilence. The Latins call this *prætermiſſio*.

FEL, in the *Materia Medica of the Ancients*, the name of a fruit much uſed by them in ſtomachic medicines, but very badly deſcribed to us. All that we know of the matter is, that there were three fruits brought from the Indies at that time, and called *bel*, *fel*, and SEL; they were all of the ſame virtues, and ſeemed nearly allied to each other in all reſpects. Serapio tells us, that the fruit *fel* was about the ſize of the piſtachia nut, and ſomewhat reſembled it in ſhape; and Avicenna obſerves, that it was an Indian medicine, bitter, and hot like ginger; and that it was uſed as a ſtomachic. He alſo ſays the ſame thing of the two other fruits; whence it appears, they were nearly the ſame thing.

FEL, in *Medicine*. See GALL.

FEL *terræ*, *gall of the earth*, a name by which ſome authors have called the ſmall centaury, becauſe of its great bitterneſs.

FELAGUS, in our *Law Books*, was uſed for a companion, or friend, who was bound in the decennary for the good behaviour of another. In the laws of king Ina, it is ſaid, if a murderer could not be found, the parents of the perſon ſlain ſhould have ſix marks, and the king forty; if he had no parents, then the lord ſhould have it; *et ſi dominus non habet*, felagus *ejus*. Leg. Inæ, cap. 15. *Felagus* is ſaid to be, *quaſi fide cum eo ligatus*.

FELAPTON, in *Logic*, one of the moods of ſyllogiſms. In a ſyllogiſm in *felapton*, the firſt propoſition is an univerſal negative; the ſecond, an univerſal affirmative; and the third, a particular negative.

FELE *homagers*, was anciently uſed for the faithful ſubjects. But it ſeems the word ſhould be written FEAL homagers.

FELIA, a name by which ſome of the chemical writers have called the ſulphurated or ſulphureous waters.

FELIS, in the Linnæan ſyſtem of *Zoology*, the name of a large genus of quadrupeds, of the order of the *feræ*; the characters of which are theſe: the fore-teeth are ſmall, obtuſe, and equal; they have three grinders; the tongue is furniſhed with prickles, all pointing backward; and the feet are formed for climbing, with claws which may be drawn in or exerted at pleaſure.

To this genus belong the lion, tiger, leopard, cat of the mountain, lynx, ounce, and domeſtic cat; which ſee under their reſpective heads.

FELIS *volans*, the *flying-cat*, in *Natural Hiſtory*, the name of an animal deſcribed by Scaliger, and ſuppoſed to be what we now call the flying SQUIRREL, a ſpecies of ſquirrel which has a looſe membrane on each ſide, connecting the fore with the hinder legs, which it can diſtend at pleaſure, and by means of which it takes ſuch long leaps, that it ſeems to fly.

FELIS *zibethicus*, in *Zoology*, a name given by many to the creature which produces the perfume called civet, and which we uſually call the CIVET-*cat*, being, in the Linnæan ſyſtem, a ſpecies of the VIVERRA. See *Tab.* II. *Quadrupeds*, N° 17.

FELLING *of Timber*. See TIMBER.

FELLOWS, or FELLIES, in *Artillery*, are ſix pieces of wood, each of which forms an arch of a circle, and theſe, joined all together by duledges, make an entire circle; which, with a nave, and twelve ſpokes, form the WHEEL of a gun-carriage.

Their thickneſs is uſually the diameter of the ball of the gun they ſerve for, and their breadth ſomething more. Their dimenſions are as follow: for a 24 pounder, 5 inches thick, and 6½ inches broad; for a 12 pounder, 4½ inches thick, and ſix inches broad; for a 6 pounder, 4 inches thick, and 5½ broad, &c. made of dry elm.

FELLOWSHIP, *Company*, or *Partnerſhip*, in *Arithmetic*, is a rule of great uſe in balancing accounts amongſt merchants, and owners of ſhips; where a number of perſons putting together a general ſtock, it is required to give every one his proportional ſhare of loſs, or gain.

The *golden rule* ſeveral times repeated, is the baſis of *fellowſhip*, and fully anſwers all queſtions of that kind: for, as the whole ſtock is to the total thereby gained, or loſt; ſo each man's particular ſhare is to his proper ſhare of loſs, or gain. Wherefore, the ſeveral ſums of money of every partner are to be gathered into one ſum, for the firſt term; the common gain, or loſs, for the ſecond; and every man's particular ſhare for the third; and the golden rule is then to be wrought ſo many times as there are partners.

There are two caſes of this rule, the one *without*, the other *with time*.

FELLOWSHIP *without time*, is where the quantity of ſtock, contributed by each perſon, is alone conſidered; without any particular regard to the length of time that any of their monies were employed. An example will make this proceſs eaſy.

A. B. and C. freight a ſhip with 212 tun of wine; A. laying out 1342*l.* B. 1178*l.* and C. 630*l.* towards the ſame; the whole cargo is ſold at 32*l.* per tun. Query, what ſhall each perſon receive?

Find the whole produce of the wine by multiplying 212 by 32, which yields 6784. Then, adding together the ſeveral ſtocks, 1342, 1178, and 630, which make 3150, the work will ſtand thus:

3150 : 6784 { 1342—Anſw.—2890,1993, &c.
1178 ——— 2537,0006, &c.
630 ——— 1356,8.

Proof 3150 6784.

FELLOWSHIP *with time*, is where the time wherein the money, &c. were employed, enters into the account. An example will make it clear.

A. B. C. commence a partnerſhip the firſt of January, for a whole year. A. the ſame day diſburſed 100*l.* whereof he received back again, on the firſt of April, 20*l.* B. pays, on the firſt of March, 60*l.* and more, the firſt of Auguſt, 100*l.* C. pays, the firſt of July, 140*l.* and, the firſt of October, withdraws 40*l.* At the year's end their clear gain is 142*l.* Query, what is each perſon's due?

A.'s 100*l.* multiplied by three months, the time it was in, makes 300*l.* and the remaining 80, by nine months =720, in all 1020*l.* of A.'s contribution. For B. 60 into 10, gives 600; and 100 into 5, 500; in all 1100*l.* for B. For C. 140 into 3, gives 420; and 100 into 3, is 300; in all 720*l.* for C. Now, 1020+1100+720= 2840 for the common antecedent, and the gain 142, is for the general conſequent; the rule will ſtand thus:

2840 : 142 { 1020 — Anſw. 51
1100 ——— 55
720 ——— 36

Proof 2840 142

N. B. All the particular times (if not ſo given) muſt be reduced into one denomination, viz. into years, months, weeks, or days.

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FELL-*wort*, in *Botany*. See GENTIAN.

FELO *de ſe*, is he that commits felony, by willingly and deliberately killing himſelf. The Saxons call him *ſelf-bane*. He muſt be of the age of diſcretion, and *compos mentis*.

A *felo de ſe* is to be interred without Chriſtian burial, with a ſtake driven through his corpſe; and is to forfeit his goods and chattels real and perſonal; but he may make a deviſe of his lands, becauſe they are not ſubjected to any forfeiture. However, theſe forfeitures are generally ſaved by the verdict of the coroner's jury, who find lunacy. See SUICIDE.

If a perſon *felo de ſe* is ſecretly made away with, ſo that the coroner cannot view his body, preſentment is to be made of it by juſtices of peace, &c. in order to entitle the king to the forfeiture of goods.

FELON, in *Surgery*. See WHITLOW.

FELON-*wort*. See NIGHTSHADE.

FELONY, FELONIA, was anciently uſed for a violent and injurious action of a vaſſal, or tenant, againſt his lord.

Menage derives the word from *felonia*, formed of *felo*, or *fello*, which occurs in the capitulars of Charles the Bald, and is ſuppoſed to come from the German *fehlen*, or Saxon *faelen*, *to fail*, or *be delinquent*. Others derive it from the barbarous Latin *vilania*. Lord Coke, Nicod, &c. derive it *a felle*, *gall*, as being ſuppoſed to be done maliciouſly. Others derive it from the Greek φηλειν, *to deceive*. But the learned Spelman, with greater probability, deduces it from two northen words, viz. *fee*, which ſignifies *fief*, *feud*, or *beneficiary eſtate*, and *ton*, which ſignifies *price* or *value*; ſo that *felony* is the ſame as *pretium feudi*, the conſideration for which a man gives up his fief; agreeable to the common expreſſion, ſuch an act is as much as your life, or eſtate, is worth.

In this ſenſe *felony* was equivalent to petty-treaſon, or it was a crime next below high-treaſon. The crime of *felony* imported confiſcation of the fee, to the profit of the lord.

All thoſe acts, whether of a criminal nature or not, which at this day are generally forfeitures of copy-hold eſtates, are ſtyled *feloniæ* in the feudal law.

FELONY was alſo applied to an injury of the lord to his vaſſal, which imported a forfeiture of the homage and ſervice thereof, and made it revert to the ſovereign.

Fidelity and *felony* are reciprocal between the LORD and the vaſſal.

FELONY is alſo uſed, in *Common Law*, for any capital offence, perpetrated with an evil intention.

Though capital puniſhment does by no means enter into the true idea and definition of *felony*, the true criterion of which is forfeiture; for in all *felonies* which are puniſhable with death, the offender loſes all his lands in fee-ſimple, and alſo all his goods and chattels; but in ſuch as are not ſo puniſhable, his goods and chattels only.

In a ſtricter ſenſe, *felony* denotes all capital crimes below treaſon.

Felony includes ſeveral ſpecies of crimes, whoſe puniſhment is the ſame, viz. death: ſuch as petit-treaſon, murder, theft, homicide, ſodomy, rape, wilful burning of houſes, receiving of ſtolen goods; breach of priſon, reſcue and eſcape, after one is arreſted or impriſoned for *felony*, and divers others found in the ſtatutes, which are daily making crimes *felony*, that were not ſo before.

Felony by the common law is againſt the life of a man, as murder, manſlaughter, felo de ſe, ſe defendendo, &c. againſt a man's goods, ſuch as larceny and robbery; againſt his habitation, as arſon and burglary; and againſt public juſtice, as breach of priſon.

Piracy, robbery, or murder upon the ſeas, are *felonies* puniſhable by the civil law, and alſo by ſtatute.

Felony is eaſily diſtinguiſhed from treaſon.

From leſſer crimes it is diſtinguiſhed by this, that its puniſhment is death, though not univerſally; for petty-larceny, i. e. ſtealing of a thing under the value of twelve-pence, is *felony*, according to Brook, though the crime be not capital, but only a loſs of goods. The reaſon Brook gives for its being *felony* is, that the indictment runs, *felonice cepit*.

Till the reign of Henry I. *felonies* were puniſhed by pecuniary fines; that prince firſt ordered *felons* to be hanged, about the year 1108.

Felony is of two kinds; the one *lighter*, which for the firſt time is entitled to the benefit of CLERGY; as manſlaughter. The other more heinous, is not allowed the privilege.

Felony is alſo puniſhable by loſs of all lands, not intailed; and all goods and chattels, both real and perſonal; though the ſtatutes make a difference in ſome caſes concerning lands, as appears by ſtat. 37 Hen. VIII.

Felony ordinarily works corruption of blood, unleſs the ſtatute, ordaining the offence to be *felony*, provide otherwiſe; as the ſtat. 39 Eliz. cap. 17.

Perſons indicted of *felony*, &c. where there are ſtrong preſumptions and circumſtances of guilt, are not repleviſable; but for larceny, &c. when perſons are committed, who are of good reputation, they may be bailed.

FELONY, *appeal of*. See APPEAL.

FELONY, *compounding of*. See THEFT-BOTE.

FELONY, *diſcovery of*. See DISCOVERY.

FELONY, *miſpriſion of*. See MISPRISION.

FELT, a kind of ſtuff, either of wool alone, or of wool and hair; neither ſpun, croſſed, nor woven, but deriving all its conſiſtence from its being wrought, and fulled with lees and ſize, and afterwards faſhioned on a block or mould, by help of fire and water.

Caſtors, camels, and coneys hair, lambs, and ſheeps wool, &c. are the moſt uſual ingredients of *felts*; and hats of all kinds are the works they are chiefly employed in.

The *felt* intended for a hat, being ſufficiently fulled, and prepared, is reduced into one piece, ſomewhat in the figure of a large funnel; in which ſtate it remains ready to be put into form, and become a HAT.

FELUCCA, or FELUCCO, a little veſſel with from ten to ſixteen banks of oars, not covered over, much uſed in the Mediterranean as a paſſage boat. The natives of Barbary employ boats of this ſort as cruiſers.

The word is formed from the Arabic *felkon*, *a ſhip*.

It has this peculiarity, that the rudder may be applied either in the head or ſtern; there being diſpoſitions in both to receive it. For ſize, it may be compared to a ſloop or ſhaloop.

FEMALE, the ſex that conceives and bears fruit.

An animal that generates within itſelf, is called *female*; and that which generates in another, MALE.

The *female*, in quadrupeds, and even in birds, is uſually ſmaller and weaker than the male; though in birds of prey, as the falcon, hawk, &c. it is otherwiſe; the *female* being bigger, ſtronger, bolder, hardier, and more courageous.

The like is obſerved in moſt inſects, particularly ſpiders; to that degree, that M. Homberg aſſures us, he has weighed five or ſix male garden-ſpiders againſt one *female* of the ſame ſpecies, which has been equal to them all.

For the numeral proportion of males to *females*, ſee MARRIAGE.

Naturaliſts alſo diſtinguiſh male and *female* plants; male and *female* flowers, &c.

FEMALE *ſcrew*. See SCREW.

FEMBLE, the name given by the common people of Lincolnſhire to the female hemp. There is no country where hemp ſucceeds better than in this, and great quantities are annually raiſed there.

FEME *covert*, in *Law*, denotes a married woman; who is alſo ſaid to be under covert-baron.

By the law of England, a *feme covert* committing a bare theft in company with, or by coercion of her huſband, is not deemed guilty of felony; neither does ſhe become acceſſary to a felony, by receiving her huſband who has been guilty of it, as he does by receiving her. But if ſhe commit a theft by the bare command of her huſband; or treaſon, murder, or robbery, in his company, or by his coercion, or keep a bawdy-houſe with him, ſhe is puniſhable in the ſame manner, as if ſhe was ſole; and generally if ſhe be guilty of any offence not capital, ſhe may be indicted, &c. without making the huſband a party. But if ſhe incur the forfeiture of a penal ſtatute, the huſband muſt be made defendant in the action or information. Hawk. Pl. of the Crown, book i. chap. 1. See COVERTURE.

FEME *ſole*, an unmarried woman, whoſe debts contracted before marriage become thoſe of her huſband after it. See CUSTOM *of London*.

FEMININE, or FOEMININE, in *Grammar*, one of the genders of nouns.

The *feminine* gender is that which denotes the noun or name to belong to a female. In the Latin, the *feminine* gender is formed of the maſculine, by altering its termination; particularly by changing *us* into *a*. Thus, of the maſculine *bonus equus*, *a good horſe*, is formed the *feminine*, *bona equa*, *a good mare*; ſo, of *parvus homo*, *a little man*, is formed *parva fœmina*, *a little woman*, &c.

In French, the *feminine* gender is expreſſed, not by a different termination, but a different article: thus, *le* is joined to a male, and *la* to a female.

In Engliſh, we are generally more ſtrict, and expreſs the difference of ſex, not by different terminations, nor by different particles, but different words; as *boar* and *ſow*, *boy* and *girl*, *brother* and *ſiſter*, &c. though ſometimes the *feminine* is formed by varying the termination of the male into *eſs*; as in *abbot*, *abbeſs*, &c.

FEMI-

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FEMININE *rhymes*. See RHYME.

FEMOREUS, in *Anatomy*, a name given by ſome of the authors on theſe ſubjects to a muſcle, more generally called the CRURÆUS or *cruralis*.

FEMORIS *quartus*, in *Anatomy*, a name given by Veſalius and others to one of the muſcles of the thigh, called by the later writers from its ſhape *pyriformis*.

FEMORUS *ſextus*, in *Anatomy*, a name given by Spigelius and others to a muſcle, now generally called the ILIACUS *internus*.

FEM-OWL, an Engliſh name uſed in Shropſhire, and ſome other counties, for the *caprimulgus*, or goat-ſucker, called alſo the *churn*-OWL. It is a very beautiful bird, and more reſembles the cuckow than the owl-kind.

FEMUR, or *Os* FEMORIS, in *Anatomy*, the thigh-bone. See *Tab. Anat. (Oſteol.) fig.* 3. *n.* 20. and *fig.* 7. *n.* 22. See Os.

Dionis derives the word *femur*, from *fero*, becauſe it bears the whole weight of the body.

The *femur* is the largeſt and ſtrongeſt bone in the body, and its articulations are proportioned to its bulk and ſtrength. Its upper part is jointed with the *iſchium*, by enarthroſis, the head of the *femur* being received into a cavity of the *iſchium*; and the two kept together by a ſtrong cartilage or bandage. The lower end is articulated with the *tibia* by *ginglymus*, two heads of the *femur* being received into two cavities of the *tibia*; beſide a cavity between the two heads, which receives a proceſs of the *tibia*.

The *femur* is pretty much incurvated, or bent, the convex part being before, and the concave behind. It is divided into three parts; the *upper*, the *middle*, and the *lower*.

The *upper* conſiſts of a head and a neck, and two tuberoſities; the extremity or head is round and big, and received into the *acetabulum* of the coxendix, wherein it is tied by two ligaments; the one from the top, the other from the bottom of the *acetabulum*, but both inſerted into the middle of the head. This head is an epiphyſis in children, and in ſome ſubjects remains ſo for a long time, and is therefore liable to be ſeparated from the neck by any violent force. Immediately under the head is the neck of the *femur*, which is a ſmall, long, and a little oval apophyſis, making an angle with the body of the bone; by means whereof the thighs and feet are kept at a due diſtance from each other, to make our ſtanding the firmer; beſide that the obliquity of the neck conduces to the ſtrength of the muſcles, which muſt otherwiſe have paſſed too near the center of motion. The two tuberoſities are called the greater and leſs *trochanters*.

The *middle* part or ſhank of the *femur* is round, ſmooth, and poliſhed, on its fore-ſide, and rough on the hind-ſide; along which there runs a ſmall ridge, the whole length of the bone, called *linea aſpera*, ſerving for the inſertion of muſcles.

The lower part of the *femur* is divided by a ſinus in the middle, into two heads or apophyſes, called *condyli*, which make the *ginglymus* above mentioned; being both received into the ſinus of the *tibia*.

Between the hind-parts of the head is a ſpace for the paſſage of the great veſſels and nerves, which go to the leg.

The *femur* has a very large cavity, running its whole length, filled, like the reſt, with marrow. The curvity of the *femur* makes it ſerve as a buttreſs to the body, to prevent its falling, or bearing too much forward.

Surgeons and bone-ſetters ſhould take care, that in fractures of the *femur* they do not endeavour to ſet it ſtrait, which is againſt nature. See THIGH.

Cartilages of the Os FEMORIS. No part of the *os femoris* is covered, except the uniform convexity of the head, and the articular portion of the lower extremity. The trochanters have no true cartilage, what appears like it being only the remains of tendinous inſertions; the cartilaginous ſubſtance, which to a certain age unites the *apophyſes* to the body of the bone, does not belong to theſe, becauſe it is only found in the time of youth, and in adults is converted into a bone. The cartilaginous matter, by which the head of the *os femoris* is cemented, deſerves, however, to be obſerved here, becauſe that *apophyſis* has been ſeparated by violent falls. The convexity of the head of the *os femoris*, all the way to its ſymphyſis with the neck, is covered with a very ſmooth, ſhining cartilage. A little below the middle of this convexity, and ſomething toward the back part, there is a depreſſion in the ſhape of a creſcent, the cartilage being here interrupted by the inſertion of the internal articular ligament of the head of the *os femoris*. The cartilage which covers the lower extremity of the bone is exactly fitted to the ſemi-oval convexity of the inferior ſurface of each condyle, and to the pulley formed by their union. Winſlow's Anatomy, vol. i. p. 126.

Ligaments of the Os FEMORIS. The *os femoris* is connected by its upper extremity to the *os innominatum*, and by the lower to the bones of the leg, by means of ſeveral ligaments. The ligaments of the upper extremity are two in number, one which ſurrounds the whole articulation thereof, with the cotyloide cavity, and one contained in the articulation. The firſt is termed the orbicular ligament of the head of the *os femoris*; the other the internal ligament; and to theſe may be, though but improperly, added a third, which is of the nature of a capſular ligament. The orbicular ligament is the moſt conſiderable, the largeſt, and the ſtrongeſt, of all the articular ligaments of the human body; it is fixed quite round the border of the cotyloide cavity, and is made up of ſeveral ſorts of fibres, and is much ſtronger and thicker in ſome parts than in others. The other, or internal ligament of the head of the *os femoris*, reſembles a flat cord, and is compoſed of a bundle of flat fibres, cloſely interwoven. The ligaments of the lower extremity of the *os femoris*, by which this bone is connected with the leg, are ſix in number, one poſterior, two lateral, the middle, or crucial, and the capſular. The crucial ligaments lie within the joint, and are fixed by one end to the back part of the notch, or opening, which parts the two condyles: theſe are ſurrounded by the capſular ligament, but all the reſt lie on the outſide thereof, being cloſely joined to it. Of the two lateral ligaments, one is internal, and broad, being fixed to the tuberoſity of the internal condyle; the other is external, and narrow, and is fixed to the tuberoſity of the external condyle. The poſterior ligament is broad and thin, and being fixed a little above the convexity of the external condyle, it thence deſcends obliquely behind the great notch, and external condyle. The capſular ligament is, as it were, glued to the three former, and is fixed quite round the inferior extremity of the *os femoris*; at a ſmall diſtance above the anterior, lateral, and poſterior parts of the cartilage, and above the poſterior part of the great notch; and from the cartilage and notch, through the ſmall ſpace upward already mentioned, it covers the bone, and afterwards is inverted downward, to form the capſula for the mucilaginous liquor of the joint. Winſlow's Anatomy, p. 126, &c.

FEMUR *moventium ſextus*, in *Anatomy*, the name given by Veſalius and ſome others, to the muſcle now called the PSOAS *magnus*.

FEN, in *Geography*, a kind of wet land, or rather moraſs.

Fens are of two ſorts: the firſt of a boggy conſiſtence, compoſed of water and earth intermixed; ſcarce firm enough to ſuſtain the tread of a man.

The ſecond are pools, or collections of waters, with pieces of dry land raiſed here and there, above the ſurface thereof.

The former kind neither receive nor emit any river; but the latter are frequently the heads or ſprings of rivers; ſuch is the head of the Tanais, &c.

What the farmers call *fens* or *fenny* lands, are of two kinds: firſt, thoſe which are only drowned by upland floods and great rains, and are very large and lie upon the levels, ſo that the water cannot run off from them, but muſt be there till the hot weather and winds dry it off; and, ſecondly, thoſe that are conſtantly wet, only that in dry times they are covered with ſhallower water than in others. In draining of theſe ſorts of lands, which is the only means of making them uſeful to the public, two things are to be conſidered, firſt the laying them perfectly dry, which can only be effected by making cuts and drains for carrying off the water from their loweſt parts, and thence from the whole. Or ſecondly, the taking off from them the great additional wetting they have from land floods, and long continued rains. The firſt method makes a perfect cure, the other is only a temporary relief, and makes the lands more ſerviceable in dry times, and leaves leſs for the ſun to dry up.

Whatever is attempted in regard to the draining of *fens*, the loweſt part of the ground is to be found out firſt, and the overflowing from great rains, and from land floods, muſt be provided for, in the carrying off that way; for ſhould this be neglected, all the labour and coſt employed on the other principle would be thrown away. If it is found that this can be done, there muſt afterwards be cut a large drain through the middle of the land, and ſeveral ſmaller drains from all parts communicating with this.

The great drain muſt be dug deep enough to drain the whole level; and this, and all the others, muſt be made narroweſt at the head, and wider all the way to the mouth, where they muſt be wideſt of all.

Theſe drains muſt be all well cleanſed from mud and weeds every ſpring and autumn, and the water from land floods muſt be kept from coming in upon theſe lands, as much as poſſible, that there may be the leſs to be drained off;

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off; the lower edges of the *fen* land muſt be for this purpoſe guarded with banks to turn the water into other channels. In Eſſex they have many lands that lie below the high-water mark, and are above the low-water mark, and have land floods or fleets running through them, which make a ſort of ſmall creek. Theſe lands they have a very eaſy way of draining, though they are naturally very moiſt when they firſt encloſe them from the ſea; they do it with a bank, which they extend from one ſide of the land they deſign to take in to the other, excepting a ſpace that they leave, where the creek, or land flood, runs into the ſea. Then they prepare a wooden frame, well planked, and of conſiderable thickneſs, fitted to the head of the creek, and capable of ſhutting it wholly up; in this frame they make ſeveral holes, in which are placed wooden troughs, made each of four boards, and ſuited in ſize and number to the quantity of water that is to be diſcharged through them from the land floods. Each of theſe trunks is open toward the creek; but on the ſea-ſide it has a door or flap, which opens when the land flood preſſes againſt it, and gives it free paſſage out; but when the ſea-water is riſen to the height of it, and preſſes it, is ſhut by the force, and no ſea-water is let in. When this head is prepared, they let it in, and ſtopping up the whole creek, they continue the banks on each ſide till they meet it: thus all the land floods are let out at low water, and not a drop of ſea-water can be admitted, ſo that the lands are kept dry and uſeful, which were before rendered uſeleſs, by being drowned with ſalt-water, at every high-water mark. The freſh-water of the creek is thus kept unmixed with the ſea-water, and therefore affords good drink for the cattle, which is commonly very difficult to be had in this ſort of lands, the tides ſpoiling what freſh waters there are every time they come up.

Several ſtatutes have been made for draining fens, chiefly in Kent, Cambridgeſhire, Bedfordſhire, and Lincolnſhire. 4 Jac. I. cap. 8. & 13. 15 Car. II. cap. 17. 16. 17 Car. II. cap. 11. 11 Geo. II. cap. 34. & cap. 39. 21 Geo. II. cap. 18. & 22 Geo. II. cap. 11. 16 & 19.

The wet grounds called *fens* in Lincolnſhire and elſewhere in England, bring many advantages to the inhabitants of thoſe counties. Fowl and fiſh are very plentiful in them. The pike and eels are large and eaſily caught, but they are uſually coarſe. The duck, mallard, and teal, are in ſuch plenty, as is ſcarce to be conceived; they are taken in DECOYS, by prodigious flocks at a time. They ſend theſe fowl to London from Lincolnſhire, twice a week on horſeback, from Michaelmas to Lady-day; and one decoy will furniſh twenty dozen, or more, twice a week, for the whole ſeaſon, in this manner. The decoy-men contract with the people who bring them to London, at a certain rate, and they are obliged to take the whole number that is catched off their hands. Two teals are uſually reckoned equal to one duck, and ſix ducks and twelve teals are accounted a dozen of wild fowl; and the uſual market-price is about nine ſhillings for ſuch a dozen. About Midſummer, when the moulting ſeaſon is, a great number are deſtroyed alſo by the people of the neighbourhoods. The poor birds at this time are neither able to ſwim nor fly well; and the people going in with boats among the reeds, where they lie, beat them down with long poles. A little before Michaelmas, vaſt flights of theſe birds arrive at the decoys from other places; they ſoon grow fat in them, and continue there a prey to the maſters or owners, as long as the decoys are unfrozen; but when they are iced over, they fly away again, and go to the neighbouring ſeas for food. Phil. Tranſ. N° 223.

The *fens* alſo abound in a ſort of herbage that is very nouriſhing to cattle; ſheep and horſes always grow fat upon it. Theſe *fens* are common, and the owners of cattle mark them, that they may be known. It is remarkable, that though all is open, the cattle uſed to one particular ſpot of ground, ſeldom leave it, but the owner may find them always in or near the ſame place. The people receive great advantage from the geeſe that abound here, beſide the food which they afford; that is, from their feathers and quills; and the produce of theſe is ſo great, that the cuſtom-houſe books in the town of Boſton ſhew, that there are frequently ſent away in one year three hundred bags of feathers; each bag containing a hundred and a half weight. Each pound of feathers brings in the owner two pence; and it may be thought ſtrange by people unacquainted with theſe things, but it is a certain truth, that the owners pluck the geeſe five times a year for the FEATHERS, and once for their quills. Each plucking affords about a pound; and many people have a thouſand geeſe at a time, or more. They are kept at no charge, except in deep ſnowy weather, when they are obliged to feed them with corn.

Oats alſo grow well in many of the *fen* countries, and in good ſeaſons bring increaſe and great advantage to the owner. There is alſo another vegetable of great profit to them: this is the *raptum ſylveſtre*, the ſeeds of this they call cole-ſeed; and they make an oil from it, of great uſe in trade. They grind the ſeed between two large ſtones, the one ſtanding perpendicularly on the other. The ſtones are made of a ſort of a black marble, and are brought from Germany. They ſometimes turn them by ſails, and ſometimes by the drains which carry off the water from the *fen* lands.

The *fens* lying low, and being of a vaſt extent, are very ſubject to be overflowed by waters from the neighbouring high countries; and though great care and expence is uſed to keep them dry, they are often like a ſea, and the ſheep are obliged to be carried off in boats, and people to live in their upper rooms, and be ſupplied with proviſions alſo by boats. See BOG and DRAIN.

FEN-*cricket*. See *Mole*-CRICKET.

FEN is alſo the name of a very pernicious diſtemper to which hops are ſubject. It conſiſts of moſs or mould, which ſpreads itſelf with great rapidity, and does great damage in the hop-grounds.

FENCE, in *Agriculture*, is a hedge, ditch, wall, or bank, made round fields, woods, gardens, &c. The incloſures of grounds are in ſome places made by ditches full of water, and in others by walls either of ſtones alone, or of ſtones and earth. Where theſe materials are in plenty, they make very good *fences*, but in other places the common method is by quick-hedges. See EARTH-*banks*, HEDGE, and WALL.

Fences for parks, and ſometimes for gardens, are made of paling; which, if winter-fallen oak be uſed, will laſt many years; the pales ſhould be cleft thin, and the rails cut triangular, and the poſts ſhould not be placed too far aſunder. *Fences* round parks, where fallow-deer are kept, ſhould be ſix feet and a half high; but where there are red deer, the *fence* ſhould be one foot higher. Parks are ſometimes fenced with walls of brick or ſtone.

The white thorn is the beſt of all trees to plant for a *fence*, being a tolerably quick grower, and laſting a long time, and making a very handſome *fence*. It will ſucceed on any ſoil where a ditch and new bank are made, except it be wholly of gravel or ſand, and even in this caſe it will thrive, if there happen a rainy ſeaſon after the planting of it.

Some raiſe it by ſeeds, and others by young plants; the latter is the moſt expeditious way, for the ſeeds lie two years in the ground before they ſhoot, but they grow very faſt after two or three years. Some prepare the haws, or fruit of the white thorn, by tying them up in a hair bag, and ſoaking them all winter; after this, if they are ſown in February or March, they will come up the firſt year, and grow better than any other way.

Where ſets are ſcarce, it is a good way when the underwoods are *felled*, or rather the year before, to ſow haws and ſloes in them, and they will furniſh a ſupply of young plants for hedges, without doing the woods any harm, becauſe they may be drawn before they come to be too large. The white thorn is alſo of conſiderable value in ſome ſort of works; its root becomes very beautifully veined when old, and elegant boxes and combs are made of it. It is uſed by ſome alſo in the buſineſs of inlaying, and would be more ſo, if its beauty were more known. The crab and the ſloe-tree, or black thorn, come next in value to the white thorn, for quicks for *fences*.

The crabs are to be ſown by kernels, pulp and all, and they will come up the firſt year; and a ſet of young crabs planted thick enough, make an excellent *fence*. The black thorn is not ſo much approved, becauſe it is not ſo ſure of growing, and if it does, its roots ſpread, and it is apt to run in too much upon the land. The buſhes of black thorn are however the beſt of any for dead hedges, and for mending of gaps; and they have another advantage over the white thorn, which is, that cattle are not ſo apt to crop them. The black thorn will grow on any ſoil where the white grows, but the richer the mould is, the better it will thrive.

Holly is another excellent ſhrub for a *fence*; it is indeed much the beſt of all the *fence* buſhes; but it grows ſo ſlow, and is ſo uncertain, that the farmers are afraid of waiting for it, or of truſting to it; but where it ſucceeds, it makes amends for the delay in its thickneſs, height, and ſtrength. It is to be raiſed like the white thorn, either by ſets or berries, and the berries in the ſame manner lie two years in the ground before they come up. It will grow on any ſoil, even on the drieſt gravel, or among ſtones and rocks. It delights moſt in light grounds. If it be raiſed in plants, they ſhould be about the thickneſs of a man's thumb, and planted in a moiſt ſeaſon, either in ſpring or autumn; they muſt be

ſhaded

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ſhaded well with ſtraw or halm after they are ſet, and muſt be carefully watered, as ſoon as they begin to ſhoot, otherwiſe they will all periſh.

If any of them ſeem to periſh, they muſt be cut off cloſe at the roots, and they will often ſprout out vigorouſly thence again. The ground muſt be dug up all about them at times, which very greatly promotes their growth; and the farmer muſt keep his ſheep from them, for they are very fond of cropping the young ſprouts.

Field mice are apt to gnaw the roots of holly in hard winters; and many of theſe trees are ſuppoſed to be killed by the froſt, when the teeth of theſe little vermin have really done the miſchief.

The beſt way of raiſing a *fence* of theſe trees, is to plant them with the quick or white thorn, four plants of that to one of holly; theſe will thrive very well together; and while the white thorn grows very ſpeedily, the holly will take its time: as this grows large, the white thorn may be pulled up by degrees, till at length there is only the holly left; and if this is found not thick enough, the boughs of it which grow neareſt the ground may be laid down and covered with earth, and they will ſend up innumerable ſuckers, which will fill up all the gaps.

Beſide theſe there are very good *fences* made of furz, of alder, and even of elder, in ſome places, on proper ſoils. Elder ſticks, or truncheons, ten or twelve foot long, are to be cut and ſtuck in the bank ſlope-wiſe each way, ſo as to make a chequer-work. This makes the ſpeedieſt ſhelter of any. When the trees grow old, they are alſo ſtill of value; their wood is a very fine one for turning, and is at leaſt equal to box, if not ſurpaſſing it.

The elder-tree makes an extremely good fence in watery places; and when planted on the banks of rivers is of great uſe in preventing them from being undermined by the current; the roots being very numerous, ſtrong, and compact. It is always ſending ſuckers alſo from its loweſt roots, which makes it very uſeful where ſtreams wear away their banks, and are widening their courſe.

The furze buſh, though an irregular grower, makes an excellent *fence* on dry banks, where nothing elſe will grow. It may be raiſed either by ſeeds, or by ſets; but the ſeeds are the beſt, eſpecially thoſe of the French furze, which grows to the height of fifteen or ſixteen foot, and is not ſubject to ſpread with its roots, and get into the good ground, as our common heath furze will always do. This has the advantage of being a very ſpeedy grower. It will make a very good hedge in three years, if taken care of. It muſt be kept well weeded while young; and the ſheep muſt be kept away from it; for they are very fond of its young ſhoots. But it only requires this care for a little while; for when grown up to any conſiderable height, nothing can hurt it. If a furze-hedge be clipped, it will grow large and thick; but if left to itſelf, it will run up to a conſiderable height, and afford good ſhelter, and yield an excellent fuel. They ſow much of the poor land in Devonſhire with furze, and make a very conſiderable advantage of it. Miller's Gard. Dict. and Mortimer's Huſbandry.

Fences made with the horn-beam plant are very common in Germany. On a parapet of earth, with a ditch on each ſide, the horn-beam ſets are planted in ſuch a manner, that every two plants may be brought to interſect one another, in the form of St. Andrew's croſs. The bark is ſcraped off in the place where they interſect, and they are bound together with ſtraw; the two plants unite together in a kind of indiſſoluble knot, and puſh from thence horizontal ſlanting ſhoots, which form a ſort of paliſado, or CHEVAUX *de friſe*. Hedges of this kind, pruned annually, will, in a few years, render the *fence* impenetrable in every part.

FENCE-*month (menſis prohibitionis*, or *menſis vetitus)* is a month wherein the female deer fawn; for which reaſon it is unlawful to hunt in the foreſt during that time.

It begins fifteen days before Midſummer, and ends fifteen days after; being in all thirty days.

There are alſo certain *fence*, or *defence* months, or ſeaſons for fiſh, as well as wild beaſts; as appears by ſtat. Weſtm. 2. cap. 13. in theſe words:

"All waters, where ſalmons are taken, ſhall be in *de-*
"*fence* for taking of ſalmon, from the nativity of our
"Lady, unto St. Martin's day. And likewiſe, young
"ſalmons ſhall not be taken or deſtroyed by nets, &c.
"from the midſt of April, to the nativity of St. John
"Baptiſt," &c.

FENCING, the art of defence; or of uſing the ſword, to wound an enemy, and preſerve one's ſelf from his attacks.

Fencing is one of the exerciſes learnt in the academies, &c.

The art of *fencing* is acquired by practiſing with FOILS, called in Latin *rudes*; whence *fencing* is alſo denominated *gladiatura rudiaria*.

Pyrard aſſures us, that the art of *fencing* is ſo highly eſteemed in the Eaſt Indies, that none but princes and noblemen are allowed to teach it. Theſe maſters wear a badge or cognizance on their right arms, called in their language *eſaru*, which is put on with great ceremony, like the badges of our orders of knighthood, by the kings themſelves.

Montaigne informs us, that when he was a youth, the nobility all ſhunned the reputation of being good *fencers*; as ſomething too ſubtle, and deſigning, and apt to corrupt virtuous manners.

Fencing is divided into two parts, *ſimple* and *compound*. *Simple* is that performed directly and nimbly, on the ſame line; and is either *offenſive*, or *defenſive*. The principal object of the firſt is whatever may be attempted, in puſhing, or making paſſes, from this or that point, to the moſt uncovered part of the enemy. The ſecond conſiſts in parrying, and repelling the thruſts aimed by the enemy.

The *compound*, on the offenſive ſide, includes all the poſſible arts and inventions to deceive the enemy, and make him leave that part we have a deſign on, bare, and unguarded, upon finding we cannot come at it by force, nor by the agility of the ſimple play.

The principal means hereof are FEINTS, appeals, or appels, which conſiſt in a ſudden beat of your blade on the contrary ſide to that on which you join your adverſary, and a quick diſengagement to that ſide again, claſhings, and entanglings of ſwords, half thruſts, &c. and in the defenſive, to puſh in PARRYING.

The proper attitude in *fencing* is to hold the head upright, though the body hath an inclination forward on a longe, and all the weight reſts on the left haunch when on GUARD. The feet, hand, body, arm, and ſword, muſt be to the line. For an explication of other terms in this art, ſee the articles BEAT, CAVEATING, FLANCONADE, GLIZADE, LOCK, LURCH, THRUST, &c.

FEND, in the *Sea Language*, imports the ſame as *defend*.

Hence the phraſe *fending the boat*, &c. that is, ſaving it from being daſhed againſt the rocks, ſhore, or ſhip's ſide.

Hence alſo

FENDERS, any pieces of old cable-ropes, or billets of wood, &c. hung over the ſhip's ſide, to *fend* or keep other ſhips from rubbing againſt her; or to prevent her from ſtriking or rubbing againſt a wharf or quay.

FENDER-*bolts*. See BOLTS.

FENDUE *en pal*, in *Heraldry*, a French phraſe, applied to a croſs, to denote it cloven down from top to bottom, and the parts ſet at ſome diſtance from one another.

FENESTRA, in *Anatomy*, a name applied to two holes, or apertures, in the inner EAR.

The *feneſtræ* are two openings in the labyrinth; the firſt of them is incloſed by the baſis of the *ſtapes*, and from its oval figure denominated *feneſtra ovalis*.

The latter, called *rotunda*, is cloſed with a tranſverſe tranſparent membrane, placed a little within the ſurface of its aperture.

Theſe *feneſtræ*, with the whole labyrinth, are comprehended in that part of the *os temporum*, properly called from its hardneſs *petroſum*.

FENGELD, in our *Ancient Writers*, is uſed for a tax or impoſition raiſed for repelling of enemies.

It comes from the Saxon *feind*, an *enemy*, and *geld*, *money*.

FENNEL, *Fœniculum*, in *Botany*. Linnæus has joined this genus to *anethum*. See DILL. Its characters are theſe: it hath an umbellated flower; the great umbel is compoſed of many ſmaller, which have no involucrum; the flowers have five incurved petals, and five ſtamina, terminated by roundiſh ſummits; the germen is ſituated under the flower, ſupporting two ſmall ſtyles, crowned by roundiſh ſtigmas, which afterward turns to an oblong fruit, deeply channelled, dividing into two parts, each containing a ſingle ſeed, flat on one ſide, but convex and channelled on the other. There are three ſpecies.

The common *fennel* is ſo well known, as to need no deſcription. It has a ſtrong fleſhy root, which penetrates deep into the ground, and will continue ſeveral years; it flowers in July, and the ſeeds ripen in autumn. The beſt time to ſow the ſeeds, is ſoon after they are ripe; the plants will come up in the ſpring, and require no other care than to keep them clean from weeds; and it will grow in any ſoil or ſituation. The leaves, ſeed, and root of this, are uſed in medicine; the root is one of the five opening roots, and the ſeed one of the greater carminative ſeeds. There is a ſimple water made from the leaves, and an eſſential oil from the ſeed and leaves. Miller's Gard. Dict.

The oil obtained from the leaves on the upper part of the plant is much finer, lighter, and more ſubtle, than the oil obtained from the lower leaves. The former oil ſwims on water, and the latter oil ſinks. Neumann.

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There is alſo a ſtrong water, or brandy, made of the ſeeds of *fennel*, called *fennel-water*. The ingredients are *fennel* ſeed, liquorice, brandy, and white wine, which are diſtilled together; and to the eſſence thereof are added ſpirit of wine, ſugar, and ſweet almonds; the whole is then ſtrained, &c.

The leaves of the ſecond ſort, called ſweet *fennel*, are very long and ſlender, growing more ſparſedly, and not ending in ſo many points as thoſe of the common ſort; the ſtalks do not riſe ſo high; the ſeeds are longer, narrower, and of a lighter colour. The ſeed is generally imported from Germany or Italy, and are by ſome preferred to thoſe of the common ſort, as being much ſweeter. Theſe ſeeds are an uſeful ſtomachic and carminative, and are ſometimes given in powder, from a ſcruple to a dram, and ſometimes candied.

The third ſort is ſuppoſed to have been brought from the Azorian iſlands, and has been long cultivated in Italy as a ſallad herb, under the title of FINOCHIA. There are not many Engliſh palates which reliſh it; nor is it eaſy to be furniſhed with good ſeeds: thoſe which are annually brought from Italy are ſeldom good; and it is difficult to preſerve the plants through the winter in England.

The ſeeds of this ſort are narrow, crooked, and of a bright yellow colour; they have a very ſtrong ſmell, like aniſeed, and are very ſweet to the taſte. Miller.

As to the method of cultivating this plant, ſee FINOCHIA.

FENNEL-*flower*, or *Devil in a buſh*, *Nigella*, in *Botany*, a genus of the *polyandria pentagynia* claſs. Its characters are theſe: the flower has no empalement, but a leafy perianthium; it has five oval, obtuſe, plain petals, which ſpread open, and are contracted at their baſe, and eight very ſhort nectariums, ſituated in a circle, each having two lips, the exterior larger, the inferior bifid, plain, and convex. It has a great number of awl-ſhaped ſtamina, which are ſhorter than the petals, terminated by obtuſe, erect, compreſſed ſummits; and in ſome five, in others ten, oblong, convex, erect germina. The germina afterward become ſo many oblong, compreſſed capſules, divided by a furrow, but connected within, filled with rough angular ſeeds. There are ſeven ſpecies.

All theſe plants may be propagated by ſowing their ſeeds upon a bed of light earth, where they are to remain. The ſeaſon for ſowing theſe ſeeds is March; in July they will produce their flowers, and their ſeeds will ripen in Auguſt, when they ſhould be gathered and dried. Miller.

The ſeed of this plant is uſed to diſſolve the viſcous matters, which, gathering in the ſinuſſes of the head, produce catarrhs. For this purpoſe infuſe a pugil of marjoram leaves in a glaſs of white wine, and add a dram of *nigella* ſeed; ſtrain the whole through a linen cloth, and ſnuff the wine ſtrongly up the noſe. For the colic, a ptiſan is made of the tops of chamomile, melilot, and *nigella* ſeeds. The eſſential oil has the ſame virtues; it is very inciſive and expectorating; the infuſion of the ſame ſeed in wine is diuretic, and provokes the menſes.

FENNEL-*flower of Crete*. See GARIDELLA.

FENNEL-*giant*, *Ferula*, in *Botany*, a genus of the *pentandria digynia* claſs. Its characters are theſe: it hath an umbellated flower, the principal umbel of which is compoſed of ſeveral ſmaller, called rays; the involucrum is compoſed of ſeveral narrow leaves, which fall off; the principal umbel is uniform. The flowers have five oblong petals, and five ſtamina of the ſame length, terminated by ſingle ſummits. Under the flower is ſituated a turbinated germen, ſupporting two reflexed ſtyles, crowned by obtuſe ſtigmas, which afterward becomes an elliptical, compreſſed, plain fruit, dividing in two parts, each having a large elliptical plain ſeed, marked with three lines on each ſide. There are eight ſpecies. Miller.

The parts in uſe are the medullary ſubſtance of the ſtalks, the ſeed, and the juice, or gum, which is the SAGAPENUM of the ſhops. Mr. Ray ſays, that the people of Sicily uſe the pith of the *ferula major*, or Pliny's female *fennel-giant*, for tinder to light their fires; and if this was practiſed by the ancients, we may gueſs why the poets feigned, that Prometheus ſtole fire from heaven, and carried it to the earth in a hollow *ferula*.

FENNEL, *hog's*, or *Sulphur-wort*, *Peucedanum*, in *Botany*, a genus of the *pentandria digynia* claſs. Its characters are theſe: it hath an umbelliferous flower; the cover of the large umbel compoſed of many linear reflexed leaves; the empalement of the flower is ſmall, and indented in five parts, and the petals of the great umbel are uniform. Each flower is compoſed of five oblong incurved petals, which are equal and entire; they have each five hair-like ſtamina, terminated by ſingle ſummits, with an oblong germen ſituated under the flower, ſupporting two ſmall ſtyles, crowned by obtuſe ſtigmas. The germen turns to an oval channelled fruit, ſplitting in two parts, containing two ſeeds, convex on one ſide, compreſſed on the other; with three raiſed furrows, and a broad membraneous border indented at the top. There are four ſpecies. Miller.

The common *hog's fennel* is found in wet and mooriſh places, and about fen ditches. It flowers in June and July. Its root is eſteemed of great uſe, as an expectorant and attenuant. It is preſcribed in diſeaſes of the breaſts and lungs, particularly in thoſe in which thoſe parts are loaded with a tough phlegm. It is alſo recommended in all obſtructions of the viſcera. It promotes urine, and is recommended in nephritic caſes. The old authors have ſpoke greatly of its efficacy in all nervous caſes, and have recommended it as a ſingular remedy in lethargies, palſies, epilepſies, and the like.

If the roots are wounded, when freſh, in the ſpring or autumn, they yield a yellow juice, which dries into a ſolid gummy reſin, that is recommended as an aperient and antihyſteric. Lewis's Mat. Med.

FENNEL, *ſcorching*, in *Botany*. See THAPSIA.

FENNEL, *ſea*. See SAMPHIRE.

FENUGREEK, *Fœnum Græcum*, *Trigonella*, in *Botany*, a genus of the *diadelphia decandria* claſs. Its characters are theſe: the empalement of the flower is well ſhaped, of one leaf, cut at the top into five almoſt equal ſegments. The flower is of the butterfly kind; the ſtandard obtuſe, oval, and reflexed; the two wings are oblong, reflexed, and ſpreading flat like the ſtandard, ſo as outwardly to appear like a regular flower of three petals. The keel is very ſhort, obtuſe, and occupies the navel of the flower. It hath ten ſhort riſing ſtamina, nine of which are joined, and one ſtands ſeparate, terminated by ſingle ſummits; and an oval, oblong germen, ſupporting a ſingle ſtyle, crowned by a riſing ſtigma. The germen afterward turns to an oblong oval pod, compreſſed, filled with kidney-ſhaped ſeeds. There are ſix ſpecies.

The firſt ſort is the common *fenugreek*, whoſe ſeed is uſed in medicine. Where this plant grows naturally is uncertain; but it is cultivated in the ſouth of France and in Germany; from whence great quantities of the ſeed are annually imported here for uſe. It is alſo much cultivated in India.

This plant has not yet been cultivated in any quantity for uſe in England, as it has generally proved a very uncertain crop, occaſioned by the inconſtancy of the weather. The ſeed from the continent is therefore always to be preferred. Miller.

The ſeeds of this plant contain an expreſſible oil blended with reſin and mucilage, but no eſſential oil; to rectified ſpirit they communicate the whole of their diſtinguiſhing ſmell and taſte; and afterwards to water a ſtrong ſavourleſs mucilage. The principal uſe of theſe ſeeds is in cataplaſms and fomentations, for ſoftening, maturating, and diſcuſſing tumours; and in emollient, carminative clyſters. They are an ingredient in the *oleum è mucilaginibus* of the ſhops. Ground in a mill, they are uſed in drinks for horſes. Neumann and Lewis.

The ſeed is leſs than muſtard-ſeed, very hard and ſolid, of a triangular form, and a ſtrong diſagreeable ſmell; when new, it is of a yellow gold-colour, but when long kept, ruddy, or brown.

FEODAL, *Feodalis*, or *Feudalis*, of or belonging to a *feud*, or FEE. Hence *feudal* ſervices, &c.

FEODALITY, the FEALTY paid to the lord by his feudal tenant.

FEODARY, *Feudary*, or *Feudatary*, an officer anciently made and authorized by the maſter of the court of wards. 32 Hen. VIII. cap. 26.

His office was to be preſent with the eſcheator, at the finding any office of lands; and to give evidence for the king, concerning the tenure, and the value thereof; to ſurvey the land of the ward after the office found, and rate it. He alſo aſſigned the kings widows their dowers, and received the rents of wards lands. This office is taken away by ſtat. 12 Car. II. cap. 24.

FEODATARY, or FEUDATARY. See FEODARY and FEUDATARY.

FEODER, a MEASURE for liquids, uſed throughout Germany.

FEODITAS, in *Old Writers*, is ſometimes uſed for *fidelitas*, or FEALTY.

FEODUM, or FEUDUM, the ſame with *fief* or FEE.

FEOFFMENT, derived from the verb *feoffare*, or *infeudare*, *to enfeoff*, *to give one a feud*, in *Common Law*, is the moſt ancient method of conveyance, and ſignifies a gift or grant of honours, caſtles, manors, meſſuages, lands, or the like corporeal or immoveable things, to another in fee-ſimple; that is, to him, and his heirs for ever, by the delivery of ſeiſin, and the poſſeſſion of the thing given. See FEE, and LIVERY.

When this is done by writing, it is called the *deed of feoffment*.

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In every *feoffment*, the giver is called the *feoffer*, or *feoffator*; and he that receives, the *feoffee*.

The proper difference in our law, between a *feoffer*, and a donor, is, that the *feoffer* gives in fee-simple; and the donor in fee-tail.

FERÆ, in the Linnæan system of *Zoology*, one of the orders of animals, of the class of *mammalia*; the characters of which are, that they have sharp teeth; the upper fore-teeth are six in number, and the canine or dog-teeth longer than the rest. Of this order are the bear, the lion, the tyger, the cat, the weasel, the ferret, the didelphis or philander; the otter, the sea-calf, the dog, the badger, the hedge-hog, the mole, and the bat, which this author makes not a bird, but a quadruped, with its fore-feet expanded into a sort of wings, &c.

FERÆ *naturæ*, in our *Law*, signifies birds or beasts that are wild, in opposition to such as are tame: such are hares, foxes, wild geese, or the like, wherein no man may claim a property. 2 Cro. 293.

FERALIA, in *Antiquity*, a feast held by the Romans, on the twenty-first of February, in honour of the dead. Vid. Mem. Acad. Inscript. tom. i. p. 43.

Varro derives the word from *inferi*, or from *fero*; on account of a repast carried to the sepulchres of such as the last offices were that day tendered to. Festus derives it from *ferio*, on account of the victims sacrificed. Vossius observes, that the Romans called death *fera*, *cruel*, and that the word *ferulâ* might arise thence.

Macrobius, Saturn. lib. i. cap. 13. refers the origin of the ceremony to Numa Pompilius. Ovid, in his Fasti, goes back as far as Æneas for its institution. He adds, that on the same day a sacrifice was performed to the goddess Muta, or *Dumb*; and that the persons who officiated, were an old woman, attended with a number of young girls.

FER *de fourchette*, *trois à fer de fourchette*, in *Heraldry*, is a cross, having a forked iron at each end, like that formerly used by soldiers to rest their muskets on; by which it is distinguished from the cross *fourché*; the ends whereof turn forked; whereas in this, the fork is fixed on the square end; as represented in *Tab. Heraldry*, *fig.* 20.

FER *de moulin*, q. d. *iron of the mill*, is a bearing in *Heraldry*; supposed to represent the iron ink, or ink of a mill, which sustains the moving mill-stone. See a representation of it in *Tab. Herald. fig.* 21.

FERD-*wit*, or FERD-*wite*, in our *Ancient Customs*, a formulary, by which the king pardoned manslaughter, committed in the army.

The word is formed of the Saxon *ferd*, *army*, and *wite*, *punishment*.

FERDFARE, from the Saxon *ferd*, *army*, and *fare*, *journey*, in our *Old Writers*, is used for being discharged from going to war.

FERENTARII, or FERENDARII, among the Romans, were auxiliary troops, lightly armed; their weapons being a sword, bow, and arrows, and a sling; which were much less cumbersome than a buckler, battle-ax, pike, &c.

The name seems to have been derived *a ferendo auxilio*; these being auxiliary forces; though Varro thinks they might be so called, because the sling and stones *feruntur*, *non tenentur*.

We have also mention of another sort of *ferentarii*, whose business was, to carry arms after the armies, and to be ready to supply the soldiers therewith in battle.

Lydius uses the name *ferentarii* for the *cataphracti equites*, i. e. cavaliers, armed cap-à-pé.

FERETRUM, among the Romans, the bier used in carrying out the bodies of the dead; which duty was performed by the nearest male relations of the deceased: thus, sons carried out their parents, brothers their sisters, &c. See BURIAL.

FERIÆ, among the Romans, were holy-days, or days wherein they abstained from work.

The word *feriæ* is usually derived *a ferendis victimis*, on account of the victims killed on these days. Martinius says, that *feriæ* were so called *velut ἱεραὶ ἡμέραι*, *dies sacri*, *holy days*. Others observe, that all days in general, though they were not feast-days, were anciently called *festæ*; or, as Vossius reads it, *fesiæ*; whence, according to that author, was formed the word *feriæ*.

The *feriæ*, or *dies ferati*, were observed and distinguished chiefly by rest; whereas the *feasts*, or *dies festi*, beside a cessation from labour, were celebrated with sacrifices and games; so that there were *feriæ*, which were not feast-days; though authors frequently confound the *feriæ*, and *festi*.

Others confound the *feriæ* with the *dies nefasti*, or *non-court-days*.

The Latin *feria* amounts to the Sabbath of the Hebrews.

The Romans had divers kinds of *feriæ*; their names, at least the principal thereof, are *æstivales*, or summer *feriæ*; *anniversariæ*, yearly *feriæ*; *compitalitiæ feriæ* of the streets and cross-ways; *conceptivæ*, votive *feriæ*, which the magistrates promised every year; *denicales*, for the expiation of a family polluted by the death of any one; *imperativæ*, or *indictivæ*, those decreed by the magistrate; *Latinæ*, the Latin *feriæ*, instituted by Tarquin the Proud, for all the Latin people, amounting annually, says Dion. Hal. to forty-seven nations, being celebrated on mount Alba, in memory of the peace concluded by Tarquin with the people of Latium. These *feriæ Latinæ* were either ordinary or extraordinary. They continued at first only for a day; but after the expulsion of Tarquin, a second day was added, and a third after the reconciliation between the plebeians and patricians; and in process of time they were prolonged to four days. At these feasts a bull was sacrificed, and each town contributed a certain quantity of meat, wine, and fruits. *Messis feriæ*, were those of harvest; there were also *paganales feriæ*, or PAGANALIA; *præcidaneæ*, which were what we properly call the vigils, or eves of the feasts; *privatæ*, or *propriæ*, those peculiar to the several families; as the *familiæ Claudiæ*, *Æmiliæ*, *Juliæ*, &c. *publicæ*, those observed by all in general, or for the public weal; *sementinæ*, those held in seed-time; *stativæ*, those kept constantly to the same day of the year; *Saturnales*, whereof we shall speak in their place; *stultorum feriæ*, or *quirinaliæ*, the *feriæ* of fools, held on the seventeenth of February; *victoriæ feriæ*, those of victory, in the month of August; *vindemiales*, those of the vintage, from the twentieth of August to the fifteenth of October; *Vulcani feriæ*, those of Vulcan, which fell on the twenty-second of May. See FEAST.

FERIÆ was also used among the Romans for fair-days; because it was their custom to hold their fairs on the *dies feriati*, or holidays. Struv. Synt. Antiq. Rom. cap. ix. p. 425. 443, &c.

FERIA is still retained in the Romish breviary, though in a sense somewhat different from the *feriæ* of the ancients; being applied to the several days of the week, beginning with Sunday; provided none of those days be a feast or fast-day. Thus, Monday is the second *feria*; Tuesday the third, &c.

The word *feria*, in this sense, is doubtless borrowed from the ancient *feria*, a day of rest. Accordingly, Sunday is the first *feria*; for anciently all the days of Easter-week were accounted festival days, by a decree of Constantine; whence those seven days were called *feriæ*; Sunday being the first, Monday the second, &c. And this week being then accounted the first of the ecclesiastical year, they afterwards accustomed themselves to call the days of the other weeks after the same manner; *first*, *second*, *third*, &c. *feriæ*. Though others will have it, that the days of the week were not called *feriæ* from the people's resting, that is, on account of being obliged to abstain from servile works; but to advertise the faithful, that they ought to abstain from sin. See Durand, De Off. Div. lib. viii. cap. 1.

These are the *ordinary feriæ*; but besides these, they have *extraordinary*, or *greater feriæ*; viz. the three last days of Passion-week; the two days following Easter-day, and Whitsunday; and the second *feriæ* of Rogation.

FERIAL *days*, *dies* FERIALES, or FERIÆ, among the *Ancients*, signify holidays, or days vacant for labour, and pleading.

But in the stat. 27 Hen. VI. cap. 5. and in Fortescue, De Laudibus LL. Angliæ, *ferial* days are taken for working days. S. Sylvester ordained—*Sabbati & dominici diei nomine retento, reliquos hebdomadæ dies* feriarum *nomine distinctos, ut jam ante in ecclesia vocari cœperant, appellari.*

So that *ferial* days are properly all the days of the week, except Sunday.

FERIJEE, in the dress of the Egyptians, is a sort of skirt worn over another garment, and made either of black woollen, or of other coloured cloth furred; this by the more genteel people is left open before. It somewhat resembles a night-gown.

FERISON, in *Logic*, a mood of the third figure of syllogisms. In this mood the first proposition is an universal negative, denoted by the vowel *e*; the second a particular affirmative; and the third a particular negative, signified by *i* and *o*.

FERLING, in our *Old Statutes*, is used for the fourth part of a penny. *Assis. panis & cerevis*, 51 Hen. III.

FERLINGATA *terræ*, in our *Old Writers*, according to Blount, is the same as *ferlingus terræ*, which lord Coke on Littleton says, was a quarentine, or thirty-two acres of land. But according to the authorities quoted by Du-Cange, Gloss. Lat. voc. *Quarentena*, it contained but forty perches.

FERLINGUS *terræ*. See FERLINGATA *terræ*.

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FERM, FIRMA, in *Law*. See FARM.

FERME *a ferme*, in the *Manege*, ſignifies to exerciſe in the ſame place without ſtirring or parting.

FERMENT, of *fervere, to boil*, in *Phyſics*, any body, which being applied to another, produces a *fermentation* therein; or, any thing capable of exciting an inteſtine motion in the parts of another; and of ſwelling or dilating the ſame.

Thus, the acid in leaven is a *ferment*, which makes bread riſe or ſwell. And the moiſture in hay is a *ferment*, which heats, and makes it ſmoke. Thus alſo, rennet is a *ferment*, which curdles and breaks milk; and barm, or yeaſt, is the *ferment* that ſets wort a working, &c.

Thoſe things are called *ferments* in an alluſive ſenſe, which when added to the liquor, only correct ſome fault therein, and by removing ſome obſtacle to the *fermentation*, forward it by ſecondary means; as alſo ſuch as being added in time of *fermentation*, make the liquor yield a larger proportion of ſpirit, and give it a finer flavour; all theſe additions have the name of *ferments* among our diſtillers, but improperly. The primary uſe of *ferments* is, to ſave time, and make diſpatch of buſineſs, while they only occaſionally and accidentally give a flavour, or add to the quantity of the ſpirit; and accordingly all *fermentable* liquors may, without the leaſt addition, only by a due application of heat, be brought to *ferment* more perfectly, though it will be more ſlowly than with the addition of any *ferment*. The general *ferments* uſed on theſe occaſions are the flowers and *fæces* of *fermentable* liquors generated, thrown up, or depoſited, during the time of the *fermentation* in that liquor, or after the end of it. There are two of theſe *ferments*, procurable in large quantities, and at a ſmall price; theſe are beer yeaſt, and wine lees. A prudent and artificial management of theſe, might render the buſineſs of the brewery for diſtillation, as in the buſineſs of the malt-diſtiller, &c. much more eaſy and advantageous. It has always been found a great difficulty to procure theſe *ferments* in proper quantities, and preſerve them always ready for uſe; and this has been a great diſcouragement to the buſineſs, and hence ſome have been obliged to contrive artificial *ferments*, or to form mixtures or compounds of particular *fermentable* ingredients; but this has been attempted without any great ſucceſs, all theſe mixtures falling ſhort even of the common baker's leaven in their uſe.

When the proper ſort of *ferment* is pitched upon, the operator is next to conſider its quantity, quality, and manner of application. The quantity muſt be proportioned to that of the liquor, to its tenacity, and the degree of flavour it is intended to give, and to the diſpatch required in the operation. From theſe conſiderations he will be able to form a rule to himſelf; but till ſuch a rule is formed, or, in order to the forming of it, proper trial will ſhew how much ſuffices for the purpoſe. The way is to begin with a little, and to add more occaſionally, the weight of the whole being noted beforehand; ſo that on weighing the remainder after the proper quantity is taken away, it will be found how much exactly has been uſed out of it for the buſineſs.

Among the ſeveral ingredients of which *fermentable* liquors are made for the ſervice of the diſtillery, treacle requires more *ferment* than almoſt any other. This is not wonderful on a juſt conſideration of the nature of the ſubject, ſince the manner in which that concrete juice is made, muſt render it greatly unfit for *fermentation* afterwards, though the original product of a vegetable juice very much diſpoſed to it in its own nature. The ſtrength of the fire uſed in the ſugar making, and its long continuance and almoſt immediate contact, and the lime and other alkalies uſed in refining the ſugar, that is, in making the treacle, do ſo condenſe, indurate, and ſcorch the body of this juice, and abſorb its acid, that it is ſcarce to be expected that it ſhould *ferment* at all, even with the addition of jalap, or other powerful ſaline and acid or acrid ſtimulators, which tend to break the viſcous and aduſt connections of the particles.

The greateſt circumſpection and care are neceſſary in regard to the quality of the *ferment*, if a pure and well flavoured ſpirit be required. It muſt be choſen perfectly ſweet and freſh, for all *ferments* are liable to grow muſty and corrupt; and if in this ſtate they are mixed with the *fermentable* liquor, they will communicate their naufeous and filthy flavour to the ſpirit, which will ſcarce ever be got off by any ſubſequent refining. If the *ferment* be ſour, it muſt by no means be uſed with any liquor, for it will communicate its flavour to the whole, and even prevent its riſing to a head, and give it an acetous, inſtead of a vinous tendency. When the proper quantity of a ſuitable and well conditioned *ferment* is got ready, it muſt be put to the *fermentable* liquor in a ſtate barely tepid, or ſcarce lukewarm. The beſt manner of putting them together, ſo as to make the *fermentation* ſtrong and quick, is this. When the *ferment* is ſolid, it muſt be broke to pieces, and gently thinned with ſome of the warm liquor; but a complete or uniform ſolution of it is not to be expected or deſired, as this would weaken its efficacy for the future buſineſs. The whole intended quantity being thus looſely mixed in ſome of the lukewarm liquor, and kept near the fire, or elſewhere, in a tepid ſtate, free from too rude commerce of the external air, more of the inſenſibly warm liquor ought at proper intervals to be brought in, till thus by degrees the whole quantity is ſet at work together.

When the whole is thus ſet at work, and ſecured in a proper degree of warmth, and kept from a too free intercourſe with the external air, it becomes as it were the ſole buſineſs of nature to finiſh the operation, and render the liquor fit for the ſtill. In this eaſy manner the whole end of *fermentation* would be anſwered. But during the whole courſe of the operation, there are ſeveral other things that may be added with ſome particular view, as either to increaſe the quantity of ſpirit, or give it ſome agreeable flavour. Theſe ADDITIONS may ſometimes require ſome alteration in the general method laid down above, though upon the whole it is right. Shaw's Eſſay on Diſtilling.

The force or effect of a *ferment* ariſes hence, that, by its more penetrative and moveable parts, it diſſolves and breaks the texture or combination of the component parts or principles of the body, gives them a new motion, and diſpoſes them to take a new arrangement, or to combine again in a new manner; and ſo to conſtitute a new ſpecies of body.

Thus the bite of a mad dog excites a ſlow *fermentation* in the blood, whereby the divers liquors, or matters it conſiſts of, loſe that nexus, or union, neceſſary to a ſtate of health; and occaſion an irregularity in the ſpirits, from which ariſe the horrors, and other ſymptoms of the diſeaſe.

One way of accounting for DIGESTION, is by ſuppoſing a certain *ferment* in the ſtomach. But what this *ferment* is, or whence it ſhould be derived, is greatly diſputed.

FERMENTS *in the earth*. It is very probable, that the natural *ferments* in the earth may be of more conſequence than is generally ſuppoſed, and tend to elucidate many things, which at preſent appear very myſterious. The different fruitfulneſs of different ſpots of the ſame ſort of land may be owing to this, as alſo the different temperature of the air at the ſame time in places very little diſtant from one another. The effluvia ſent up by ſome of theſe, not only diſſolve ſnow that falls on them, but even melt it in the air as it approaches, and cauſe it to fall in rain, not in ſnow. And often in two places within a mile or two of each other, there ſhall be a diſparity of heat and cold no way elſe to be accounted for, ſince there is often no difference of ſhade or ſhelter.

In Scotland there are large tracts of land, where the *ferment* is ſo ſtrong, that the earth lets a perſon up to the ankles as he walks; and generally, at about a foot depth under this, there is found a ſtratum of pebbles, ſo cloſe rammed together, that they ſeem an artificial cauſeway. This land, though of no greater depth than a foot, is found very rich for garden plants, and even for fruit-trees. Phil. Tranſ. N° 110.

FERMENT, among *Phyſicians*, is ſometimes uſed in a ſynonymous ſenſe with putrefaction, or rather for a putrid habit of body, conſidered as the cauſe of malignant diſorders.

But theſe authors are, nevertheleſs, very careful not to confound putrefaction with vegetable *fermentation*, accounting them only analogous proceſſes; for which reaſon, they uſe the ſame term for the putrefying and fermenting agent. It were to be wiſhed, to avoid ambiguity, that we had two different words to denote the exciting cauſe of theſe two inteſtine commotions; but this is the leſs to be expected, on account of the tendency of all putrid animal ſubſtances to promote both animal putrefaction, and a vinous *fermentation* in vegetables.

FERMENTARII, or FERMENTACEI, a denomination which thoſe of the Latin church have given to the Greeks, on account of their conſecrating and uſing leavened or *fermented* bread in the euchariſt.

As the Greeks call the Latins *azymites*, the Latins, in return, call them *fermentarii*.

FERMENTATION, an inteſtine motion, ariſing ſpontaneouſly among the ſmall, inſenſible particles of a mixed body, and producing a new diſpoſition, and a different combination of thoſe parts.

Fermentation differs from diſſolution, as the latter is only a reſult, or effect of the former: *fermentation* is frequently without diſſolution, i. e. the fermentative motion ſeldom goes ſo far as to diſſolve the body; but diſſolution always ſuppoſes an antecedent *fermentation*.

Fermentation differs from ebullition and effervescence in this,

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this, that the motion, which in the firſt is ſlow, in the two latter is violent; and that, in the firſt, the motion is reſtrained to the minute particles of the body; but, in the latter, it extends to large maſſes thereof.

Indeed it muſt be obſerved, that authors uſually allow of divers kinds of *fermentations*; viz. an inſenſible one, which is only known from its effects; and a ſenſible one; a violent and a moderate one; a hot and a cold one; a natural and an artificial one.

Chemiſts diſtinguiſh three particular kinds of *fermentation*, or three ſtages of the ſame *fermentation*, which refer to the three principal products reſulting from it. The firſt is called the *vinous* or *ſpirituous*, becauſe it changes into WINE the liquors which undergo it, and becauſe from this wine may be obtained an inflammable ſpirit, miſcible with water, called ſpirit of wine. The ſecond kind of *fermentation* is called *acid*, or *acetous*, becauſe the product of it is an acid or VINEGAR. The third kind is called the *putrid* or *putrefactive*, and ſometimes the *alkaline fermentation*, in which caſe the texture of the fermented ſubſtance is deſtroyed, and having loſt its original characters of taſte, colour, and ſmell, it becomes fœtid, rotten, and offenſive; and if committed to diſtillation, yields neither an inflammable nor an acid ſpirit, but a ſharp pungent liquor, being a ſolution of volatile alkaline ſalt, nearly ſimilar to that ſalt which may be obtained by the force of violent heat, from animal ſubſtances, without ſuffering them firſt to become putrid.

All matters ſuſceptible of the ſpirituous *fermentation* may afterwards undergo the acid, and, laſtly, the putrid *fermentation*; but ſome ſubſtances are not ſuſceptible of the ſpirituous *fermentation*, but proceed firſt to the acid, and afterwards to the alkaline or putrid *fermentation*; and laſtly, ſome ſubſtances are ſuſceptible of the putrid *fermentation* only. From theſe conſiderations, and others of a ſimilar nature, Stahl and many other chemiſts conſider theſe *fermentations* leſs, as three operations diſtinct and independent of each other, than as three principal and diſtinguiſhed degrees of one and the ſame fermentative motion, by which nature endeavours to reſolve, and to reduce into a ſimilar condition, all the moiſt compound bodies, into the combination of which the oily principle enters, that is, all animal and vegetable ſubſtances. Theſe ſubſtances, as long as they make part of the living vegetable or animal, undergo *fermentation* in a ſlow and inſenſible manner, being preſerved from it by the vital motion; but when the life of organized bodies ceaſes, all theſe ſubſtances ſenſibly acquire the fermentative motion, paſs more rapidly and regularly from one ſtage of it to another, according to the concurrence of circumſtances which generally favour *fermentation*; ſo that *fermentation*, in this view of it, appears, upon the whole, to be nothing elſe than PUTREFACTION. See DIGESTION. Dict. Chemiſtry, art. FERMENTATION.

Plants bruiſed, and left a certain time in a cloſe veſſel, ferment of themſelves; and, if let alone, the *fermentation* will proceed to putrefaction.

In order to *fermentation*, it is neceſſary the ferment have ſomething acid and ſpirituous in it; that its motion be tumultuous; that it be an open, ſpacious place, and aſſiſted by the air; and that it tend to exalt and purify the body, and produce vinous, or inflammable ſpirits. Theſe are the particular properties and conditions of *fermentation*; though, in the general, all required to effect a *fermentation*, in a body, or liquor, which is not homogeneous, that is, which conſiſts of different principles, is, that there be a ſtrong attraction between the particles of the ferment, and the body; that the parts of this latter be moved and agitated irregularly; and that this motion produce ſome alteration in the mixed.

All vegetable and animal ſubſtances, into the compoſition of which enters a certain quantity of fluid oil and earth, rendered perfectly ſoluble in water, by the intervention of a ſaline matter, being diffuſed in a ſufficient quantity of water to become liquid, or at leaſt ſoft, and being expoſed to heat from a few degrees above the freezing point to twenty-five and more, and when the communication with air is not entirely obſtructed, ſuffer ſpontaneouſly the fermentative motion, which entirely changes the nature and proportion of their principles; and, therefore, the *fermentation* of any body may be prevented or ſuſpended by intenſe cold, want of air and water, and a diſproportion of the principles of the body expoſed to *fermentation*.

Fermentation is one of the moſt obſcure proceſſes in all nature. The generality of our later philoſophers allow it in great meaſure a myſtery, to which their principles will not fully reach. Dr. Morgan attempts to account for it, on the Newtonian ſyſtem. His principle is, that the expanſive force of air, rarefied by the action of fire, or the mutual action of fire and air, is the univerſal natural cauſe of *fermentation* and diſſolution.

To ſhew this, he conſiders two great powers, or principles, in bodies; viz. an attractive, coheſive power, in the ſmall particles of matter, as the principle of all reſt, concretion, &c. and the expanſive force of heated air, as the principle of *fermentation*. On the different proportion and adjuſtment of theſe two oppoſite forces, with reſpect to each other, the conſtitution, texture, and coheſion of bodies, are ſaid to depend.

By the attractive force, acting alone, the conſtituent parts of compound bodies muſt be brought to their neareſt and greateſt contacts, and remain there in a degree of firmneſs and coheſion, proportional to the quantities of contact.

On the other hand, by the repulſive, expanſive force, acting alone, all bodies, even the moſt compact and ſolid, muſt be diſſolved and diffuſed into one perfectly fluid, incoherent maſs.

If both be found in the ſame body, and equal in degree, ſuch a body muſt continue in its preſent ſtate of fluidity, or coheſion: if the attractive power prevail, the quantity of contact, or degree of coheſion, will be continually increaſed to a certain pitch, where it will reſt. On the contrary, if the expanſive force of the fire and air, included in any body, or maſs of matter, prevail againſt the attractive power of the contiguous parts, the parts muſt neceſſarily recede from their points of contact.

And this happening through all the ſubdiviſions of which the body or maſs is capable, every ſmall part muſt be divided and ſeparated into other ſmaller parts; and theſe again into others, and ſo on, till we come to the firſt conſtituent particles or atoms, which are ſuppoſed to be perfectly ſolid, and indiviſible.

This receſs of the parts of bodies from their points of contact, and the ſeparation and diviſion conſequent thereon, is what we call *rarefaction*; as, on the contrary, the approach of the parts nearer to the points of contact, is called *condenſation*. Now from the contrary effects of theſe two forces, there neceſſarily ariſes an inteſtine commotion, colliſion, and natural ſtruggle of the parts among themſelves; i. e. the parts acted on by two ſuch oppoſite forces, will fly off, and recoil, recede, and accede, in proportion to the ſtrength and energy of the oppoſite powers, till one or the other prevail, either to fix and condenſe, or to diſſolve and diffuſe it; which alternate motion is what we call *fermentation*.

If the attractive force prevail, the moſt fluid body will be conſolidated, as water into ice.

The circumſtances neceſſary for cauſing a *fermentation* between a ſolid and a fluid, as they are ſtated by Dr. Freind and Dr. Keill, the reader will find under ATTRACTION, art. xvi. and MENSTRUUM.

Dr. Boerhaave makes the following conditions requiſite. 1. That there be a due proportion between the ſize of the particles of the fluid, and the pores of the body to be diſſolved. 2. That the figure of the particles of the fluid have a determinate relation to that of the pores of the ſolid. 3. That the particles of the fluid be ſufficiently ſolid, ſo that their moment or force of action be not too weak. And, 4. That the particles of the fluid, when received into the pores of the ſolid, be fitly diſpoſed to make ſome ſtay there, and not immediately to paſs through; but to act every way upon the ſolid as they move towards the external ſurface thereof. Chemiſtry, by Shaw, p. 344.

Mr. Rowning apprehends, that nothing more is neceſſary, than that the particles of the ſolid attract thoſe of the fluid with a greater degree of force than either thoſe of the fluid or thoſe of the ſolid attract one another; and that this ſingle ſuppoſition will apply to the ſolution of a ſolid by a fluid, and to the *fermentation* occaſioned by the mixture of two fluids. Nat. Phil. part ii. diſſ. 8.

But perhaps a more accurate and complete theory of *fermentation* may be formed by means of the modern diſcoveries relating to air. Air is known to be combined with various ſubſtances, and to adhere to their conſtituent particles in a fixed or non-elaſtic ſtate, forming, according to Dr. Hales and others, the cement or bond of union between them. This principle, which is now generally known by the name of *fixed* AIR, is ſuppoſed to be the immediate cauſe of COHESION, ſince the preſervation of firmneſs and ſoundneſs in bodies depends on reſtraining the eſcape of this air; for as ſoon as it flies off, and reſumes its elaſticity, the other conſtituent particles, viz. the earthy, ſaline, oily, or inflammable and aqueous, being hereby put into motion, immediately begin to exert their ſeveral peculiar attractive and repulſive powers, and run into new combinations, which firſt change, and at length altogether deſtroy the texture of the ſubſtance which they formerly compoſed, provided that this ſubſtance contained in itſelf a ſufficient quantity of water to allow of the inteſtine motion, by giving the proper degree of fluidity or moiſture; for without fluidity there

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can be no inteſtine motion, and without inteſtine motion there can be no change of combination. Whatever, therefore, in theſe circumſtances, occaſions a releaſe of this air, and ſerves to change its ſtate, from that of a concrete body into an elaſtic repelling fluid, will produce *fermentation*. It is well known, that the particles of bodies attract each other within certain diſtances; and that, when they are placed beyond the ſphere of each other's attraction, they begin to exert a repulſive power. Heat may be one cauſe of expanding bodies, ſo that their conſtituent particles may be removed to ſuch diſtances from each other, that their attraction ſhall ceaſe, and their mutual repulſion commence. A quick vibration, and violent inteſtine motion excited among the minute particles of bodies, will occaſion a ſimilar ſeparation of theſe particles, and a conſequent change from a concrete to a repelling ſtate. Thus, when any two united particles are torn aſunder by the ſuperior attraction or AFFINITY of a menſtruum or ſolvent, they muſt at the inſtant of ſeparation recede from each other with a force equal to that with which their disjunction was reſiſted. And the effect of the violent ſeparations of the particles of bodies, which occur in chemical decompoſitions, ſolutions, and *fermentations*, will appear very great, when we conſider the minuteneſs of the particles engaged in theſe operations, and how much the activity or force of the attraction and repulſion of bodies depends on the ſmallneſs of their ſize. See on this ſubject Macbride's Eſſays, eſſ. 2. Chemical Dict. Eng. ed. 2. vol. iii. p. 80, 81. See PUTREFACTION.

The buſineſs of *fermentation* is one of the great preparations to the diſtillery. What we uſually call vinous *fermentation* in particular, is the kind in which it is principally concerned. By this we uſually underſtand that phyſical action, or inteſtine commotion of the parts of a vegetable juice tincture, or ſolution, which render them fit to yield an inflammable ſpirit on diſtillation.

This *fermentation* in the hands of the diſtiller differs from the common one, that is uſed in the making of potable vinous liquors, as being much more violent, tumultuary, active, and combinatory than that. A large quantity of yeaſt, or other ferment, is added to the diſtiller's *fermentation*; the free air is admitted, and every thing is contrived to quicken the operation, ſo that it is ſometimes finiſhed in two or three days. This great diſpatch, however neceſſary to the large dealer, has its inconveniencies attending it; for the ſpirit is by this means always fouler, more groſs, and really terreſtrial, than it would have been if the liquor had undergone a proper *fermentation* in a ſlower manner. It alſo ſuffers a diminution in its quantity, from the violent and tumultuary admiſſion, conflict, and agitation of the free air, both in the body and upon the ſurface of the liquor, eſpecially if the liquor be not immediately committed to the ſtill as ſoon as the *fermentation* is fairly ſlacked or fully ended. It is a very difficult taſk to render the buſineſs of *fermentation* at once perfect and advantageous. To ferment, in perfection, neceſſarily requires length of time, and careful attendance, and cloſe veſſels, beſide ſeveral other articles of nice management, which cannot be expected to be received and practiſed in the large way, on account of the trouble and expence, unleſs it could be proved to the diſtillers, as poſſibly it ſome time may, that the quantity of ſpirit would be ſo much greater from the ſame quantity of materials managed thus, than by the common way, that it will more than pay its own expence; to which may be added, the very well known advantage of the ſpirit thus procured by perfect *fermentation*, being much finer than that obtained in the common way: till this ſhall be made out, it may not be amiſs to try how much of the more perfect art of vinous *fermentation* is profitably practicable by the diſtiller in the preſent circumſtances of things. The improvements to be made in this affair will principally regard, 1. The preparation or previous diſpoſition of the fermentable liquor. 2. The additions tending to the general, or ſome particular end. 3. The admiſſion or excluſion of the air. 4. The regulation of the external heat or cold; and, 5. A ſuitable degree of reſt at laſt. When proper regard is had to theſe particulars, the liquor will have its due courſe of *fermentation*, and it will thence become fit to yield a pure and copious inflammable ſpirit by diſtillation. The tincture, ſolution, or liquor, intended for *fermentation*, for the ſtill, ſhould be conſiderably thin and aqueous. That ſort of richneſs there is in the twelve ſhilling ſmall beer, is the utmoſt that ought to be allowed to it. This property not only fits it to ferment readily, but alſo to yield a larger quantity in proportion of a pure vinous ſpirit, than it would do if it were more rich or clammy: the groſs, foul, viſcid, and earthy particles of ſuch glutinous liquors, being after *fermentation* apt to riſe up with the boiling heat which muſt neceſſarily be employed to raiſe the ſpirit; and the ſpirit thus of courſe comes over foul and fetid. There is alſo another advantage attending the thinneſs of this liquor, which is, that it will ſooner become fine by ſtanding before *fermentation*; whence it may be commodiouſly drawn off from its faeces or bottom, which muſt always in caſe of corn, malt, or any other mealy ſubſtance, be kept out where the purity of the ſpirit is conſulted. A certain degree of warmth ſeems neceſſary in all the northern climates, to all ſorts of artificial liquors, intended for immediate *fermentation*, eſpecially in winter; but the natural juices of vegetables, which have never been inſpiſſated, as that of grapes, and other fruits, when fully ripened, will uſually ferment, as ſoon as they are expreſſed, without any external aſſiſtance. But as a certain degree of inſpiſſation prevents all tendency to *fermentation* in all vegetable juices, though otherwiſe ſtrongly diſpoſed to ferment; ſo a long continuance, or an increaſe of the inſpiſſating heat, eſpecially if it acts immediately through a metalline or ſolid body upon the juice, will deſtroy its fermenting property; and it will do this the more effectually, as the heat employed approaches to that of ſcorching, or the degree capable of giving an empyreuma. After the ſame manner, ſeveral experiments make it appear that there is a certain degree of heat, the continuance, or leaſt increaſe of which, proves detrimental or deſtructive to *fermentation*; as there is another, which in a wonderful manner encourages and promotes it. Theſe two degrees of heat ought to be carefully noted and ſettled by the thermometer, or other certain methods, for philoſophical and chemical uſes; but for common, or all œconomical occaſions, they may be limited to what we call a tepid and fervid heat: a fervid heat is the bane of all vinous *fermentation*, as a tepid one, or rather an imperceptible warmth, is the great promoter of them. In this neutral ſtate, therefore, with proper contrivances to preſerve and continue it, the liquor is to be put into a ſuitable veſſel for *fermentation*; at which time if it works not of itſelf, it muſt be quickened by additions; and, in general, by ſuch things as are commonly called FERMENTS. See SPIRITS, MAKING *up*, LOWERING, &c.

The juices of plants are ſtrangely altered by *fermentation*, and are ſuſceptible of many, and thoſe very various, changes from it. And it is not only the juices of fruits that are thus to be wrought upon, as thoſe of apples, pears, grapes, and the like, in the common way; but there is an artificial change to be made in the ſeeds of plants by what is called malting. And it is not grain alone that is thus to be wrought upon, but any other ſeed whatever may be made to yield its juices and virtues freely to water by this proceſs. The juices of roots alſo, for inſtance that of liquorice, will be wrought upon in the ſame manner; and the juices of the bodies of trees, as of the birch, and the like. If in the month of March a hole be bored into the body of a birch-tree, and this hole be ſtopped with a cork, through the middle of which there is thruſt a quill open at both ends, the juices of the tree will drop out at the quill at the rate of a large drop every ſecond of a minute, and a great quantity will in time be obtained in this manner. This liquor is not unpleaſant to the taſte, and looks tolerably clear, reſembling water into which a little milk had been ſpilt. There are many ways of fermenting this juice, by all of which it is converted into a ſort of wine. Theſe are well known; but there is another remarkable property in our maples, both the common ſmall kind, and the great one, which we call the ſycamore; theſe being tapped in the ſame manner, will bleed freely in winter; and their juices, after a hard froſt breaks, will flow out in ſo copious a manner, as is ſcarce to be conceived. The willow, the poplar, and the walnut-tree, will all bleed alſo; and *fermentation*, of which their ſeveral juices are eaſily ſuſceptible, will turn them all into palatable and ſtrong wines. See BREWING.

To obtain an idea of theſe changes, we cannot conſider it better, than in the procuring of a ſpirituous liquor from malt, by means thereof.

It is to be obſerved then, that the malt being made, as ſhewn under the article MALT, and then laid to infuſe or maſh in hot water, the reſt of the proceſs of brewing is nothing but a raiſing and directing of a *fermentation*, or inteſtine motion.

How ſuch motion is mechanically affected, and how it brings forth ſuch a ſpirit, may be conceived from what follows; ſuppoſing the reader acquainted with theſe common propoſitions in hydroſtatics; viz.

1. That a body immerſed in any fluid, ſpecifically lighter than itſelf, will ſink; otherwiſe it will emerge, and get to the top.

2. That if two equal bodies of different ſpecific gravities be immerſed in a fluid, lighter than either of them, the celerities of their deſcents will be as their gravities.

3. That

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3. That if two unequal bodies of unequal ſpecific gravities be immerſed in a fluid, lighter than either, the celerities of their deſcents will be compounded of their gravities and dimenſions together.

The ſame laws, by which bodies deſcend, hold good in the aſcent of thoſe ſpecifically lighter than the fluid.

Hence, in all heterogeneous fluids, the conſtituent parts of which are not fitted to aſſociate and cohere, ſo as to form what is called an uniform homogeneous fluid, the heavier may be accounted as ſolid bodies immerſed in a fluid ſpecifically lighter; and the lighter parts, as ſuch bodies in a fluid ſpecifically heavier; ſince it may be demonſtrated, that the component parts of all fluids, ſeparately conſidered, are ſolid.

The liquor, therefore, called *wort*, which is a decoction of malt, may be conſidered as ſuch an heterogeneous fluid, whoſe parts cannot be interchanged in their poſitions, till each has obtained ſuch an elevation as correſponds to its proper gravity; but leſt this alone ſhould fail of the intention, by not being ſufficient to break thoſe moleculæ and viſcidities, which entangle the ſpirituous parts, and likewiſe to prevent their flying off at the ſurface, ſome portion of an already fermented ſubſtance is mixed with it.

In the fermenting of malt for diſtilling the ſpirit, the meal of unmalted corn is found neceſſary to be mixed with the malt, to prevent its exceſſive *fermentation*, and throwing off the matter of the ſpirit; but as diſpatch is required in this caſe, a good quantity of yeaſt is added to quicken the *fermentation*, ſo that it may be finiſhed in two or three days. More yeaſt is to be added if the weather be cold, and leſs if it be hot: the reverſe of this is to be underſtood of meal, more of which is to be added in hot weather to check, and leſs in cold, to haſten the operation, which in the preſent caſe is deſigned to be violent, contrary to what ought to be obſerved in the *fermentation* of wines, where the ſlower the operation is performed, the better the liquor will prove, and this may indeed hold here alſo in a leſs degree; for it is poſſible to ferment the waſh ſo violently, that it ſhall ſoon end in putrefaction. Shaw's Lectures, p. 216.

This ſubſtance, termed *barm*, or *yeaſt*, conſiſts of a great quantity of ſubtle ſpirituous particles, wrapped up in ſuch as are viſcid. Now, when this is mixed with ſuch a liquor, it cannot but much contribute to that inteſtine motion which is occaſioned by the intercourſe, and occurſions of particles of different gravities; as the ſpirituous particles will be continually ſtriving to get up to the ſurface, and the viſcid ones continually retarding ſuch an aſcent, and preventing their eſcape.

So that by theſe two concurring cauſes the particles extracted from the grain will by ſuch frequent occurſions be ſo comminuted, as continually to increaſe the more ſubtile and ſpirituous parts, until all that can be made ſo by attrition, be ſet looſe from their former viſcid confinements; and this appears by the warmth of the liquor, and the froth driven to the top; juſt at which time, if it be thrown into the ſtill, it affords ſome quantity of a highly inflammable ſpirit.

Moderate warmth much haſtens this proceſs, as it aſſiſts in opening the viſcidities, in which ſome of the ſpirituous parts may be entangled, and unbends the ſpring of the included air, which cannot but contribute to the rarefaction and comminution of the whole.

The viſcid parts, which are raiſed to the top, not only on account of their own lightneſs, but by the continual efforts and occurſions of the ſpirit to get uppermoſt, both ſhew when the ferment is at the higheſt, and prevent the finer ſpirits making their eſcape; for if this inteſtine luctus be permitted to continue too long, a great deal will get away, and the remaining liquor will grow flat and vapid, and raiſe little beſides phlegm in the ſtill.

A quantity of fixed air is extricated in the proceſs of *fermentation*, recovers its elaſticity, and being rarer and lighter than the fermenting liquor, riſes to the top, occaſioning an inteſtine commotion, and bearing with it ſome of the more volatile and ſpirituous parts of the liquor; but being heavier than the atmoſpherical air, reſts on the ſurface. See WORT.

Some of the proceſſes in chemiſtry ſeem to prove, that *fermentation* is not confined to animal and vegetable ſubſtances, but that mineral are alſo liable to it in ſome degree. If an ounce of lead and an ounce of biſmuth be melted together in an iron ladle, and an ounce of quickſilver be heated in another ladle, and all three mixed together, this makes an amalgamation, which appears perfectly homogeneous, and paſſes through leather in a running form, without leaving any thing behind. But this mixture being ſuffered to ſtand quiet for ſome hours, a groſs matter will ſeparate from it by degrees, and float upon the reſt, which will now run eaſily through leather, and leave the groſs matter behind. Here appear all the requiſites of *fermentation*. 1. A fluid form. 2. An uniform matter. 3. An inteſtine motion; and, 4. An actual ſeparation of a groſſer matter leaving a thinner behind. Shaw's Lectures, p. 139.

Fermentation is a point of the utmoſt conſequence in medicine, and the animal œconomy; it is one of the principal means or inſtruments we have for altering, exalting, or calling forth the properties and powers of bodies. See DIGESTION.

The greateſt uſe of the theory of *fermentation* in medicine, will be in teaching what parts of the materia medica are moſt properly brought under this procedure; and how ſuch inteſtine motion does, in ſome things, deſtroy their virtues: for by ſome medicines an intention is aimed at, which is not to be procured, but by their being ſpirituous, whereas, in others, the very contrary property is required: in ſuch caſes, therefore, when by any adventitious cauſe thoſe medicines get into a ferment, they are deſtroyed, and ſhould not be adminiſtered.

FERMENTED *liquors*. All *fermented* liquors abound with a ſuperabundant proportion of water; and if a very conſiderable quantity of it were taken away, they would become not only richer, but more durable, provided that ſo much of the aqueous humidity was retained, as was juſt ſufficient to preſerve the vinous conſiſtence, to keep the ſaline part fluid, and to retain the ſlimy and unctuous parts expanded and mixed among the reſt. But as an actual and truly ſaline matter abounds in WINE and VINEGAR, and that of an acid, auſtere, and tartareous kind, when the ſpirituous part is drawn away, the wine becomes ſurpriſingly more auſtere; and when a large quantity of the watery part is ſeparated, this ſuperabundant ſaline, tartareous matter, coagulates into a cryſtalline form, and either falls to the bottom, or ſticks to the ſides of the caſk. For the ſubtile, oily matter, which makes the ſpirituous part in wine, blunts and takes off from a tartareous acidity, in the ſame manner that the addition of ſpirit of wine blunts, ſheathes, and dulcifies the acid, corroſive parts of ſpirit of nitre in making the ſpiritus nitri dulcis. But this tartareous ſalt abounding alſo with an undue proportion of ſo groſs and unctuous matter, cannot be diſſolved or diluted without a very large proportion of water, which being taken away, it is preſently converted into dry and ſolid cryſtals, as is the known caſe of cream of tartar. Hence it proceeds, that the auſterity and roughneſs of wine are the more preſerved, the more the wine is deprived of its ſpirituous parts. This experiment is familiar in our kitchens, where wine being burnt or boiled into ſauce, is found to have a much greater degree of auſterity, than the ſauce and wine had before it had undergone the action of the fire, and loſt its ſpirituous part. When the water is even by diſtillation plentifully drawn off from wine, not of a terreſtrial and chalky, but of a tartareous nature, a beautiful tartar will be found to cryſtallize, among the remaining maſs, in a conſiderable proportion. But though this ſuperfluous water, that generally dilutes the wine, and weakens its taſte, might be advantageouſly ſpared from it, and it would then become much more rich and noble, and at the ſame time more ſmooth and ſoft, through the loſs of ſome conſiderable portion of its tartar; yet this ſeparation cannot be effected by diſtillation, becauſe that carries away other parts as well as the water, and damages the whole, by taking off what ought to be the moſt carefully preſerved. The ſpirituous part is the life of all *fermented* liquors, it keeps the whole together, and in a manner embalms and renders them durable and not ſubject to corruption; it alſo in a great meaſure gives them that aromatic refreſhing and reſtorative virtue, and the beſt effects they have on the human body. Nor is this all; but the intimate and ſubtile union of this ſpirituous part with the reſt, is perfectly the ſole and entire cauſe of both the former effects, ſo that it by no means ſuffices to have the ſpirit barely preſent among the other parts, for then it might be drawn off and poured back again, without any damage to the wine; but the eſſential union is here diſſolved by taking it away, and can never be reſtored again by a ſimple re-affuſion. It is therefore deſtructive of the end propoſed, thus to break and diſſolve the texture of the wine, and this entirely ſubverts and deſtroys its nature. This inevitably proves the caſe, whenever wine is evaporated or diſtilled, which conſtantly requires a degree of heat capable of raiſing water into vapour, and hence the ſpirituous part being much lighter than the aqueous, flies off together with it, or before it, and the wine is left diſſolved in its texture, and without its ſoul. Upon this, the remaining ſaline unctuous maſs is ſo diſturbed, as no longer to remain connected, but it becomes thick and turbid, and afterwards runs impetuouſly into a kind of corruption, attended with acidity and ropineſs. All theſe circumſtances ſhew, that though the condenſing of wines, by taking away their ſuperfluous humidity, would be a very deſirable thing, yet it is by no means to be done by evaporation.

Fermented

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Fermented liquors are eſteemed great antidotes to PUTREFACTION; accordingly the abſtinence from them is aſſigned as one cauſe why the Turks are more ſubject than other people to the plague, and other contagious diſtempers. It is likewiſe obſerved, that beer, wine, and ſpirituous liquors, coming more into general uſe, has been one great means of ſuppreſſing putrid diſeaſes. See Pringle's Obſerv. on the Diſeaſes of the Army, p. 286. 294. and Macbride's Eſſ. eſſ. 3. See ANTISEPTIC, CHOWDER, and SPRUCE-*beer*, and WORT.

FERN, *Filix*, in *Botany*, the name of an order of plants belonging to the *cryptogamia* claſs, and comprehending ſixteen genera; among which are the horſe-hair, maiden-hair, adder's tongue, ſpleenwort, polypody, &c. to the laſt of which belong the common male and female *fern*, beſides a great number of other ſpecies. The leaves are compoſed of other leaves affixed on each ſide of the middle rib, and thoſe are ſubdivided, almoſt to their rib, into other pinnulæ, or little leaves. The flowers have not been diſcovered, and the ſeeds grow in cluſters on the under part of the leaves. To this it is to be added, that there is alſo a peculiar face in the *ferns*, which diſtinguiſh them at firſt ſight from the other plants of this kind.

The ſeeds of the ſeveral ſpecies of *fern* were wholly unknown to the ancients. Swammerdam, in his Biblia Naturæ, claims to himſelf the honour of having firſt diſcovered them; but it appears from Hook's works, that Dr. William Cole ſent an account of the ſeeds of ſeveral of the plants of this kind to that author, in 1669, whereas Swammerdam declares his diſcovery of them to have been in 1673; ſo that it is plain that Dr. Cole's was prior to his by ſome years. The ſeed-veſſels of the common *fern*, the Engliſh and foreign maiden-hairs, the wall-rue, harts-tongue, and the like plants, are all ſimilar in their general form, their only differences being in the ſize, and in their arrangement on the plants. The number or quantity of the ſeeds is very different in different plants, but Mr. Miles obſerves, that the fewer ſeeds there are in any ſpecies, there is always the more in quantity of a ſort of ſpungy or fungous matter, which forms a kind of tubercle, not unaptly reſembling what is called jews-ears, which ſeems a ſubſtance intended for the ſheltering of the ſeeds.

In the female *fern* and Engliſh maiden-hair, the whole ſurface of the leaf on the under ſide ſeems covered with a congeries of ſeeds, ſo that they guard one another, and therefore have leſs occaſion for a covering of fungous matter of this kind; yet even on theſe plants, when the ſeeds are fallen off, there are found ſmall membranes, a little curled, looking as if they had been raiſed with the edge of a fine pen-knife from the ſkin of the leaf, not unlike the pieces of ſkin that are raiſed off from the hand, in trying a pen-knife, or other ſharp inſtrument. In the common male *fern* there are found, at the proper ſeaſon, ſeveral brown ſpots placed in a regular manner; theſe are of a pale brown colour, and are principally compoſed of this fungous matter, the ſeed-veſſels being ſmall and inſerted round it. Phil. Tranſ. N° 461. p. 774.

Theſe ſeed-veſſels conſiſt of a ſtalk, by which they are inſerted into the leaf; this repreſents an elaſtic cord, and is ſurrounded by a great number of annular ribs, reſembling the cartilages of the aſperia arteria; and indeed nothing in nature ſo exactly reſembles this cord or ſtalk, as the wind-pipe of a ſmall bird. This cord encircles the globular membranous pod wherein the ſeed lies, adhering to it, and dividing it into two hemiſpheres. See *Tab. of Microſcopical Objects, Claſs* 2.

The pod is compoſed of a fine whitiſh membrane, ſomewhat like that which lines the inſide of a pea-ſhell; the ſeeds are irregular in ſhape, and of a reticulated ſurface. The moſt advantageous way of viewing this is to uſe the common microſcope for opake objects, putting on a ſmall magnifier, and laying the ſeeds with their capſules, &c. as taken from the back of the plant, on a piece of poliſhed ivory. The proper time of the year is in the beginning of September, and then if the plant be newly gathered, the ſeed-veſſels often burſt while they are under inſpection, which is the method nature has taken for diſperſing the ſeed, and ſhew a very elegant appearance. Phil. Tranſ. N° 461. p. 782.

The common *female fern* is a very miſchievous and troubleſome weed to the farmers, being very difficult to deſtroy, where it has any depth of ground to root in. Its roots will often penetrate to eight foot deep, and ſpreading a great way, they will riſe again to the ſurface, and ſend up new plants at a conſiderable diſtance. In graſs land the beſt way of deſtroying them, is mowing the graſs, three times a year, in ſpring, in May, and in Auguſt. Dung and aſhes are very good manure for lands which abound with them; but the beſt of all things for deſtroying them, is urine. *Fern* cut up when the ſap is in it, and laid to rot upon the ground, is a very good manure for land, and will mellow it ſo as to prevent its binding. Trees planted where *fern* grows, are obſerved to thrive very much, even though it be upon a hot gravel; the reaſon of this is, that the *fern* ſhades the roots, and keeps them moiſt and cool. Mortimer's Huſbandry, p. 316.

Scotch ſheep put into a land where there is much *fern* growing among the graſs, generally deſtroy it in a little time, partly by their dung and urine, and partly by treading it down.

The root of the *male-fern* is greatly recommended by medical writers, as a cure for the rickets in children. Some alſo give it in powder, againſt worms; and it has the ſame virtues againſt the ſtone and gravel, with the reſt of the genus of capillary plants, aſcribed to it. It was frequently preſcribed by the ancients in diet drinks, for removing obſtructions, and in chronic caſes of all kinds, but is much diſuſed at preſent. Lemery, Dict. des Drog.

All the ſpecies of *fern*, and other vegetables, which carry their ſeeds on the back of their leaves, as moon-wort, and the like plants, poſſeſs the ſame general virtues of drying and ſtrengthening the viſcera, eſpecially the ſpleen.

FERN-*aſhes*. The poor people in many parts of the north of England, uſe aſhes of *fern* inſtead of ſoap, for waſhing their clothes; they cut the plant green, and then burn it to aſhes, and make them up into balls with water; they dry theſe in the ſun, and keep them ready for uſe.

The aſhes of the common *female-fern* produce a very ſingular phænomenon in the common way of treating them and their ſalt. If a large quantity of theſe aſhes be procured, and the ſalt to the quantity of ſeveral pounds extracted from them, in the common way, it will ſucceed better than in ſmaller quantities. The greater part of this ſalt being dried, if the remainder, which is more moiſt, be expoſed to the air to receive ſome of the vapours of it, this will ſoon become fluid, or an oil, as it is very improperly called, by deliquium. The reſt of the lixivium, which will be very heavy, and of a deep blood-red, or claret-colour, being ſet by in a glaſs-veſſel unſtopped for five or ſix months, there will be found at the bottom of the liquor a very large quantity of ſalt precipitated to the thickneſs of about two inches on the bottom of the veſſel. The lower part of this will have all the foulneſs, and appear diſcoloured; but the upper part will be extremely pure and white. From the ſurface of this part there will grow up a number of plants, in appearance ſtanding erect, and at ſmall diſtances from one another. Theſe are only the laſt cryſtallizations of the ſubſiding or ſeparating ſalt, but they have a regularity that is very ſurpriſing; they vary conſiderably in ſize and weight, but are all of the ſame ſhape, exactly reſembling ſo many plants of the common unbranched *fern*, ſending out a great number of regular leaves on each ſide the ſtem. Theſe ramifications of the ſalt will remain many weeks in this perfection, if the veſſel be not ſtirred; but they are ſo tender, that the leaſt motion deſtroys them, and they after this never form themſelves again. Phil. Tranſ. N° 105.

FERN-*oil*, in *Pottery*, a name given by our merchants who have been in China, to a ſort of varniſh, which the Chineſe uſe in their porcelain manufactories. It is alſo called lime-oil, and is a thing ſo eaſily made, that it would be worth attempting what might be done with it, in our imitations of the porcelain. They make it in this manner: they take a large quantity of *fern* well dried, and ſpreading a covering of it over a piece of ground ſufficient for the quantity of oil they intend to make, they lay upon this a coat of large lime-ſtones, newly calcined into lime; on theſe they ſprinkle with the hand a ſmall quantity of water juſt to ſlake them. They cover this bed of lime with another of *fern*, and ſo on, till they have raiſed it to eight or ten foot high; they then ſet fire to the *fern*, this burns away in a little time, and leaves a mixture of the lime and its own aſhes. This mixture is laid in the ſame manner between beds of more *fern*, and burnt again. This operation is repeated five or ſix times. Obſerv. ſur les Coutom. de l'Aſie.

When the laſt calcination is finiſhed, the mixture of lime and aſhes is carefully gathered up, and thrown into large veſſels of water, and with every hundred weight of it, they put in one pound weight of kekio; they ſtir the whole together; and when the coarſer part has ſubſided to the bottom, they take off the finer, which ſwims at the top in form of a fine cream, and putting it into another veſſel of water, they let it ſubſide to the bottom by long ſtanding; they then pour off the water, and ſave the reſiduum in form of a thick oil.

This they mix with the oil of ſtone, prepared by powdering and waſhing in the ſame manner a particular ſort of

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of ſtones, and with this they cover all the veſſels that they intend to varniſh. The *fern* aſhes have a very great ſhare in the advantage that this oil has over our common varniſhes; and the Chineſe tell us, that they once inſtead of *fern* uſed the wood of a tree, called ſe-tki, and they ſuppoſe that the ſuperiority of the old porcelain over the preſent, is owing to the uſe of this tree inſtead of the *fern*; but it is now too ſcarce among them. The new manufacture which we have at Briſtol, excels every thing that has been done of the like kind, in the beauty of the varniſhing; and it is ſaid, they have founded their advantage on an imitation of this and the Chineſe oil of ſtone. Theſe two oils, as they are called, are always mixed together; and they muſt be carefully preſerved of the ſame degree of thickneſs, or elſe all the varniſhing will not be even.

FERN, *flowering*. See OSMOND *royal*.

FERN, *common*, or *true mules*, *filicula*. See MILT-*waſte*.

FERN, *dwarf*, in *Botany*, the name of a genus of plants, the characters of which are theſe: the flowers are not diſcovered; the ſeeds grow in cluſters on the backs of the leaves, and the whole plant reſembles the larger or common *ferns*.

FERN, *mules* or *moon*. See HEMIONITIS.

FERN, *ſweet*. See CHERVIL.

FERNAMBUC. See BRAZIL *wood*.

FEROENSIS *Marga*, in *Natural Hiſtory*, a name given by ſome authors to a marley earth, found principally in the fiſſures and cavities of ſtone, and called by the generality of later naturaliſts, *agaricus mineralis* and *lac lunæ*; and by the ancients, *terra*, or *creta ſeleneuſiaca*. See LAC *lunæ*.

FERRA, in *Zoology*, the name of a fiſh, called alſo by ſome *gwiniad* or GUINIAD.

FERRARIA, in *Botany*, a genus of the *gynandria triandria* claſs. Its characters are theſe: the flower is incloſed in a double ſpatha or ſheath, out of each of which is produced one flower. The flower has ſix oblong acute-pointed petals, three of which are alternately longer than the other, and they ſeem to be joined at their tails; their borders are fringed, turned backward, and ſilky. It has three ſtamina which riſe above the petals, and a roundiſh three-cornered germen ſituated under the flower, which afterward turns to an oblong ſmooth three-cornered capſule, crowned by the decayed petals of the flower, with three cells, wrapped in the permanent ſheath of the flower; in each cell are lodged many ſmall round ſeeds. There are two ſpecies, natives of the Cape of Good Hope. There is a great ſingularity in the root of one of theſe ſpecies, that it vegetates only every other year, and ſometimes every third year; in the intermediate time it remains inactive, though very ſound and good. Miller.

FERRARIA is alſo a name uſed by ſome authors for agrimony; and by others, in particular by Lobel, for the ſcrophularia or fig-wort.

FERRET, *Viverra*, in *Zoology*, an animal of the MUSTELA or WEASEL kind, called by ſome alſo MUSTELA *ſylveſtris*, FURO, and FURUNCULUS.

It is of a middle ſize, between the weaſel and pole-cat; its head is ſmall and flattiſh; its ears ſhort, erect, and very wide; its noſe or ſnout long, like that of a hog; and its eyes ſmall and red; its colour is a pale yelloviſh white; the back and ſides a little darker than the belly; and its feet have all five claws each: it breeds very well with us, but is ſaid not to be a native here, but brought from Africa. Ray's Syn Quad. p. 198.

It was originally brought from Africa into Spain, in order to free that country from the multitude of rabbits with which it was over-run; and from thence the reſt of Europe was ſupplied with it.

This creature has but one note in her voice, which is a ſhrill, but ſmall whining cry. The female uſually brings forth ſeven or eight young ones at a time; ſhe carries them in her body forty days; the young ones are blind for a long time after they are littered. When they are tamed they are to be fed with milk, and with barley-bread; they will faſt a long time; when they walk they ſet up their back, which is otherwiſe ſo long that it would be troubleſome to drag it on; when they are touched, they ſmell very diſagreeably; they naturally ſleep very much. The *ferret* is a bold and audacious animal, and is an enemy to almoſt all others. It does not eat the fleſh of the creatures it kills, but ſucks their blood. The uſe we make of this creature is the ſending it into rabbit-holes to drive them out; but we are obliged to faſten up their mouths that they may not tear the rabbits to pieces; but it ſtill is able to annoy them with its claws, and ſoon drives them out. It feeds on milk, ſmall birds, and the fleſh of animals, and is a creature eaſily kept tame, and will breed and bring up its young in that ſtate; and theſe will naturally hunt the rabbit, in the ſame manner as their parents.

When the warrener has occaſion to uſe the *ferret* to catch rabbits, he firſt makes a noiſe in the warren to frighten them all into their holes; then he pitches his nets; and having muzzled the *ferret*, that he may not bite the rabbits, he turns him into their holes to frighten them out; and then the dogs drive them into the nets that are ſet for them. Warreners aſſert, that the FITCHET will mix with the *ferret*; and they are ſometimes obliged to procure an intercourſe between theſe animals to improve the breed of the latter, which, by long confinement, becomes leſs eager after rabbits, and leſs uſeful: Buffon denies this; but Mr. Pennant alleges a fact in proof of it. Zoology, vol. i. p. 91.

FERRET, *Indian*, *viverra Indica*, a name by which ſome have called the animal known in America by the name of QUIRPELE and QUIL. See ICHNEUMON.

FERRETS, in *Glaſs-making*, the irons with which the workman tries the melted metal to ſee if it be fit to work.

It is alſo uſed for thoſe irons which make the ring at the neck of bottles.

FERRETES *d'Eſpagne*, in *Natural Hiſtory*, a name given by authors to certain ſtones of a regular figure, found on the ſides of a rock in Spain; and as has been ſince diſcovered very plentifully on the bottom and ſides of the Fontaine de Salut, near Bagneres in France, and in other places in the country thereabout. They are ſmall ſtones of the colour of ruſty iron, and of a regular figure, being either parallelopiped with oblique angles, of which the ſides are unequal, or ſmall ſolid bodies with ſix ſides, only differing from cubes or dice in this, that the ſurfaces are not perfectly perpendicular to one another, but a little inclined; they are alſo commonly longer than they are broad, and broader than they are high. The largeſt of theſe fall ſhort of an inch in meaſure, being about eleven lines in length, nine and a half in breadth, and ſix in height; but they are uſually a great deal ſmaller, and are ſometimes found in cluſters, a hundred or more together; and ſome of them have ſhining ſkins, ſeemingly of a metallic ſubſtance. Theſe ſtones are not only found in the bath, but in the digging a way for a common road from the town of Bagneres to it, they were found lodged in their proper ſtratum. The workmen here met with a bed of a ſoft kind of ſlate of a bluiſh colour, but lighter than that of the common ſlate. The whole rock they worked through was compoſed of layers or beds of this, lying almoſt parallel over one another. The ſubſtance of the ſlate ſeemed to be a compoſition of fibres or ſtrings laid regularly ſide by ſide by one another, and all equally inclined to their beds or layers. Whence it comes, that upon breaking them with a hammer, the pieces ſometimes are pretty like the figure of a regular parallelopiped with oblique angles. Upon a narrower examination of this ſort of ſlate, there are uſually found in it a great number of parallelopiped ſtones like thoſe before ſpoken of, only ſmaller; and ſeveral little black ſpots diſcovered in other parts of the ſtone when they are examined with glaſſes, prove alſo to be regularly figured bodies of the ſame kind.

Every one of theſe ſtones, ſo long as it remains in the rock, is always found between two bundles or cluſters of tranſparent fibres, of which generally one is placed on the one, and the other on the oppoſite ſide; theſe cluſters of fibres are largeſt in the largeſt ſtones; however, they are always found even about the ſmalleſt in ſome quantity. Philoſ. Tranſ. N° 472. p. 30.

FERRETTO, in the *Glaſs-trade*, a ſubſtance which ſerves to colour glaſs. This is made by a ſimple calcination of copper, but it ſerves for ſeveral colours. There are two ways of making this: the firſt is as follows; take thin plates of copper, and lay them on a layer of powdered brimſtone, in the bottom of a crucible; over theſe lay more brimſtone, and over that another layer of the plates, and ſo on alternately till the pot is full. Cover the pot, lute it well, place it in a wind furnace, and make a ſtrong fire about it for two hours. When it is taken out and cooled, the copper will be found ſo calcined that it may be crumbled to pieces between the fingers like a friable earth; it will be of a reddiſh, and in ſome parts a blackiſh colour. This muſt be powdered and ſifted fine for uſe. Neri's Art of Glaſs, p. 30.

The other way is leſs eaſy, but it makes a more valuable *ferretto*. It is this: make a number of ſtratifications of plates of copper and powdered vitriol alternately in a crucible, which place on the floor of the glaſs-furnace near the eye, and let it ſtand there three days; then take it out, and make a new ſtratification with more freſh vitriol, and calcine it again as before; repeat this operation ſix times, and a moſt valuable *ferretto* is produced.

FERRIFIC *Cauſe*, a term uſed by ſome writers to expreſs that principle to which what they call the production or generation of iron in burnt bodies, in which no iron could be diſcovered before burning, is owing. It is the general

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general opinion of the preſent philoſophers, that this iron thus diſcovered in the aſhes of plants, and the like burnt ſubſtances, really exiſted there before, and only needed the diſunion of the concreted body to the bringing of its parts together. If this be the caſe, there is evidently no production of iron in the caſe, and therefore the term *ferrific* is a word without meaning. Becher, however, in his ſupplement to his Phyſica Subterranea, is of a very different opinion, determining, that the iron is really produced in theſe caſes during the action of the fire; and that by the tranſmutation of ſome other matter into iron; and from this he argues the poſſibility of gold-making among chemiſts by tranſmuting ſomething elſe into gold, as ſome other ſubſtance is in this caſe tranſmuted into iron.

FERRUGINOUS, denotes a thing to partake of the nature of iron, or to contain particles of that metal.

It is particularly applied to certain mineral ſprings, whoſe water in their paſſage along the ſtrata of the earth meets with the ore of this metal, or with pyritæ containing it, part of which they waſh off, and carry with them; and thus become impregnated with the principles thereof. Such are what we call CHALYBEAT WATERS.

The waters of Tunbridge, thoſe of Forges, and of the iron ſpring at Bourges, and many others, are *ferruginous*.

FERRUGO, the ruſt of IRON, or a kind of calx found on the ſurface thereof.

The ruſt of iron is a reſtringent; applied by way of peſſary, it repreſſes the fluor uterinus, and drank, prevents conception: it cures the eryſipelas, and exanthematous eruptions. It is of good uſe in a paronychia, roughneſs of the eye-lids, and a condylema. It alſo ſtrengthens the gums, relieves under the gout, being rubbed on the part affected, and makes the hair grow after an alopecia. Wine or water, in which red hot iron has been quenched, being drank, is good for the cœliac paſſion, dyſentery, diſorders of the ſpleen, cholera morbus, and relaxations of the ſtomach.

FERRUM. See IRON.

FERRUM *equinum*. See *Horſe-ſhoe* VETCH.

FERRY, a liberty by preſcription of the king's grant to have a boat for paſſage upon a river, for the carriage of horſes and men for a reaſonable toll: it is uſually to croſs a large river. Terms de Ley.

A *ferry* is no more than a common highway; and no action will lie for one's being diſturbed in his paſſage, unleſs he allege ſome particular damage, &c. 3 Mod. Rep. 294. The not keeping up a *ferry* has been held to be indictable.

FERTILITY, FRUITFULNESS, that quality which denominates a thing fertile or prolific.

The Egyptian nitre or natron renders the ground exceedingly *fertile*. M. de la Chambre obſerves, that the plants grow in ſuch abundance in Egypt, that they would choak one another if they were not hindered by throwing ſand upon the fields, inſomuch that the Egyptians muſt take as much pains to leſſen the richneſs of their ſoil as other nations do to increaſe that of theirs. Phil. Tranſact. N° 160.

Nothing can produce *fertility* in either ſex but what promotes perfect health; nothing but good blood, ſpirits, and perfect animal functions, that is, high health, can beget perfect FECUNDITY; and therefore, according to Dr. Cheyne, all means and medicines, all noſtrums and ſpecifics to procure *fertility*, different from thoſe which procure good blood and ſpirits, are arrant quackery and cheating. He ſays, that water-drinking males are very rarely infertile; and that if any thing in nature can prevent *infertility*, and bring fine children, it is a milk and ſeed-diet, perſevered in by both parents.

FERULA, a little wooden pallet or ſlice, reputed the ſchoolmaſters ſceptre wherewith he chaſtiſes the boys, by ſtriking them on the palm of the hand.

The word is Latin, and has alſo been uſed to denote the prelates crozier and ſtaff. It is ſuppoſed to be formed of the Latin, *ferire, to ſtrike*; or, perhaps, *ferula* in this ſenſe may be derived from the name of a plant, called in Latin, *ferula*; in Engliſh, *fennel-giant*; the ſtem whereof was anciently uſed to correct children with.

Under the eaſtern empire the *ferula* was the emperor's ſceptre, as is ſeen on divers medals; it conſiſts of a long ſtem or ſhank, and a flat ſquare head. The uſe of the *ferula* is very ancient among the Greeks, who uſed to call their princes ναρθηκοφοροι, q. d. *ferula-bearers*.

In the ancient eaſtern church, *ferula* or *narthex* ſignified a place ſeparated from the church; wherein the penitents or the catechumens of the ſecond order, called *auſcultantes*, ακροαματικοι, were kept, as not being allowed to enter the church; whence the name of the place, the perſons therein being under penance or diſcipline: *ſub* ferula *erant eccleſiæ*.

FERULA, in *Botany*. See FENNEL *giant*.

FERULÆ, a word uſed by the ancients to expreſs the horns growing on the deer or ſtag at the age of two years.

FERULÆ, among *Surgeons*, called alſo SPLINTERS, are little chips of different matter; as of wood, bark, leather, paper, &c. applied to bones that have been diſjointed when they are ſet again.

The bark of the herb fennel-giant, called by ſome in Latin, *ferula*, was anciently much uſed on this occaſion; whence the name *ferula* became common to all.

FERULACOLS, in *Botany*, a name by which ſome authors have called the thlaſpi, or treacle-muſtard.

FERULAGO. See FENNEL-*giant*.

FERZAA, in *Natural Hiſtory*, a name given by the Perſians to that gem which we call the turquoiſe or Turkey-ſtone, a blue, opake, and ſoft gem. See TURCOIS.

FESCENNINE, in *Antiquity*. *Feſcennine verſes* were a kind of ſatirical verſes, full of wanton and obſcene expreſſions, ſung or rehearſed by the company, with many indecent geſtures and dances, at the ſolemnization of a marriage among the Romans. Hor. ep. i. lib. v. 145.

The word is borrowed, according to Macrobius, from *faſcinum, a charm*; the people taking ſuch ſongs to be proper to drive away witches, or prevent their effect; but its more probable origin is from Feſcennium, a city of Campania, where ſuch verſes were firſt uſed.

FESOLI, or FIESOLI, *congregation of*. See JERONYMITES.

FESSE, in *Heraldry*, one of the nine honourable ordinaries of the eſcutcheon, which it divides horizontally in the middle, and ſeparates the chief from the point. It is ſuppoſed to repreſent a broad girdle or belt of honour, ſuch as thoſe with which knights at arms were anciently girded.

It poſſeſſes the center of the eſcutcheon, and contains in breadth one third part thereof. Thus, he beareth azure, a *feſſe*, or, by the name of Eliott. See *Tab. Herald. fig.* 22.

When the *feſſe* takes up leſs than its proper breadth, it is called a *bar*.

FESSE-*point* is the exact center of the eſcutcheon.

It is thus called, as being the point through which the *feſſe* line is drawn from the two ſides; and accordingly it divides the eſcutcheon into two equal parts when the eſcutcheon is parted *per feſſe*.

FESSE-*ways*, or *in* FESSE, denotes things borne after the manner of a *feſſe*; i. e. in a line or range, acroſs the middle of the ſhield, which the French call *en feſſe*.

FESSE, *party per*, implies parted acroſs the middle of the ſhield, from ſide to ſide, through the *feſſe* point.

This the French expreſs by one word, *coupé*.

FESSIER, in *Anatomy*, the name given by the French writers to what others call the glutæus, or according to Riolanus, the glautius. There are three muſcles of this name among authors, the glutæus major, medius, and minor, and the French call them the grand, moyen, and petit *feſſier*.

FESTA *in cappis*, in *Middle-age Writers*, grand holidays, in which the whole choir of the cathedrals wore caps.

FESTI *Dies*, among the ancients, were *feaſt-days* or holidays.

Numa diſtinguiſhed the days of the year into *feſti*, *profeſti*, and *interciſi*. The firſt were thoſe dedicated to the gods; the ſecond were thoſe allowed to men for the management of their own affairs; the third were ſhared between the gods and men.

The *feſti dies*, again, were divided, according to Macrobius, Saturn. cap. 16. into *ſacrifices*; *epulæ*, or banquets; *ludi*, or games, and *feriæ*; and the *profeſti* into *faſti*, *comitiales*, *comperendini*, *ſtati*, and *præliares*.

FESTING *Men*. See FASTERMANS.

FESTING-*penny*, earneſt given to ſervants when hired or retained. It is ſo called in ſome northern parts of England, from the Saxon, *feſtnian, to faſten*, or *confirm*.

FESTINO, in *Logic*, one of the moods of the ſecond figure of ſyllogiſms.

In a ſyllogiſm *in feſtino*, the firſt propoſition is an univerſal negative; the ſecond, a particular affirmative; and the third, a particular negative.

FESTIVAL. See FEAST and FESTUM.

FESTOON, in a *General Senſe*. See GARLAND.

FESTOON, in *Architecture* and *Sculpture*, is a decoration in form of a garland or cluſter of flowers.

The word is French, *feſton*, which ſignifies a *garland*, formed of the Latin, *feſtum*, *feaſt*.

It conſiſts of a ſtring or collar of flowers, fruits, and leaves, tied together, ſomewhat biggeſt in the middle, and ſuſpended by the two extremes; from which, beſide the main part which falls down in an arch, two leſſer parts hang perpendicularly.

This ornament is made in imitation of the *feſtoons* or long

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long clusters of flowers, hung by the ancients on the doors of their temples, &c. on festival occasions.

Festoons are now chiefly used in freezes, tablets, and other vacant places, required to be filled up and adorned. They are sometimes used over or under a niche.

FESTUCA, *Fescue-grass*, in the *Linnæan System of Botany*, the name of a kind of oat-grass, which makes a distinct genus of plants of the *triandria digynia* class: the characters of which are, that the calyx is a many-flowered glume, and is bivalve, erect, and contains the flowers ranged together in a slender spike; the valves are strait, oblong, pointed, without awns or beards, and the lower is the smaller. The flower is composed of two valves, the lower is the larger: this is of the shape of the cup; but it exceeds it in size; it is somewhat cylindrical and pointed, and is terminated by a strait beard or awn. The stamina are three capillary filaments, shorter than the flower; the antennæ are oblong; the germen is of a turbinated form; the styles are two in number, and are short and bent backward; the stigmata are single; the flower closely surrounds the seed, which is single, oblong, slender, extremely sharp-pointed at each end, and marked with a longitudinal furrow.

FESTUM, in a *General Sense*. See FEAST.

FESTUM, in our *Law-books*, is frequently used for a general court or assembly, because such were anciently always kept on the great festivals of the year.

Thus, in our chronicles, we read, that in such a year the king kept his *festum* at Wincheſter, &c. that is, he kept a court there at that time: *Rex apud Winton. maximum* festum *& convivium celebravit, tempore natalis Domini, convocatis ibidem principibus & baronibus totius regni.*

To FETCH *Way*, in *Sea-language*, is to be shaken or agitated from one side to another. The terms are usually applied to a mast, bowsprit, &c. when it is not sufficiently wedged, being loose in the partners; or to any body which is moved by the rocking of the ship, for want of being well secured.

FETCHING *the Pump*, is the act of pouring water into the upper part of it, to expel the air which is contained between the lower box or piston and the lower end of the pump that rests on the ship's floor; and accordingly, to make the water poured into the chamber communicate with that in the bottom of the pump-well, so as to be thrown out above by striking with the brake or handle.

FETSA, in *Modern History*, is a name which the Turks give to the written judgments or decisions of the mufti. The word in the Turkish language signifies *sentence*, and in Arabic, the *reply* or *judgments of a wise man*.

FETICHE, in *Modern History*, a name given in Guinea to their divinities; one of whom is supposed to preside over a whole province, and one over every family. This idol is a tree, the head of an ape, a bird, or any such thing, as their fancy suggests.

FET-*Lock*, in the *Manege*, a tuft of hair growing behind the pastern-joint of horses.

Hence, the joint where it grows is called the *fet-lock-joint*.

FETUS. See FOETUS.

FEUD, FEODUM, the same with fief or fee.

Estates in land were originally at will, and then they were called *munera*; afterward they were for life, and then they were called *beneficia*; and for that reason the livings of clergymen are so called at this day; and afterward they were made hereditary, when they were called *feoda*; and in our law, *fee-simple*.

When Hugh Capet usurped the kingdom of France, about the year 947, to support himself in such usurpation, he granted to the nobility and gentry, that whereas till then they generally enjoyed their honours for life, or at will only; they should from thenceforth hold them to them and their heirs. However, under the reign of Ludovicus Pius, who succeeded his father A. D. 814, grants of hereditary fiefs were frequent in France. Muratori observes, that the word *feudum*, which came to be substituted in place of *beneficium*, does not occur in any authentic charter previous to the eleventh century; and Dr. Robertson adds, that a charter of king Robert of France, A. D. 1008, is the earliest deed in which he has met with the word *feudum*. Hist. Ch. V. vol. i. p. 269. This was imitated by William, called the Conqueror, upon his accession to the crown of England; for till his reign *feuds* or fees were not hereditary, but only for life, or for some determinate time. See FEE.

Feuds were called by various names, according to their respective natures; as *feudum antiquum*, which descended to a son, &c. from his ancestors; *apertum*, resulting back again to the lord of the fee, where the blood of the last person last seised in fee-simple is utterly extinct and gone; *honorarium* and *individuum*, a title of nobility, not of a divisible nature, and descendible to the eldest son in exclusion of all the rest; *improprium*, an improper or derivative *feud*; *maternum*, descending to the son from the mother; *novum*, one newly acquired by the son, to which, in ancient times, only the descendents from his body could succeed, by the known maxim of the early feudal constitutions; *novum* held *ut antiquum*, descendible in the same manner as a *feudum novum*; *paternum*, descendible from father to son; and *proprium*, a proper *feud*, distinguished from one improper, which are the two grand and general divisions. Blackst. Com. vol. ii.

FEUD is also used in our ancient customs for a capital quarrel or enmity, not to be satisfied but with the death of the enemy; and thence usually called *deadly feud*.

Feud, called also *feida*, and *faida*, in the original German signifies *guerram*; i. e. *bellum, war*. Lambert writes it *feeth*, and saith it signifies *capitales inimicitias*, or *implacable hatred*.

In Scotland, and the North of England, *feud* is particularly used for a combination of kindred, to revenge the death of any of their blood, against the killer and all his race, or any other great enemy.

FEUDAL, or FEODAL, of, or belonging to a *feud* or *fee*.

We say, a *feudal* matter, *feudal* jurisprudence, *feudal* seisure, &c. A *feudal* lord, in default of fealty and homage from his vassal, may seize the fruits of the fee. A Neapolitan lawyer, called Caravita, has a Latin treatise of the *feudal* law, intituled, Prælectiones Feodales.

When once the use of fees was thoroughly established in France, they would needs extend it much farther; and almost all the great offices of the crown thus became *feudal*; even the courts of justice were drawn in; in order to which, they were annexed to certain lands or revenues.

The design of these infeodations was to render the offices hereditary, after the manner of fees, which were now become so; and thus the offices of the grand chamberlain, grand butler, &c. came to be held by hereditary right.

As the Northern nations brought in the use of coats of arms, by preserving down in their families the armorial bearings of their ancestors shields, &c. as hereditary marks of honour, so they also, according to some, brought in the *feudal* law, by means of which arms grew up to farther perfection, as is evident by many armorial figures of ancient families, representing the acknowlegements and services they were obliged to perform to their own lords and superiors.

Thus, roses, cinquefoils, spur-rowels, bow and arrows, hunting-horns, ships, and the like figures, were expressive of the services they were bound to do their lord; and hence these figures have become common in arms throughout all Europe. For instance, the old barons of Arran and Lorn were obliged to furnish their lord with a ship in time of war; and thence it is that their arms carry ships or lymphods to this time.

FEUDATARY, or FEODATARY, a vassal or person who holds of a superior in fee; i. e. on condition of yielding him fealty and homage, or other service. See VASSAL.

The electors, princes, and free cities, of Germany, are all *feudataries* of the emperor.

FEUDBOTE, a recompence for engaging in a feud or action, and for the damages consequent thereon; it having been the custom of ancient times for all the kindred to engage in their kinsmen's quarrels; according to that of Tacitus De Morib. Germanor. *Suscipere tam inimicitias seu patris, seu propinqui, quam amicitias, necesse est.*

FEU *de joie*, in the *Military Art*. See *Running* FIRE.

FEUDIST, a lawyer, or doctor learned, or much conversant in feuds or fees. Du-Moulin is reckoned a great *feudist*.

FEVE. See AURELIA.

FEVER, FEBRIS, in *Medicine*, a disease, or rather class of diseases, whose characteristic is a preternatural heat felt through the whole body, or, at least, the principal parts thereof, attended with other symptoms.

Sydenham defines a *fever*, a strenuous endeavour or effort of nature to throw off some morbific matter that greatly incommodes the body. Quincy defines it, an augmented velocity of the blood; others, a fermentation of the blood, accompanied with a quick pulse and excessive heat.

Fevers are of various kinds, denominated and distinguished from the particular causes that produce them; the time they continue; their accesses and returns; and their different symptoms.

Riverius reckons above thirty different kinds of *fevers*; and Sydenham has increased them to double that number; but certainly physicians have observed something common to all these diseases, which made them denominate them *fevers*. A late author thinks, that the consideration of what constitutes a *fever*, which he thinks

very

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very ſimple and obvious, with its true cauſes and genuine effects, will give a more juſt and clear notion of the diſeaſe, and lead to a more rational practice than all that has been ſaid by authors at ſo great length on theſe ſubtile and unneceſſary diſtinctions. He thinks the moſt natural and uſeful diviſion of *fevers* is into continued and interrupted; and he conceives they may all, when conſidered ſimply, and not as the effect of another diſeaſe, be reduced to one or other of theſe two ſorts. Medic. Eſſ. Edinb. vol. i. p. 264, 265.

In every *fever* from an internal cauſe, the three chief obſervables are theſe: firſt, an univerſal trembling, and then an increaſed heat and quick pulſe: a *fever* almoſt always begins with a cold or ſhivering; and ſoon after, the pulſe growing quicker, affords the primary diagnoſtic of a *fever*. The health of the patient ſeems to be the primary aim of nature in *fevers*, though they often terminate in death.

By Dr. Brown Langriſh's ſtatical experiments made on the blood of people in acute continual *fevers*, compared with what he ſays of the blood of three young men in perfect health, it appears, that in ſuch *fevers* the ſerum is in leſs proportion, and the craſſamentum is more viſcid and tenaceous than in health. The indications of cure from which are plain. See his Modern Theory and Pract. of Phyſ. p. 68. 74.

By the chemical analyſis it is proved, that in acute *fevers* the ſaline and ſulphureous parts abound more than in health; and that the urine is impregnated more and more with theſe ſaline and ſulphureous principles, as the ſymptoms abate upon a criſis by urine.

FEVERS, *ſigns of*. Theſe are an accelerated progreſſive motion of the blood, diſtinguiſhed by the quickneſs of the pulſe; this is ſucceeded by an increaſed heat in the body, and immediately after this the tonic motion of the parts is either conſtringed or relaxed. This is ſeen in the face: in the firſt caſe, it becomes red and bloated; in the latter, thin and pale: theſe ſymptoms are ſucceeded by an immoderate thirſt, and a loathing of food of all kinds; an abſence of ſleep, or diſturbed and unrefreſhing ſleep; and a peeviſhneſs or uneaſineſs in the temper, with an extreme ſenſibility of every thing, and a neglect of the common buſineſs of life: after this there is a great loſs of ſtrength, and an inaptitude to any motion; a ſenſation of pain in ſome part; a very uneaſy and difficult reſpiration; a ſweating more than uſual; and finally, there is a change in the urine, its colour being uſually very high, and its conſiſtence thicker than that of perſons in health. When the *fever* comes on gradually, the patient generally complains firſt of languor, liſtleſſneſs, ſoreneſs of the fleſh, or of the bones, as it is vulgarly expreſſed; heavineſs of the head, loſs of appetite, ſickneſs, with clammineſs of the mouth; after ſome time there ſucceed exceſſive heat, violent thirſt, inability to ſleep, &c. When the *fever* attacks ſuddenly, it always begins with an uneaſy ſenſation of exceſſive cold, accompanied with debility and loſs of appetite; the cold is frequently attended with ſhivering, oppreſſion about the heart, and ſickneſs of ſtomach, or vomiting. Buchan.

FEVERS, *general cauſes of*. Theſe are an overheating the blood by exerciſe, and thus throwing it into violent commotions; violent and ſudden cooling of the body when very hot; the abuſe of ſpirituous liquors, and the eating large quantities of foods hard of digeſtion; a watchfulneſs beyond the uſual cuſtom, ſuch as long ſitting up by the ſick, or the like; and the ſuppreſſion of any accuſtomed evacuation, particularly of habitual hæmorrhages by the noſe or other parts. Beſides theſe, the paſſions of the mind very frequently throw people into *fevers*; and it is obſerved alſo, that perſons often accuſtomed to have *fevers* are much more eaſily thrown into them on ſlight accidents than any others. To all theſe cauſes are to be added thoſe of contagion, unwholeſome air, and external or internal injuries.

FEVERS, *prognoſtics in*. All *fevers* are in their nature ſalutary, being the means nature uſes to rid herſelf of ſomething that oppreſſes her, yet they are often fatal in the event; but this is rather to be attributed to the fault of the conſtitution than of the *fever*. The cauſe of the diſeaſe being impeded, and other diſeaſes coming on, the patient often dies under them; ſo that the moſt judicious phyſicians obſerve, that people rather die with a *fever* than of a *fever* in theſe caſes.

It is to be obſerved in general, that of the great number of perſons who have *fevers*, very few proportionably die of them.

Fevers very often are cured by nature alone, and go off very happily only by the patient's abſtinence, a quiet ſtate, and keeping up the natural evacuations. In this manner great numbers recover without the help of medicines; a number almoſt as great is deſtroyed by medicines, which, when adminiſtered by perſons who have not ſufficient judgment, interrupt nature, and prevent the neceſſary excretion. *Fevers* go off, according to the language of phyſicians, either by a criſis or lyſis: in the firſt caſe, they leave the patient at once, after the critical days; in the other, they wear off gradually, growing ſlowly leſs and leſs violent. The acute *fever* uſually goes off in the firſt way; the intermittents in the other. Critical evacuations, of whatever kind, when they happen in ſufficient quantity, bring with them a ſort of inſtantaneous cure, the patient becoming well and eaſy from them, though immediately before he was in the utmoſt anxiety and uneaſineſs. No *fever* ever goes off without ſweating, and a change in the urine. But in *fevers* in general the ſweats do not come on at firſt, but afterwards; and in general, the ſweats never come on during the violence of the burning heat, but when that remits a little, the ſweat breaks out. If it appears during the exceſſive heat, the preſage is bad, at leaſt, it is of no uſe or good to the patient. Sweats coming on at a proper time, and flowing to a proper degree, bring on recovery; but when they are ſuppreſſed, the diſeaſe becomes worſe; there is a pain and laſſitude in the limbs, and the diſeaſe is protracted in length, and from an acute, becomes a ſlow *fever*. If alſo there be no change perceived in the urine, and the heat do not exceed the ordinary ſtandard, it is a fatal prognoſtic for the patient; and the old phyſical axiom is uſually verified, that while the pulſe and the urine are well in *fevers*, the patient dies.

A dejection of ſpirits in a *fever*, and a melancholy ſtate coming upon a perſon uſually chearful when well, is always a bad omen.

The ſeveral different kinds of *fevers* have their ſtated times in which each attacks the patient. Tertians uſually ſeize people about dinner-time, and are particularly common about the period of the vernal equinox. Quartans uſually make their firſt attack about four or five o'clock in the afternoon, and are more common in autumn than at any other ſeaſon of the year. The ſynocha, or continent *fever*, expreſsly ſo called, uſually attacks perſons in the morning before day-break. Bilious *fevers* uſually make their firſt attack about the time of ſun-riſe, and are moſt common in the midſt of ſummer. The catarrhal *fevers*, finally, moſt commonly attack perſons in the evening, and they are moſt frequent about the equinoxes. The more any *fever* departs from its uſual courſe, the worſe is the prognoſtic; any *fever*, when it has been improperly treated by medicines, becomes much more ſtubborn and difficult of cure than when it has been left to itſelf. The particular medicines which diſturb the courſe of nature in *fevers*, and by that means render them more difficult of cure, are aſtringents, too powerful abſorbents, opiates, &c. And it is obſerved, that when *fevers* go off happily and eaſily, eſpecially when they go off of themſelves without medicines, the patient always enjoys a better ſtate of health after than he had before. Junker's Conſp. Med. 257.

FEVERS, *method of cure in*. The phyſician in all *fevers* is to endeavour to make himſelf the ſervant and aſſiſtant of nature; what nature endeavours in the beginning and increaſe of the diſeaſe, is to prepare, diſpoſe, and ſearch the noxious matter; and in the ſtate and decline of it, to eliminate and evacuate the matter ſo prepared by the proper paſſages. The whole buſineſs of art is, therefore, to aſſiſt nature in theſe two efforts of ſecretion and excretion of the matter.

The method of doing this in every particular ſpecies of *fever*, is to be ſeen under their ſeveral particular heads; but as we are here treating of *fevers* in general, it may be proper to give the method of treating them as *fevers*, without running into the ſeveral ſub-diſtinctions.

The remedies which we are to give to aſſiſt the ſecretion and preparation of the morbid matter, are the diluting and cooling liquors in general: ſuch are a ſufficient quantity of warm and weak fluids, as the common barley-water, and the like; and teas, made of the common herbs of ſage, mint, baum, &c. with the milder alexipharmic roots. Nothing is more likely to abate the heat, attenuate the humours, remove ſpaſms and obſtructions, promote perſpiration, increaſe the quantity of urine, &c. in ſhort, produce every ſalutary effect in an ardent or inflammatory *fever*, than drinking plentifully of water, thin gruel, or any other weak diluting liquor, of which water is the baſis: the neceſſity of ſuch liquors is plainly indicated by the dry tongue, the parched ſkin, and the burning heat, as well as by the thirſt of the patient. Many cooling liquors, very agreeable to patients in *fevers*, may be prepared from fruits, as decoctions of tamarinds, apple-tea, orange-whey, &c. with theſe alſo are to be given the gentle reſolvents, ſuch as are able to break the thick and tough conſiſtence of the humours. Of this kind are the temperate alexipharmic roots eſpecially,

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cially, as they are also endowed with a diuretic virtue. Such are the roots of elecampane, pimpernel, butterbur, and the like. Scordium is also by some greatly recommended in this intention. These may be conveniently given in decoctions or infusions; and with these powders are to be given, composed of the absterfive and digestive salts, such as tartarum vitriolatum, and the like, mixed with such things as have a power of obtunding and incrassating the acrid and thin sulphureous saline humours; such are the absorbent powders of oyster-shells, crab's-claws, and the like. These should be first fated with lemon-juice, and then mixed with a little nitre, and with the before mentioned salts, they make an excellent medicine. They may be given every three, four, or six hours, as the urgency of symptoms require, and a draught of the decoction before prescribed given after them. The absorbent powders have been commonly prescribed in *fevers*; but it would be better if they were neglected. Emulsions of sweet almonds, and the cooling seeds, are also very proper at convenient intervals. See FEBRIFUGE.

The method of suppressing *fevers* by means of cold, now commonly adopted, was practised by Hippocrates, Galen, Celsus, Avicenna, and the ancients: they exposed their patients to cold air, and they gave them cold water to drink. Nothing is more desired by a patient in a *fever* than fresh air; it removes his anxiety, cools the blood, revives the spirits, and is in every view beneficial. There ought, therefore, to be a constant stream of fresh air into his chamber, so as to keep it moderately cool. Air that has been repeatedly breathed, when the blood is inflamed, or the humours are in a putrid state, becomes unfit for respiration, and acquires a noxious quality. See AIR, *fixed*, and BLOOD.

The medicines by which the physician is to assist nature in her following business of excretion, are the gentle diaphoretics, among which the diaphoretic antimony, when truly prepared, holds a very high place. The alexipharmics, which have also a diuretic virtue, such as the mixtura simplex, when faithfully prepared, and lightly camphorated, are very proper; and the bowels are in the mean time to be kept open by emollient glysters. These things are proper in all *fevers*; but in some, also vomits, gently laxative medicines and bleeding, are extremely proper: those, however, are not to be admitted at random in all kinds.

At the beginning of a *fever*, the patient generally complains of great lassitude or heaviness; and this symptom evinces the propriety of keeping him easy, and, if possible, in bed: lying in bed relaxes the spasms, abates the violence of the circulation, and gives nature an opportunity of exerting all her force to overcome the disease. The bed alone has often removed an incipient *fever*. The food of the patient in a *fever* should be light, and easy of digestion, and given in small quantities: it ought chiefly to be of the vegetable kind, as panada, roasted apples, gruel, and such like. All violent medicines are to be avoided in *fevers*; for nature usually attempts to do her office placidly and quietly in these cases, and such medicines violently disturb her motions, and often bring on mischiefs which she would have wholly avoided. For this reason, vomits, though they are by some given indiscriminately in all *fevers*, are to be very cautiously meddled with; and there are, in reality, only a few *fevers* in which they can be allowed to be proper; for in acute legitimate *fevers*, the cause of the disease never lies in the primæ viæ; and the violent emotions in vomiting not only dreadfully disturb the stomach and bowels, but occasion a fullness of the vessels about the head and neck, with various disorders of the head in particular. In bilious *fevers*, the cause is indeed evidently in the primæ viæ; but even in these, it is not so disposed as to be so safely thrown up by vomit, nor can the inflammatory state of the patient at that time properly bear such a violent shock. In intermittents, vomits are never proper, unless in tertians, for the cause in the other does not lie in the primæ viæ; and even in tertians, it may be disposed to evacuation by gentler means, and without the violent tumult that a vomit occasions in the body.

Notwithstanding the cautions above given with respect to the use of vomits, they are in many cases very necessary and beneficial on the first attack of a *fever*. Antimonial medicines, administered for this purpose, curb the circulation, and promote all the discharges. Their influence on the whole nervous system is such, that the strength is rarely so much reduced when they are duly adverted to as when they are omitted.

Acrid purges are in general to be avoided in *fevers*. The proper medicines of this kind are the sal Glaub. ver. tart. vitr. sal polychrest. or Rupellense, tamarind. rhubarb, and manna; and if two or three grains of the emetic tartar is added in cases that indicate a vomit to be proper, they will operate both ways, and there will be no occasion for administering an emetic by itself. Bleeding, though absolutely necessary in synochal or continent *fevers*, is not advisable in many others; and very often the opening a vein, and taking away too little blood, is the occasion of congestions of blood in the head, whence arise deliriums and other dreadful symptoms. The state of diseases in this country is so much altered, that true inflammatory *fevers* are very rare; and that there is hardly one *fever* in ten where the lancet is necessary. In many cases bleeding would be very prejudicial; and this general rule may be observed, never to bleed at the beginning of a *fever*, unless there be evident signs of inflammation. The giving of hot sudorific medicines before the proper time greatly disturbs nature, and brings on many ill consequences. Junker's Consp. Med. p. 261. Buchan's Med. chap. 13.

In all *fevers* the drinking plentifully of warm and cold weak liquors, is attended with many good consequences; the patient is always refreshed by it, the febrile heat is mitigated, rest is promoted, and the proper and necessary sweats forwarded. The symptoms of *fevers* are never to be so regarded as to prevent the due attention to the principal point, nor is the physician to be alarmed at them. Want of appetite, and thirst, with long watchings, are not to be attacked with particular medicines, but looked upon as mere symptoms that will hereafter go off of themselves; and inquietude of mind should have no other medicine than serious advice of the harm it will do. Sudden cooling of the body in all *fevers* is a very dangerous thing. The patient is advised to swallow his liquids gently, not hastily. Volatile salts have been with many of a long time in great use in *fevers*; but they are usually attended with bad consequences afterwards, many persons having been thrown into œdematous swelling of the legs and feet, and some into an absolute ascites, only by the use of these in *fevers*.

Acids in general are by many very much dreaded in *fevers*; but there is no real ground for this: on the contrary, in sanguineous *fevers*, during the time of the violent heat and immoderate thirst, they are found of the greatest use and benefit. Spirit of vitriol, or of sulphur, lemon-juice, with that of barberries, are all found very beneficial; only in cases where there is a cough, the vitriolic acid is to be avoided, because it usually irritates that symptom, and lemon-juice sweetened with sugar alone is to be given. The use of astringent medicines, though too common, yet is extremely improper in all *fevers*; for in all these cases the secretions and excretions all require to find the ways open; but these are all obstructed by astringents, and violent symptoms are brought on by this means, and often death. But in stubborn intermittents, where the peccant matter is discharged, and yet these symptoms remain merely from their having become habitual, these astringents may be allowed of, and are indeed not only safe, but of the greatest use. Junker's Consp. Med. p. 263.

Nitre is an admirable medicine in *fevers* in general; it agrees with all temperaments, but principally with the hot; when taken in solution with warm and weak liquors, it always gently opens the bowels; and when given in powders, it more than all other things obtunds the acrimony of the humours.

In feverish disorders, accompanied with hæmorrhages, the arnica vera has been recommended. See ARNICA *vera*.

The most general and genuine division of *fevers* is into *essential* and *symptomatic*.

FEVER, *essential*, is that whose primary cause is in the blood itself, and which does not arise as an effect or symptom from any other disease in the solids or other parts.

This is what we absolutely and properly call a *fever*.

FEVER, *symptomatic*, is that which arises as an accident or symptom of some other antecedent disorder; as an inflammation, phlegmon, erysipelas, imposthume, small-pox, pleurisy, &c.

Whence it is peculiarly denominated inflammatory, erysipelatous, purulent, variolous, or pleuritic *fever*.

Essential fevers are generally distinguished into *continued* and *intermitting*; others choose to divide them into *diary*, *intermittent*, *continent*, and *continued*.

FEVER, *continual*, is that which gives the patient no respite or intermission, or which shews no remarkable increase or abatement in the symptoms.

This is subdivided by some into the *acute*, *ardent*, or *inflammatory*, the progress of which is quick, and the symptoms violent; the *slow*, or *nervous*, in which these are more gentle; and the *malignant*, *putrid*, or *petechial*, when livid or petechial spots manifest a putrid state of the humours; and by others into *putrid* and *not putrid*.

FEVER *not putrid*, *continual*, is that wherein the parts of the blood are not so dissolved and broken as to give occasion for

for the principal parts thereof to be ſecreted; or that wherein there is not any diſcharge of putrid, purulent matter into the blood.

FEVER, *continual putrid*, is that wherein the texture of the blood is rendered ſo lax, or even diſſolved, that its parts or principles ſeparating, ſome of the principal of them are ſecreted and loſt. See *Putrid* FEVER.

FEVER, *ardent* or *inflammatory*, called by the Greeks καυσος, is a very acute *fever*, generally introduced by rigor or chillneſs, and attended with a vehement heat, a frequent and full pulſe, a pain of the head, dry ſkin, redneſs of the eyes, a florid countenance, pains in the back, loins, &c. difficulty of breathing, dry coughs, extreme thirſt, reſtleſſneſs, and commonly a rough and black tongue. The more dangerous ſymptoms are a delirium, laborious reſpiration, ſtarting of the tendons, hiccup, cold clammy ſweats, and an involuntary diſcharge of urine. The perſons moſt ſubject to this *fever* are the young and vigorous, and plethoric; and it is moſt frequent in the ſpring and beginning of ſummer. It is occaſioned by violent exerciſe, ſtrong liquors, and a full diet, with little exerciſe, and by any thing that obſtructs perſpiration, as lying on the damp ground, drinking cold liquor when the body is hot, watching, &c. This *fever* ſeems to have no critical time for its termination, either in recovery or in death. When it is very violent, or very badly conducted, it ſometimes proves fatal on the ninth day. Perſons often die from the eighteenth to the twentieth; and ſometimes about the fortieth day, after having been alternately better and worſe. The general courſe of theſe *fevers* is determinable from the fourteenth to the thirtieth day. The regimen proper for this *fever* ſhould be ſuch as is calculated to dilute the blood, correct the acrimony of the humours, allay the exceſſive heat, remove the ſpaſmodic ſtricture of the veſſels, and promote the ſecretions. The patient ſhould, therefore, drink plentifully of diluting liquors, as water-gruel, clear whey, barley-water, balm tea, &c. which may be ſharpened by juice of orange, currant jelly, &c, orange-whey, made by boiling in milk and water a bitter orange, ſliced, or a lemon, a little cream of tartar, or a few ſpoonfuls of vinegar, till the curd ſeparates, is an excellent cooling drink. Two or three ſpoonfuls of white wine may be added to the boiling liquor. If the patient be coſtive, an ounce of tamarinds, with two ounces of ſtoned raiſins of the ſun, and a couple of figs, may be boiled in three pints of water to a quart, and this liquor may be uſed at diſcretion. His diet ſhould be ſpare and light, and conſiſt chiefly of gruel, panada, roaſted apples, &c. He ſhould be relieved by the admiſſion of freſh air into his chamber, and by ſprinkling it with vinegar, lemon-juice or vinegar and roſe-water, with a little nitre diſſolved in it. His mouth ſhould be often waſhed with a mixture of water, honey, and vinegar; and his feet and hands ſhould be frequently bathed in lukewarm water, eſpecially if the head be affected. To which we may add, that the patient ſhould be kept as ſtill and compoſed as poſſible. Bleeding ſhould be performed as ſoon as the ſymptoms of an inflammatory *fever* appear, and repeated at the diſtance of twelve, eighteen, or twenty-four hours, according to the ſymptoms, till the hardneſs and fullneſs of the pulſe is ſenſibly abated. Hæmorrhages, or bleedings from the noſe, often occur in this *fever*, much to the relief and ſecurity of the patient. If the *fever* and heat be very great, forty or fifty drops of dulcified ſpirit of vitriol may be made into a draught, with an ounce of roſe-water, two ounces of common water, and half an ounce of ſimple ſyrup; and this draught may be adminiſtered every three or four hours while the *fever* is violent. When the patient diſcovers an inclination to vomit, the efforts of nature ſhould be aſſiſted by weak chamomile-tea or lukewarm water. If the belly be bound, a clyſter of milk and water, with a little ſalt, and a ſpoonful of ſweet-oil or freſh butter in it, ſhould be daily adminiſtered; and if this ſhould fail, a tea-ſpoonful of magneſia alba, or cream of tartar, may be frequently added to the patient's drink. If about the tenth, eleventh, or twelfth day, the pulſe becomes more ſoft, the tongue moiſter, and the urine begins to depoſit a reddiſh ſediment, the diſeaſe promiſes a favourable iſſue; but if, on the contrary, the ſpirits of the patient become languid, the pulſe ſinks and yet retains its hardneſs, and his breathing becomes difficult, accompanied with a ſtupor, trembling of the nerves, ſtarting of the tendons, a ſwelling of the belly, wildneſs of the eyes, and conſtant raving, there is great danger. In this caſe bliſtering-plaſters ſhould be applied to the head, ancles, inſide of the legs and thighs; and poultices of wheat-bread, muſtard, and vinegar, may be likewiſe applied to the ſoles of the feet; and the patient ſhould be ſupported with cordials, as white-wine whey, negus, ſago-gruel with wine in it, &c. As this diſeaſe is always attended with danger, the beſt medical advice ſhould be procured as ſoon as poſſible.

Inflammatory *fevers* may be diſtinguiſhed into two ſtages; the firſt, while the pulſe continues hard, in which it is proper to bleed; and the ſecond, when the inflammatory ſymptoms ſtill remaining, the pulſe is too low for that evacuation. In this laſt ſtate, bliſters are the chief remedy, and which, except in a few ſingular caſes, are not to be uſed ſooner. If the bliſters are large, it is better to apply them gradually, than many at a time. It is uſual to begin with the back, and, if neceſſary, to apply them next to the legs or the thighs, reſerving the arms laſt, that the patient may be ſo much the longer conveniently moved. There is no caution more neceſſary to a young phyſician, than to abſtain from all opiates through theſe *fevers*, however much the patient may complain of pain or watchfulneſs. Indeed, if the *fever* be accompanied with a diarrhœa, which is not critical, the looſeneſs is to be gradually checked by diaſcordium, after giving rhubarb, and endeavouring to turn the humours to the ſkin by the uſe of the diaphoretics, omitting the nitre, with the uſe of the white decoction for the common drink. When the patient is beginning to recover, he ſhould avoid exceſs of food, drink, exerciſe, and company, for fear of a relapſe; and if his digeſtion be bad, and he ſhould be troubled with feveriſh heats, an infuſion of Peruvian bark in cold water will be of uſe; and when he has recovered his ſtrength, he ought to take ſome gentle laxative. Buchan's Dom. Med. chap. 15. and Tiſſot's Advice, &c. p. 244, &c. Pringle's Obſ. on the Diſeaſes of the Army, p. 134. 136.

To the claſs of *burning fevers* are reducible the *lipyria*, *aſſodes*, *helodes*, &c.

The *lipyria* is a burning *fever*, wherein the heat is very intenſe within-ſide, and at the ſame time the external parts are cold.

The *aſſodes* is a burning *fever*, attended with great inquietudes, naufeas, vomiting, &c.

The *helodes* is a *fever* wherein the patient ſweats continually.

The *ſyncopal fever* is that attended with frequent ſwoonings.

The *epialos* is that wherein both heat and cold are felt in the ſame part at the ſame time.

FEVER, *bilious*. When a *fever* is accompanied with bilious diſcharges by vomit or ſtool, whether it be continual, intermitting, or remitting, it is called bilious, and belongs to the claſs of *ardent fevers*. See BILIOUS *fever* and CHOLERIC *fever*.

Dr. Percival, in his Eſſays Medical and Experimental, informs us, that in theſe *fevers* the powder of COLUMBO root, given in doſes of fifteen to twenty grains, with vitriolated tartar, from one to two ſcruples every four, five, or ſix hours, produces both ſpeedy and beneficial effects. Dr. Haygarth of Cheſter farther remarks, that after the primæ viæ are unloaded of their bilious contents, the columbo-root admirably allays the nauſea, conſtantly attendant on this diſorder; and that it anſwers our warmeſt wiſhes, by correcting the bile, reſtoring the proper tone of the ſtomach, and of the whole habit; and that it is an excellent preventative of relapſes to which patients in this diſorder are peculiarly diſpoſed.

Burning bilious fever of the Weſt Indies, called alſo the *yellow fever*, frequently attacks the Europeans, who indulge to exceſs, and are not careful to guard againſt the heats and dews that are common in that part of the world. It attacks with a tranſient chillneſs and ſhivering, which are ſoon ſucceeded by a burning heat all over the body, and more particularly about the præcordia; the pulſe is high and quick, but not hard; the eyes are heavy; a violent head-ach follows, with a ſtrong pulſation of the temporal arteries, and a laborious reſpiration; a nauſea ſucceeds with bilious diſcharges; the anxiety of the patient is very great, and he feels pain in the back and loins, and an uneaſy laſſitude in the limbs. In about twelve hours after the firſt attack, the tongue is very dry, rough, and diſcoloured; the thirſt is exceſſive, a foreneſs is felt all over the body, and a delirium comes on. In the laſt ſtage the patient labours under a COMA, manifeſts great oppreſſion about the præcordia; at length the tendons tremble, and cold ſweats and convulſions terminate in death. When the patient recovers, the criſis uſually happens on the fourth day after the attack, and diſcovers itſelf by a ſuffuſion of bile all over the body; and a yellow tinge in the eyes is reckoned a favourable prognoſtic. Inceſſant vomiting, with diſcharges, growing of a darker colour, is a fatal ſign; and if a dry ſkin, which is a threatening ſymptom, accompanies an inflamed redneſs of the eyes, death may be expected in a few hours. Bleeding ſhould be immediately propoſed; but after the third day it is hardly adviſeable. Then one or two grains of tartar emetic ſhould be given for evacuating

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ating the bile; and the belly muſt be kept ſoluble by repeated doſes of ſaline purges. When the primæ viæ are evacuated, the bark, either in ſubſtance or infuſed in cold water, muſt be freely uſed, in doſes as large and as often repeated as the ſtomach can digeſt them. It ſhould be given as ſoon as a remiſſion is obſerved, or a diaphoreſis is produced. The columbo-root ſhould be alſo tried. Bliſters may keep off the coma; or if it comes on, they ſhould be applied to the head, arms, and legs, and ſinapiſms to the ſoles of the feet. Cordial medicines, with camphor, ſhould be alſo duly adminiſtered. Motherby's Dict.

FEVER, *benign catarrhal*, in *Medicine*, the name given by authors to a *fever* extremely different from the malignant one of the ſame denomination, which is alſo called by way of diſtinction, *petechialis*. This is the diſeaſe deſcribed in the writings of the ancients, under the name of *febris quotidiana continua*. It is properly a continual ſymptomatic *fever*, in which nature is labouring of herſelf to correct the vitiated lymph, whether its faults be in quality or only in motion. This is done by increaſing the ſecretory or excretory motions beyond their natural ſtandard, but yet not to any great violence. The difference between this and the malignant kind, though ſo very great as to make them appear wholly different ſpecies, yet is only in degree. Junker's Conſp. Med. p. 313.

Signs of it. This *fever* always attacks people in an evening, and is principally frequent in the ſpring and autumnal ſeaſons. A gravedo and coryza either preſage it, or are immediately joined with it, and the patient is afflicted with a hoarſeneſs and difficulty of ſwallowing; he feels alſo a kind of inflammation, or, as it were, St. Anthony's fire within his throat, and a weight in the breaſt; and is attended through the whole courſe of the diſeaſe with a violent cough, which brings up nothing, and with a remarkable univerſal languor of the body. Pains in the back, attended with ſhiverings, frequently alſo attend the firſt attacks of this *fever*, and continue half an hour, ſometimes an hour; theſe are ſucceeded immediately by a gentle heat, and this brings on a ſenſe of ſtraitneſs over the breaſt, a difficulty of breathing, and in ſome people a continual reaching to vomit. This heat endures fewer or more hours, according to the degree of the plethora. The pulſe is frequent and quick, the appetite is weak, the ſtrength fails, and the ſleep becomes unquiet and diſturbed; the head rather feels weak than painful; and ſometimes vomitings, often diarrhœas, ſoon ſucceed theſe complaints. Sweats are frequent and copious; and the urine, which is of an orange-colour, as it is in all inflammatory *fevers*, has this peculiar quality in this caſe, that it depoſits a bluiſh white ſkin, beſide the roſe-coloured ſediment.

Perſons ſubject to it. Theſe are principally thoſe of a ſanguine or phlegmatic habit, and ſuch as have a very faulty ſerum; ſuch as are obliged by their uſual occupations to expoſe their head and neck much to the cold; thoſe who have had the itch, or any other violent cutaneous eruption ſtruck in upon them; and thoſe who are watchful long in the night, and drink too much wine.

Cauſes of it. Theſe are frequently violent and ſudden cooling of the body, as when hot with exerciſe, by drinking large draughts of cold liquors; the acrid matter uſed to be thrown off by a coryza, driven back; and all things which any way impede natural and healthful perſpiration.

Prognoſtics in it. The ſimple catarrhal *fever* often goes off very happily without the aſſiſtance of medicines, only by obſerving a good regimen; but notwithſtanding this natural mildneſs, it often becomes dangerous to particular conſtitutions, and by means of improper treatment; but the more it recedes from its natural mildneſs, and the more intenſe the heat is, the greater fear there is of ſome of the viſcera being injured. The happieſt event of it is, by a daily reſolution and ſucceſſive diſſipation of the morbific matter.

Method of treatment. The fault of the lymph in this diſeaſe uſually conſiſting in its viſcous and mucous texture; this is to be relieved by alexipharmics, and the like medicines. The roots of elecampane, pimpernel, and vincetoxicum are famous for doing great ſervice in theſe caſes; and to theſe may very properly be added the ſaline digeſtives, ſuch as nitre, and the tartarum vitriolatum. The mixtura ſimplex is alſo to be given in doſes of twenty-five drops, twice, or oftener in a day. The cough is to be moderated by liquorice, emulſions of ſweet almonds, oil of almonds and barley-water, water-gruel, or the like. The bowels are alſo to be gently kept open by a laxative diet, a frequent drinking of weak and emollient liquors, and by clyſters at proper times. See CATARRH.

FEVER, *malignant catarrhal*, in *Medicine*, the name of a *fever* extremely different from the ſimple *catarrhal fever*, and much more dangerous. This is alſo called by ſome the *petechial catarrhal fever*. It is a diſeaſe in which nature is endeavouring, by increaſing the ſecretory and excretory motions, to eliminate the catarrhal, acrid, and active matter. This is unqueſtionably the ſame ſpecies of *fever* with the ſimple one of this name, but extremely different in degree, and is often even epidemical. This is called by ſome the *febris Hungarica*, and *febris caſtrenſis*, or *camp-fever*; but the latter appellation is uſed to expreſs it in its very worſt ſtate, and when attended with its moſt terrible ſymptoms. The petechiæ, or ſpots, in this *fever*, are to be carefully diſtinguiſhed from thoſe in the common ſcorbutic caſes. Junker's Conſp. Med. p. 317.

Signs of it. Theſe are the ſame with thoſe of the ſimple *catarrhal fever*; but with this difference, that in this caſe there are alſo violent anxieties of the mind, a ſudden reſolution of the ſtrength, a continual difficulty of breathing, and a loathing of all kinds of food. This laſt ſymptom uſually continues till the eleventh day. The patients are alſo ſubject to frequent faintings, and are uſually delirious, and complain of very ſharp pains in the back, and at the joints. After theſe ſymptoms the petechiæ uſually appear; theſe are little red ſpots on the breaſt, &c. reſembling flea-bites. When hot medicines are given, the petechiæ are enlarged. Aphthæ and quinſeys are alſo very frequent attendants on this *fever*; and diarrhœas ſeldom fail of appearing at ſome ſtage of the diſeaſe, and are often critical.

This *fever* ſeldom attacks the patient with a ſhivering. It is very contagious, in the manner of other malignant *fevers*, and has this peculiar circumſtance, that it is very often complicated with other diſeaſes, and according to the ſeaſons and other accidents, frequently appears under their form. In February, March, and April, it often has the appearance of a pleuriſy; in May and June, it often affects the ſymptoms of the *cholerica febris*; and at this ſeaſon of the year is frequently, in the beginning, attended with terrible hæmorrhages. In July and Auguſt, a dyſentery is frequently joined with it; and, in the winter months, it generally has a bad cough attending on it. Perſons of tender habits are much more ſubject to this diſeaſe from infection than thoſe who are of a hardy and robuſt make. But as it is contagious, it ſometimes ſpares no age, ſex, or conſtitution, that come in the way.

Cauſes of it. The moſt frequent cauſes of this diſeaſe are a fermentaceous and putrid exhalation in the air, and the contagion from the bodies and effluvia of the ſick; and in this laſt caſe, a natural terror of receiving the infection is often found to make people more ſubject than ordinary to receive it. And to theſe are to be added the eating vitiated and fermenting proviſions, and the ſudden cooling of the body when very hot with labour or exerciſe; and frequent and violent paſſions ſuppreſſed.

The ſpots which appear on certain days in this diſeaſe are not eſſential to it, though common; and hence the *fever* is rather called by accurate writers, *febris petechizans*, than *petechialis*; they are a relief to the patient, if they are not violently repelled, or ſome other way improperly treated. When they appear earlier than the ſeventh day, they are alſo obſerved to be worſe preſages than when they appear on, or after it. When the ſpots appear in very great numbers, they uſually fly back again, and the patient is much endangered by it. And when they are of a bright red, and after three or four days appearance go off again, and leave the patient better than before, they are a ſure good prognoſtic. But if they are of a livid or black colour, they are a very bad omen; and when after the eruption the perſon does not find himſelf relieved, the conſequence is often a miliary purple *fever*. Lightheadedneſs before the ſeventh day is leſs dangerous than if it does not happen till after it. Diarrhœas in all other eruptive *fevers* are a very bad ſymptom, and often preſage the death of the patient. But that is not the caſe in this; they ſometimes prove critical, and carry off the diſeaſe. But when that is not the caſe, they are of no bad effect, and are always better for the patient than an obſtinate coſtiveneſs. But it is to be obſerved, that though theſe diarrhœas, when they come naturally, are of great relief in many caſes, and of no harm in others; yet art is not here to be uſed as nature, and no purging medicines are by any means to be given to bring on a laxity of the bowels.

Method of cure. Gentle evacuations are to be brought on by ſuch medicines as encourage perſpiration, and promote urine. Abſorbents, ſaturated with acids, as crab's-eyes, ſated with lemon-juice, are of ſervice; and to theſe ſhould be joined a ſmall quantity of nitre. Cooling emulſions are alſo to be given at times; and ſpirit of wine, camphorated, is to be rubbed on the head to mitigate the violent head-achs. And Stahl greatly recommends,

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commends, in the caſe of a too violent diarrhœa, the uſe of powders made of purified nitre and mountain cryſtal. In caſes of obſtinate coſtiveneſs, clyſters muſt be injected as often as is found neceſſary; and when there is a complaint of ſoreneſs in the fauces, and difficulty of ſwallowing, aſtringent gargariſms are to be uſed. Junker's Conſp. Med. p. 322. See HOSPITAL *fever*, and *Putrid* FEVER.

FEVER, *choleric*, in *Medicine*, the name of a *fever*, called alſo by ſome BILIOUS *fever*, and by others a *cauſus*; though the generality of writers diſtinguiſh the *cholerica febris* from the *cauſus*. All bilious *fevers* are properly ſpecies of acute *fevers*, and owe their origin to diſtemperatures of the bile, at times when the aliments are in a ſtate of fermentation in the ſtomach and inteſtines.

The *cauſus* is diſtinguiſhed from the *cholerica febris*, properly ſo called, by its being ever much more violent and dangerous, and by the excretions which attend it. For in the *choleric fever* the vitiated gall and other bilious excretions are always plentifully voided, ſometimes upwards, ſometimes downward, and ſometimes both ways. In the *cauſus*, the matter is more uſually detained in the body, and rarely voided otherwiſe than by vomiting, and that uſually only in ſmall quantities, and in the beginning of the diſtemper.

Signs of it. The general ſigns of the *cholerica febris* and *cauſus* are a remarkable anxiety, and frequent complaints about the breaſt, as of a ſtraitneſs and painful heat. A violent heat on the inſide of the mouth, and inſatiable and intolerable thirſt, trembling and convulſive motions of the joints, and violent deliriums. Dryneſs of the mouth and tongue are often ſo terrible in this diſeaſe, that the ſkin cracks with it; and often the whites of the eyes, ſometimes the whole body, becomes yellowiſh. The peculiar and appropriated ſymptoms of a *cholerica febris*, ſtrictly ſo called, are an univerſal languor and debility of the limbs.

A ſevere ſhivering firſt ſeizes the patient, and is ſoon ſucceeded by a very violent heat and raging pain in the head; and after the two firſt days, there uſually are very terrible ſtrainings and reachings to vomit. The matter brought up at theſe times is cauſtic, acrid, and bilious, and inflames, and even ulcerates the fauces, and if voided upon a ſtone floor, effervеſces violently. If this vomiting abates, there immediately comes on a diarrhœa, attended with a teneſmus, occaſioned by the irritation of this ſharp matter in the rectum. Faintings alſo are very frequent in this diſeaſe, eſpecially where the vomitings do not bring up a ſufficient quantity of the offending matter. The peculiar and appropriated ſigns of the *cauſus*, ſtrictly ſo called, are theſe: a violent and inſatiable thirſt, greater than that in any other *fever*. The bowels are always bound; and it is but very ſeldom that there is any tendency to vomit. The urine is reddiſh and turbid, and after ſtanding ſome time, depoſits a red ſediment. Often there is a ſenſible pain and ſoreneſs in the præcordia, ſo that the patient cannot bear the leaſt touch upon the breaſt; and uſually, in the courſe of the diſeaſe, there are faintings and violent convulſions.

Perſons moſt ſubject to this diſeaſe are ſuch as eat largely, and drink heavy and imperfectly fermented liquors after it. The *cholerica febris*, properly ſo called, is moſt frequent with thoſe of a cholerico-ſanguineous habit, and ſuch as feed on high-ſeaſoned meats, and drink abundance of wine or other ſtrong liquors; and is often brought on ſuch perſons by their falling into a violent paſſion after a full meal. The *cauſus* peculiarly attacks the people of melancholic habits, who are much inclined to paſſion, but ſuppreſs it, and who are naturally coſtive.

Prognoſtics in it. The ſimple *choleric fever* is attended with great danger, if not timely undertaken to be cured. But the *cauſus* is yet more fatal than it, and from Hippocrates's days has been accounted among the *febres lethiferæ*, or *fevers* that very frequently kill the patient.

In many *fevers* nature is able to help herſelf, and ſucceeds beſt of all when left alone. But theſe are of that number of diſtempers in which the aſſiſtance of art is abſolutely neceſſary, and out of which nature very ſeldom brings the patient ſafely when unaſſiſted. The happieſt turn this *fever* can take, is the copious diſcharge of the peccant matter by vomit; for when it goes downward, the febrile heat always increaſes, and the ſymptoms in general uſually grow worſe. When the reachings are violent, and the matter brought up is but ſmall in quantity, then the patient is uſually ſubjected to painful hiccoughs, and dangerous ſyncopes and convulſions. When much bile is thrown up by vomit, and that not very badly coloured, and there is no diarrhœa, there is then little danger from the diſeaſe; and in general, coſtiveneſs in this ſtate of the diſeaſe is more eligible than a tendency to ſtools. The more violent the delirium is in theſe diſeaſes, and the longer continued, always the greater is the danger to the patient. And if the pains and burning heat ſuddenly ceaſe, and a ſhivering and dejection of the ſpirits ſucceed, there is no doubt of a gangrene being coming on within. Junker's Conſp. Med. p. 273. 277.

Method of cure. The cure of theſe diſeaſes conſiſts in mitigating the violent ſharpneſs of the humour, and promoting its evacuation: and finally, in abating the burning heat brought on by it. The utmoſt endeavours are firſt to be made to correct and alter the morbific matter. To this purpoſe, the ſeveral preparations of nitre, with the teſtaceous powders and mucilaginous ptiſans, with ſmall mixtures of lemon-juice, and frequent draughts of cooling and diluting liquors, are to be given moderately warm. If the coſtiveneſs be too violent, clyſters of broth muſt be injected, with the addition of a little oil and ſalt; and, if neceſſary, ſmall doſes of rhubarb. To quell the febrile heat and emotion of the blood, the mixtura ſimplex may be given with great ſucceſs; and there is often a ſenſible good effect from the application of rags wetted in camphorated ſpirit of wine to the pit of the ſtomach. After the morbific matter is evacuated, the reachings to vomit may be allayed by gentle opiates. All hot medicines change the BILIOUS *fevers* into inflammatory ones; and the common ſudorifics drive the morbific matter into the blood, and uſually bring on almoſt immediate diſcolourings of the ſkin like thoſe of the jaundice. Bleeding, though performed ever ſo early in the diſeaſe, ſeldom does any good, except only in remarkably plethoric habits.

FEVERS, *colliquative*, are thoſe wherein the whole body is conſumed and emaciated in no long time; the ſolid parts, with the fat, &c. melted down, and carried off by a diarrhœa, ſweat, urine, &c.

FEVER, *continent*. See SYNOCHUS.

FEVER, *depuratory*. See DEPURATORIA *febris*.

FEVER, *diary*, is that which does not ordinarily hold beyond twenty-four hours. It is the gentleſt of all *fevers*; is frequently got by too much exerciſe, or other external accidents. It is cured by reſt alone, and keeping in bed. If it remain for ſeveral days, it is either called a *continual ephemera*, or *ſimple ſynochus*.

FEVER, *epidemic*. See EPIDEMIC, *Peſtilential* DISEASES, PLAGUE, &c.

FEVERS, *eruptive*, are thoſe which, beſide the ſymptoms common to other *fevers*, have their criſes attended with cutaneous eruptions. Such are thoſe of the ſmall-pox, meaſles, the petechial, the purple or ſcarlet *fever*, and the miliary *fever*; the other ſymptoms are, a grievous oppreſſion of the breaſt, laborious ſhort breath, obſtinate waking, ſpaſms, ſore throat, cough, &c.

FEVER, *goal*. See HOSPITAL *fever*.

FEVER, *hectic*, is a ſlow, durable *fever*, which extenuates and emaciates the body by inſenſible degrees. See HECTIC and CONSUMPTION.

It has three ſtages: the firſt, while it conſumes the juices of the body; the ſecond, when it exhauſts the fleſhy ſubſtance of its humidity; and the third, when it lays hold of, and deſtroys the ſolids themſelves; in which laſt ſtage it is reputed incurable. Its effect is ſomewhat like that of a flame, firſt conſuming the oil of the lamp, then the moiſture of the wick; and laſtly, the wick itſelf. But this *fever* is frequently conſidered as of the *ſymptomatic* or *ſecondary* kind, ariſing in phthiſes, &c.

FEVER, *inflammatory*. See *Ardent* FEVER.

FEVER, *intermitting*, is that which ceaſes and returns again alternately at ſtated periods, and is called alſo an AGUE. Agues are occaſioned by effluvia from putrid ſtagnating water. They are alſo produced by eating too much ſtone-fruit, by a poor watery diet, damp houſes, evening dews, lying on the damp ground, watching, fatigue, depreſſing paſſions, and the like. In a word, whatever relaxes the ſolids, diminiſhes the perſpiration, or obſtructs the circulation in the capillary or ſmall veſſels, diſpoſes the body to this diſeaſe.

In this kind of *fever*, cold and heat, ſhivering and ſweating, ſucceed each other; the paroxyſms are attended with ſickneſs, nauſeas, vomitings, head-ach, pain in the back and loins, &c. the paroxyſms are acute, but the diſeaſe uſually more or leſs chronical.

Sometimes the diſeaſe comes on ſuddenly, when the perſon thinks himſelf in perfect health; but it is more commonly preceded by liſtleſſneſs, loſs of appetite, and the other ſymptoms above recited. The quality of the urine after the fit characteriſes theſe ſeveral ſpecies of intermittents: it is of a reddiſh colour, and lets fall a ſediment exactly reſembling brick-duſt. It is ſometimes frothy, and a pellicle or thin frothy ſkin appears on the top, and adhering to the ſides of the glaſs in which it is contained.

While the fit continues, the patient ought to drink freely of water-gruel, orange-whey, weak chamomile-tea; or,

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If his ſpirits be low, ſmall wine-whey, ſharpened with the juice of a lemon. His drink ſhould be warm; and if twenty or twenty-five drops of laudanum be put into his drink, and given about half an hour after the commencement of the hot fit, it would promote his ſweat, ſhorten the fit, relieve the head, and tend greatly to remove the diſeaſe. His food between the paroxyſms ſhould be nouriſhing, and eaſy of digeſtion; and his drink be ſmall negus, acidulated with the juice of lemons or oranges, and ſometimes a little weak punch. Moderate exerciſe will alſo be of great uſe.

In the cure of an *intermitting fever*, when it does not go off without medicine, the firſt object is to cleanſe the ſtomach and bowels; for this purpoſe vomits ſhould be taken before any other medicine; a ſcruple or half a dram of the powder of ipecacuanha will be ſufficient for an adult, which may be taken two or three hours before the return of the fit, and repeated at the diſtance of three or four days: during the operation, the patient ſhould drink plentifully of weak chamomile-tea. If he be afraid to take a vomit, he muſt in this caſe cleanſe the bowels by a doſe or two of Glauber's ſalts, jalap, or rhubarb. At the beginning of an *intermitting fever*, when exceſſive heat, a delirium, &c. indicate an inflammation, bleeding may be proper: the intermittents that prevail in cold dry ſprings are ſometimes blended with an inflammatory diſpoſition; but the autumnal *fevers* are frequently combined with a principle of putrefaction, in which caſe bleeding would be improper: as the blood is ſeldom in an inflammatory ſtate in *intermitting fevers*, this operation is rarely neceſſary.

After proper evacuations, the patient may ſafely uſe the Peruvian bark, which, by the general conſent of phyſicians, is allowed to be a ſpecific for theſe *fevers* in all ſeaſons, ages, and conſtitutions. Two ounces of the powder may be divided into twenty-four doſes, and made into boluſſes with ſyrup of lemon, or mixed with red-wine, chamomile-tea, water-gruel, or any other liquor that is moſt agreeable to the patient. In a quotidian *fever*, one of theſe doſes may be taken every two hours during the interval of the fits. In a tertian ague, it will be ſufficient to take a doſe every third hour, and in a quartan every fourth. A ſmaller quantity of bark will ſuffice for a young perſon; and the doſe muſt be adapted to the age, conſtitution, and violence of the ſymptoms. The patient ſhould perſiſt in the uſe of this medicine till the diſeaſe is entirely overcome; and eſpecially in autumnal or winter agues, which are much more obſtinate than thoſe of ſpring and ſummer. A cup of the following infuſion drank three or four times a day will greatly promote the cure: take an ounce of gentian root, half an ounce of calamus aromaticus, and as much orange peel, with three or four handfuls of chamomile-flowers, and a handful of coriander ſeeds; bruiſe them together in a mortar, and uſe them in form of an infuſion or tea. About half a handful of theſe ingredients may be put into a tea-pot, and a pint of boiling water poured on them; or two handfuls of the ſame ingredients may be put into a bottle of white-wine, and a glaſs of it may be drank twice or thrice a day. Thoſe who prefer a decoction of the bark, may boil an ounce of it with two drams of bruiſed ſnake-root, and an equal quantity of ſalt of wormwood, in a quart of water, till it is reduced to a pint: to the ſtrained liquor may be added an equal quantity of red wine, and a glaſs of it taken frequently. In obſtinate agues, and particularly unfavourable circumſtances, it will be neceſſary to mix with two ounces of the bark, half an ounce of Virginian ſnake-root, and a quarter of an ounce of ginger, or ſome other warm aromatic; but when the ſymptoms are of an inflammatory nature, the aromatics may be omitted, and half an ounce of ſalt of wormwood or ſalt of tartar may be added to the above quantity of bark. When children are afflicted with this diſeaſe, the bark may be rendered more palatable by mixing it with diſtilled waters and ſyrup, and ſharpening it with the elixir or ſpirit of vitriol. It may be alſo given in the form of a clyſter. Dr. Lind recommends for an adult half an ounce of the extract of bark diſſolved in four ounces of warm water, with the addition of half an ounce of ſweet-oil, and ſix or eight drops of laudanum, to be repeated every fourth hour, or oftener, as occaſion ſhall require. The quantity of extract and laudanum muſt be diminiſhed for children. Children have been ſometimes cured by wearing a waiſtcoat with powdered bark quilted between the folds of it; by bathing them frequently in a ſtrong decoction of the bark, and rubbing the ſpine with ſtrong ſpirits, or with a mixture of equal parts of laudanum and the ſaponaceous liniment. Profeſſor Bergman, in his Opuſcula Phyſica & Chemica, 1779, mentions ſeveral inſtances in which the moſt obſtinate *intermittent fevers* that have raged in Sweden for ſome years paſt, and that would not yield to the bark, have been almoſt conſtantly removed by the artificial Seltzer-water, or other ſimilar impregnations of water with fixed air. The following preventative will be of ſervice to thoſe who live in low marſhy countries, or who are liable to frequent attacks of this diſeaſe: take an ounce of the beſt bark, Virginian ſnake-root, and orange peel, of each half an ounce; bruiſe them all together, and infuſe them for five or ſix days in a bottle of brandy, Holland gin, or any good ſpirit; pour off the clear liquor, and take a wine-glaſs of it twice or thrice a day. Gentian root, or calamus aromaticus may alſo be chewed for the ſame purpoſe: all bitters, eſpecially thoſe that are warm and aſtringent, are antidotes to agues. Buchan. Dom. Med. chap. 14. and Tiſſot's Adv. &c. chap. 18. § 250.

In *intermitting fevers*, it ſeems, from Dr. Langriſh's experiments, that the craſſamentum of the blood is not ſo viſcid and tenacious, neither is the ſerum ſo bilious, ſaline, and acrid, as in acute coninual *fevers*. The red globules abound more, and the cruor is more viſcid and tough in quotidians than in tertians, and in tertians than in quartans. Mod. Theor. and Pract. of Phyſ. p. 229.

The cold bath has been preſcribed with ſucceſs as a ſtrengthener to thoſe who were recovering from obſtinate *intermitting fevers*, to prevent a return of the diſeaſe. See Dr. Huxham's Obſ. de Aere & Morb. Epid.

Intermitting fevers are of divers kinds; as the QUARTAN, QUOTIDIAN, *double* QUOTIDIAN, and TERTIAN. There are alſo *intermitting fevers* which only return every fifth day, or every ſixth, or every ſeventh, and at other intervals.

FEVER, *inteſtinal*, *febris inteſtinalis*, in *Medicine*, a name given by Heiſter to a peculiar ſpecies of acute *fever*, paſſed over in ſilence by the generality of authors, but by ſome called the *meſenteric fever*, and by our Sydenham the *new fever*, *nova febris*. This differs from other acute *fevers*, in that it is attended always with a diarrhœa, which, however, is ſalutary, and which it is very dangerous to ſtop; and in that it is not relieved by the attemperating or diaphoretic medicines uſeful in other *fevers*, much leſs by the hot ſudorifics; all theſe things exaſperate and make it worſe; and the only things that give relief in it are gentle cathartics, and vomits that operate without violence. This *fever*, therefore, evidently ſhews the error of thoſe haſty reaſoners, who declare, that all acute *fevers* are to be cured by diaphoretics.

This peculiar ſpecies of *fever*, though unknown to many of the late writers, and called by Sydenham a new diſtemper, was not unknown to the ancients. Hippocrates has left many things concerning it; as have alſo the later Greeks, and Celſus; and among the moderns, Duret, Sennertus, Foreſtus, Riverius, Etmuller, Baglivi, Stahl, Hoffman, and Lanciſci, have all met with it, though they have given but very ſhort and imperfect deſcriptions of it in their writings.

The generality of thoſe who have written of this *fever* have referred it to the malignant kinds, from its being uſually attended with ſevere and uncommon ſymptoms from the beginning, or from ſuch being brought on in the courſe of an irregular treatment. The common method of curing *fevers* by diaphoretic medicines brings on in this, anxieties and ſtreightneſs of the præcordia, with pains about the ſtomach, loſs of appetite and deliriums, with efflorescences of various kinds, particularly petechial ſpots; and theſe ſymptoms are not unfrequently attended with death. But it is to be obſerved, that diſeaſes are to be carefully diſtinguiſhed in their own ſymptoms; thoſe which the phyſician brings on being often very different from what nature would offer.

Theſe *fevers* have their ſeat in the ſtomach and *inteſtines*; or if they have it any where elſe, it appears at leaſt that their origin, which is in a putrid colluvies, is always much more eaſily educed and evacuated by theſe than by any other paſſages. Many of the diſtempers mentioned by authors under peculiar names, are properly to be referred as to their cauſes to this ſpecies of *fever*. The dyſenteric *fever* is abſolutely of this kind, and many of the petechial ones. The catarrhal *fevers* alſo are referable to this kind; and the continual quotidian and tertian, with the *fevers* deſcribed by the ancients under the names of *hemitritæus*, *aſſodes*, *helodes*, *epiala*, and *lipyria*, with the *tritophyæ*, nearly allied to the *hemitritæi*, and by ſome authors confounded together, the words being uſed as ſynonymous.

Symptoms of inteſtinal fevers. Theſe are frequent ſhiverings when the patient is firſt ſeized with the diſtemper, which return at different and irregular intervals. After theſe, the tongue, teeth, and fauces, are covered with a foul and viſcid phlegm, the tongue, in particular, often looking yelloviſh and blackiſh with it; the patient perceives a continual diſagreeable taſte in his mouth from

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from this, and the people who are about him an ill ſmell. There is always a diarrhœa attending theſe *fevers*, and the fæces voided in it have a peculiarly offenſive ſmell. The hypochondria are always diſtended, and often in pain; the patients are attended with violent tremblings in their ſleep, ſo that they are frequently waked in terrors and uneaſineſs, and in tenderer ſubjects, theſe alſo are very frequent while waking. Pains in the head and neck are alſo conſtant attendants of this diſtemper, and ſeem to take their origin from ſpaſms. The urine, in the beginning of the diſeaſe, is of a natural ſtate and colour, and afterwards becomes turbid, and depoſits a muddy ſediment during the whole courſe of the diſtemper.

Theſe are the conſtant ſymptoms of theſe *fevers*; but beſide theſe, there are ſometimes other violent ones, ſuch as violent anxieties of the præcordia, pains in the ſtomach, and in the ſide reſembling thoſe of a pleuriſy, a loſs of ſtrength, a violent internal heat, and a continual convulſive or tremulous motion of the hands, with a ſubſultus tendinum, hiccough, and cold ſweats; which are extremely dangerous ſymptoms, and preſage a fatal period to the diſtemper.

Beſide theſe, which are the common and the additional ſymptoms of theſe *fevers*, there are yet ſome others often ſeen in them, which are merely accidental, and are owing to the improper management of the patient. It is a common error to give hot and ſudorific medicines in theſe caſes; the conſequence of which is, that the peccant matter which was lodged before in the primæ viæ is propelled into the blood, and not being able to make its way through the pores, it appears under the ſkin in form of petechiæ or purple ſpots, or of papulæ of a purple or reddiſh, ſometimes of a livid or blackiſh colour. Under this circumſtance, which is wholly owing to the ignorance of the preſcriber, the diſtemper gets the name of a petechial or a purple *fever*. Sometimes the ſame methods ſend the matter to the ears, where it occaſions deafneſs; ſometimes to the parotids and maxillary glands, where it forms tumours, inflammations, and abſceſſes of a very bad ſort; and finally, if it be transferred to the brain, violent deliriums and a phrenitis are the certain conſequence. Thus, according as this matter happens to be driven by this improper treatment to a more or leſs noble part of the body, it gives the ſymptoms of a more or leſs dangerous diſeaſe; and very frequently the patient ſeems to have a pleuriſy or peripneumony, or an inflammation in the liver, ſpleen, or inteſtines, while in reality the cauſe of the diſeaſe is all the while the ſame; and there is no difference, but that of the matter's ſettling on one or another part. Heiſter's Compend. Med. p. 83. and 97.

The method of cure. All hot medicines muſt be avoided, and the diſcharge of the peccant matter by the diarrhœa promoted by glyſters, and by purging medicines. Some adviſe aloes, and other medicines of that kind; others ſena and manna; ſome the purging ſalts; but moſt prefer rhubarb, given in often repeated ſmall doſes. Large draughts of the lubricating decoctions, ſuch as barley-water and water-gruel, are to be given, and emulſions of ſweet almonds and of the cold ſeeds. Small quantities of oil of ſweet almonds are alſo to be given at times, and juleps of the cooling waters and ſyrups moderately acidulated, and powders of nitre, cinnabar, and the common abſorbents, as crabs-eyes and the like, are to be given, to take off the pains and ſpaſms, and to attemperate the acrid matter. Bleeding in this *fever* is not neceſſary, unleſs in plethoric habits; and in thoſe caſes it muſt be done on the acceſs of the diſeaſe; for if done after the third or fourth day, it is uſually found to do more harm than good.

The diet in theſe *fevers* is not to be ſo very thin and weak, as in other acute *fevers*, but moderate nouriſhment is to be allowed, that the patient may retain his ſtrength ſufficiently to go through it: in the beginning of the diſeaſe, however, the patient has uſually an averſion for food, and then it is not to be forced upon him; but when the ſtomach begins to require it, then it is to be given in a moderate quantity; and great care muſt be taken that nothing aſtringent or difficult of digeſtion be allowed, but light and innocent meats, and with theſe a little good wine to promote digeſtion. Some alſo have given frequent vomits, by ſmall doſes of ipecacuanha in theſe *fevers*, with very good ſucceſs; and it is remarkable, that the purple *fever* mentioned by Stahl and others, as peculiarly affecting lying-in women, and being very frequent in Saxony for a long time, was by Dr. Wagner and others cured by this method: its origin being found to be a viſcous matter putrifying in the ſtomach and inteſtines; and therefore, the diſtemper being properly one of theſe *inteſtinal fevers*, was curable by the ſame methods with them; that is, by emptying the primæ viæ.

Some, as Baglivi and Burchard, have called theſe *fevers* *meſenteric fevers*; but improperly, according to Heiſter, lib. c. p. 85.

FEVERS, *malignant*, are thoſe in which the danger is much greater than the ſymptoms indicate, or in which the uſual regular ſymptoms do not appear (nature being oppreſſed with the malignity of the *febrile* matter), but other foreign ſymptoms ariſe; as a pain about the ſtomach, and præcordia; a livid complexion, with the face much diſfigured, &c. and ſometimes efflorescences on the ſkin, &c.

Some authors, from microſcopical obſervations, affirm, that in all *malignant fevers*, the blood is ſo corrupted, that ſwarms of little worms are generated therein, which occaſion moſt of the ſymptoms.

In all *malignant fevers* the blood is too fluid. Bloodletting has here no place; emetics do well at firſt, afterwards ſudorifics and alexipharmics: bliſters are commended in the progreſs of the diſeaſe. See *Malignant catarrhal* FEVER, *Miliary* FEVER, *Putrid* FEVER, and HOSPITAL *fever*.

FEVER, *meſenteric*. See *Inteſtinal* FEVER.

FEVER, *miliary*, or *purple*, an acute, continual, and exanthematous *fever*, in which nature ſeems to be endeavouring to drive out the ſubtle morbific matter to the ſurface of the body, by increaſing her ſecretory and excretory motions. It takes its name from the ſmall puſtules or bladders, &c. which appear on the ſkin, reſembling in ſhape and ſize the ſeeds of millet.

This *fever* is divided into two kinds; of the which, one is called *purpura rubra*, or the *red purple fever*; and the other by a very odd form of expreſſion, the *purpura alba*, or *white purple fever*.

The *white purple fever* is uſually malignant; it is eaſily complicated with the petechial *fevers*, and in ſome places has of late years been found often to affect lying-in women.

The *red purpura* is much more benign and mild than this, and indeed often is attended with no danger.

Theſe two ſpecies of *purpura* ſeem to differ as much as the ſmall-pox and meaſles do from one another, the white *fever* of this kind being uſually as much more fatal than the red, as the ſmall-pox is more fatal than the meaſles; but as there are caſes in which the ſmall-pox is mild and benign, and the meaſles are ſometimes dangerous, ſo in theſe diſeaſes, out of the natural courſe, the white is ſometimes mild, and attended but with a ſlight *fever*, while the red is fatal, and attended with a very high one. As the ſmall-pox alſo has white puſtules, and the meaſles only protuberances on the ſkin, ſo the *white purple fever* has alſo white regular puſtules, while the red has only ſuch protuberances as thoſe of the meaſles.

The *miliary fever* is ſometimes a primary diſeaſe; but it is much oftener a ſymptom of ſome other malady, as the ſmall-pox, meaſles, ardent, putrid, or nervous *fever*; and in all theſe caſes it is the effect of a too hot regimen or medicines.

Signs of this diſeaſe. The white kind ſeizes the patient with a general ſhivering and coldneſs, and a ſtraitneſs of the præcordia, with great anxiety of mind, a low, quick pulſe, and loſs of ſtrength; and afterwards ſhews itſelf in alternate changes of heat and cold; and before the appearance of the eruptions, the patients are worſe in reſpect of their anxiety and other ſymptoms; they are very reſtleſs, and ſometimes delirious; the tongue appears white, the hands ſhake, attended frequently with a burning heat in the palms; and in child-bed women the milk generally goes away, and the other diſcharges ſtop; and they complain of a troubleſome pricking or itching under the ſkin. The puſtules uſually firſt appear on the third or fourth day, ſometimes later; and at their approach, there is firſt perceived a general redneſs of the ſkin; and after this the redneſs is collected into ſpots, in the middle of each of which there appears a white puſtule; and theſe are often ſo copiouſly ſpread over the body, that they almoſt touch one another. Theſe puſtules are pellucid, and contain only a clear water, afterwards they grow yellowiſh; in child-bed women they are ſometimes interſperſed with puſtules of a red colour: when theſe appear the diſeaſe is called a raſh; and their eruption is uſually attended with an acute *fever*; when theſe puſtules have ſtood four days, they dry away, and the places appear ſcaly, and the diſeaſe terminates. Sometimes, in people of humid habits, and ſuch as have no *fever*, theſe puſtules ſweat out a white water.

The *red purple fever* ſeizes the patient in nearly the ſame way with the white; that is, with ſhiverings and heat ſucceeding one another. It is alſo attended with a tenſion and pain in the back, and with a ſtraitneſs of the breaſt, and a cough. The *purple* eruptions appear on the fourth, or on the ſeventh day, or later even than that, in form of ſmall protuberances like millet ſeeds, and are attended at the time of their eruption with an itching within

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within the ſkin: they are moſt numerous when the ſweat is moſt abundant, as on the breaſt, back, &c. though the whole body is ſometimes covered with them: the *fever* is not violent, and the ſweat is copious, and of an ill ſmell. In ſome caſes this diſeaſe is attended with no *fever* at all, and people go about their buſineſs with it, only complaining of an itching all over them. Some have violent pains of the head at the time, and are unaccountably ſleepy and anxious; but theſe ſymptoms uſually go off as ſoon as the eruptions appear properly: theſe remain fully out a few days, and then die away of themſelves, and the perſon finds himſelf as well as before. The *purple fever* of both kinds ſeems to have been more frequent of late than in the times of the earlier writers on medicine. The white kind, in particular, ſome years ago, was in a manner epidemic in Saxony, and carried off great numbers, and particularly ſeized the lying-in women. Wherever the petechial *fevers* are frequent, there the white *purple fever* is uſually alſo common. It often alſo mixes itſelf with the ſmall-pox, and makes the caſe always greatly worſe, and all the ſymptoms more violent. The red *purple fever* is moſt frequent with young men, and ſuch as lead ſedentary lives, and are ſubject to violent paſſions; labouring people are ſcarce ever found affected with this diſeaſe. Among women, thoſe of tenderer conſtitutions are moſt ſubject to it, and eſpecially ſuch as have been before ſubject to hyſteric complaints. And the perſons moſt ſubject of all to it are thoſe of both ſexes who live at eaſe and within doors, and by this means always are ſending off the humours to the ſurface of the body.

Cauſes of it. Theſe are a bad quality in the air, contagion from perſons who have the diſeaſe, the driving back of ſweats, and even the forcing them too violently by hot medicines: this too often happens to women in child-bed, and to perſons in petechial *fevers*. To theſe are to be added alſo, the curing the rheumatic and catarrhal diſorders by a too cold regimen and method, and an omiſſion of habitual bleedings, or by ſuppreſſion of the menſes, or diſcharges by the hæmorrhoidal veins. The *miliary fever* is ſometimes occaſioned by violent paſſions and emotions of the mind; by great evacuations, a weak watery diet, rainy ſeaſons, exceſſive uſe of cold, crude, unripe fruits, impure waters, and unwholeſome proviſions. In child-bed women this diſeaſe is often the effect of great coſtiveneſs during pregnancy, and of immoderate uſe of green traſh, &c. But the more general cauſe is indolence.

Prognoſtics in it. The going back of the eruptions in the white *purpura* is very often fatal, and in the mildeſt circumſtances is uſually attended with aphthæ, alienations of the mind, and terrible anxieties; and if by means of medicines the eruptions appear again, and yet the ſymptoms occaſioned by their going in do not diſappear, there is great reaſon to ſuſpect danger. The white *purpura* attending the petechial *fever* is very dangerous when the eruptions appear on the fourth day, but is leſs ſo when they appear later. The white *purpura*, when not attended with a *fever*, is leſs dangerous than otherwiſe; but it is uſually attended with diſtreſſing anxieties of mind, and with ſpaſtic motions.

The red *purpura*, when the eruptions are ſtruck back, is not attended with ſuch ſudden danger as the white; but people uſually have ſome convulſive motions attending it, and a great languor and debility of motion, and ſometimes inflammations of the fauces, and dangerous quinſeys; ſometimes a dry cough, ſometimes a heat of urine, or arthritic complaints, or a ſpurious pleuriſy, or a hemicrania; but all theſe ſymptoms go off as ſoon as the eruptions appear again.

If a diarrhœa comes on in the progreſs or decline of the diſeaſe, and is ſuddenly checked, it endangers an apoplexy. In child-bed women a diarrhœa is a very dangerous ſymptom; and the change of the colour of the urine from a yellow to a pale-colour is alarming; ſleepineſs is a favourable ſymptom.

Method of cure. This is to be the ſame both in the red and the white *purpura*, and is not different from that in other inflammatory *fevers*; namely, a gentle, but continual perſpiration muſt be kept up, and this alone will often cure the diſeaſe.

The patient's food ſhould be weak chicken-broth with bread, panada, ſago, or groat-gruel, &c. to a gill of which may be added a ſpoonful or two of wine. If his ſpirits are moderately high, his drink ought to be weak, as water-gruel, baum-tea, &c. a decoction of two ounces of the ſhavings of hartſhorn, and the ſame quantity of ſarſaparilla in two quarts of water, ſweetened with white ſugar, may be uſed as his ordinary drink. When the ſpirits are low, wine-whey or ſmall negus, ſharpened with the juice of orange or lemon, ſhould be allowed. If the *fever* has a putreſcent tendency, the patient's ſtrength muſt be ſupported with generous cordials joined with acids; and if the putreſcence increaſe, the bark muſt be adminiſtered. When the head is affected, the body ſhould be kept open by emollient clyſters.

On the days before the eruption of the ſpots, powders are to be given of nitre, diaphoretic antimony, and the abſorbents, as crabs-eyes, and the like; and when the eruptions are out, which uſually happens on the fourth day, the ſame powders muſt be given interchangeably, with gentle ſudorific draughts; from all which, fumitory-water, however, is to be carefully excluded. When the eruptions appear and return, camphor ſhould be added to any other medicines. The moſt proper cordial in this caſe is good wine, and the medicines ſhould be of the cordial and perſpirative kind; and all heating ones ſhould be avoided. A vomiting and diarrhœa, which ſometimes attend this diſorder, are mitigated by the ſaline draughts with ſaffron and crabs-eyes. This method is to be continued, only giving the doſes leſs frequently in the decline of the diſeaſe; and when it is wholly gone off, gentle purges are to be given thoroughly to cleanſe the primæ viæ; and the patient is by degrees to be hardened to the air. It is to be obſerved, that all irritations of the bowels are as bad in theſe caſes as in the ſmall-pox or meaſles, and that even the uſe of the moſt gentle clyſters ſhould be very ſparingly admitted. Bleeding can very rarely, if ever, be proper in this diſeaſe, as it commonly ſeems to be more of a putrid than of an inflammatory nature. Bliſters may be uſed through the whole courſe of the *fever*; but they ſhould be ſmall, and one applied at a time. However, if the pulſe ſhould ſink remarkably, the puſtules fall in, and the head be affected, it will be neceſſary to apply ſeveral bliſtering-plaſters to the moſt ſenſible parts, as the inſide of the legs and thighs, &c. People who are often ſubject to returns of the red or white *purpura*, would be right to uſe cupping with ſcarification frequently, by way of prevention; and when the cauſe of the diſeaſe is the ſuppreſſion of ſome habitual evacuation, great care is to be taken to ſupply the place of that by bleedings, if it cannot be recalled in the accuſtomed way. This is to be done at different times to prevent relapſes; and in general, a method of uſing gentle exerciſe, ſo as to promote a moderate ſweat, is greatly preferable to the method uſed by ſome of clothing too warm, which rather promotes the diſeaſe, by inviting the humours to the ſurface.

Pregnant women ſhould guard againſt coſtiveneſs, uſe regular exerciſe, avoid all green traſhy fruits, and other unwholeſome things; now and then take a gentle laxative of manna or rhubarb, or cream of tartar, and bleed in the firſt months; and when in child-bed, ſtrictly obſerve a cool regimen. Junker's Conſp. Med. p. 327. and 329. Buchan's Dom. Med. chap. 21.

FEVER, *milk*. See MILK.

FEVER, *nervous*, called alſo *ſlow fever* and *fever on the ſpirits*, attacks perſons of a weak relaxed habit, who neglect exerciſe, eat little ſolid food, ſtudy hard, or indulge in ſpirituous liquors. This *fever* may be occaſioned by any thing that depreſſes the ſpirits and impoveriſhes the blood, as anxiety and grief of mind, watching, intenſe thought, poor and irregular diet, unripe fruits, damp and unwholeſome air, exceſſive evacuations, wet cloaths, great fatigue, and whatever obſtructs the perſpiration and cauſes a ſpaſmodic ſtricture of the ſolids. The preſaging ſymptoms of a *nervous fever* are low ſpirits, want of appetite, laſſitude, watchfulneſs, ſighing, and dejection of mind; theſe are ſucceeded by a low, quick, and unequal pulſe; a dry tongue, without any conſiderable thirſt; alternate chilneſs and flushing; giddineſs and pain in the head; nauſea and vomiting; pale urine, reſembling dead ſmall beer; difficult reſpiration, and ſlight alienations of mind. If in the progreſs of this *fever*, towards the ninth, tenth, or twelfth day, the tongue and ſkin become moiſt, with a plentiful ſpitting and gentle purging; or if a ſuppuration happens in one or both ears, or large puſtules break out about the lips and noſe, a favourable criſis may be expected; but the more dangerous and alarming ſymptoms are an exceſſive looſeneſs, waſting ſweats, with frequent fainting fits; a trembling tongue when put out, cold of the extremities, and a fluttering or ſlow creeping pulſe; a ſtarting of the tendons, an almoſt total loſs of ſight and hearing, and an involuntary diſcharge by ſtool and urine. The patient in this diſeaſe ſhould be kept cool and eaſy; his ſtrength and ſpirits muſt be ſupported by nouriſhing diet and generous cordials; and therefore, wine ſhould be mixed with his gruel, panada, &c. and ſtrong wine-whey or ſmall negus, ſharpened with the juice of orange or lemon, or muſtard-whey, will be proper for his ordinary drink. Wine that is good and genuine is a very neceſſary and effectual medicine in this *fever*; patients have been recovered from the moſt dangerous ſtate by uſing in whey, gruel,

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gruel, and negus, a bottle or two of ſtrong wine every day. If a nauſea prevails at the beginning, a gentle vomit ſhould be given; and if the ſymptoms continue, it may be repeated any time before the third or fourth day. Thoſe who cannot take a vomit ſhould have their bowels cleanſed by a ſmall doſe of rhubarb, or an infuſion of ſena and manna. Bleeding is generally improper in this diſeaſe, but bliſtering is highly neceſſary; bliſtering-plaſters may be applied in all ſtages of the *fever* with great advantage; and if the patient be delirious, he ought to be bliſtered on the head and neck. Bliſters, however, are moſt proper towards the beginning, or after ſome degree of ſtupor comes on, in which caſe it will be always proper to bliſter the head. A ſtool ſhould be procured every other day by a glyſter of milk and water, with a little ſugar; to which may be added, if neceſſary, a ſpoonful of common ſalt. A violent looſeneſs, ſhould it happen, may be checked by ſmall quantities of Venice treacle, or by giving the patient for his ordinary drink the white decoction. If a miliary eruption happens, as it ſometimes does about the ninth or tenth day, it ſhould neither be checked by bleeding and other evacuations, nor puſhed out by a hot regimen. In deſperate caſes, large doſes of muſk may be frequently repeated, or fifteen grains of muſk, with three grains of camphire, and ſix grains of ſalt of hartſhorn, may be made into a bolus, with a little ſyrup, and given three or four times a day. In the intermiſſion of the *fever*, the patient ſhould take half a dram, or a whole dram of bark in a glaſs of red port or claret, four or five times a day. The bark may alſo be adminiſtered with other cordials, in the following manner: take an ounce of Peruvian bark, half an ounce of orange peel, two drams of Virginian ſnake-root, and one dram of ſaffron; let them be powdered and infuſed for three or four days in a pint of the beſt brandy; ſtrain the liquor, and give two tea-ſpoonfuls of it three or four times a day in a glaſs of ſmall wine or negus. Buchan's Dom. Med. chap. 19. Edinb. Med. Eſſ. vol. iv. p. 280. vol. vi. p. 28.

FEVER, *peripneumonic*. See PERIPNEUMONY.

FEVERS, *peſtilential*, are acute, contagious, and mortal diſeaſes. Some will have the *fever* to be the diſeaſe or plague itſelf; others only account it a ſymptom of the plague. See *Epidemical* DISEASES, PLAGUE, *Putrid* FEVER, &c.

FEVER, *petechial*, is a malignant *fever*, wherein, beſide the other ſymptoms, on the fourth, or more frequently on the ſeventh day, petechiæ, or red ſpots, like fleabites, appear chiefly on the breaſt, ſhoulders, and abdomen; the ſpots afterwards turn paler, then yellow, and ſo diſappear. When they grow livid or black, they uſually prove fatal.

This *fever* is contagious, and often epidemical. See *Malignant catarrhal* FEVER and *Putrid* FEVER.

FEVER, *puerperal*, or *child-bed fever*, is that to which women are ſubject in the time of pregnancy, and more eſpecially in their lying-in: it generally makes its attack on the ſecond or third day after delivery. The proximate cauſe of this diſorder is an irritability and inflammation of the abdominal viſcera, and principally of the inteſtines and the omentum; and the remoter cauſes are a ſudden emptying of the womb, in conſequence of which the blood ruſhes into the emptied membranes with an impetuoſity that often excites inflammation; coagulated blood lodged in the uterus after delivery, obſtructed lochia, a putrid air, acceſs of the milk, inflammation of the breaſts, abſorption of acrid milk, and retention of the excrements. But the chief prediſponent cauſe of the inflammation of the inteſtines and omentum in lying-in women to which this *fever* is owing, is the conſtantly increaſing preſſure of the gravid uterus againſt theſe viſcera during the latter months of geſtation, and in the time of labour; the ill effects of which are aggravated by occaſional cauſes occurring after delivery, particularly by keeping the patient hot and coſtive, and giving her warm ſpices and ſpirituous cordials. This *fever* comes on like moſt others, with a cold or ſhivering fit, which is ſucceeded by reſtleſſneſs, pain of the head, great ſickneſs and bilious vomiting. The pulſe is quick, the tongue dry, the ſpirits depreſſed, and ſtrength weakened. A great pain is commonly felt in the back, hips, and region of the womb; a ſudden change takes place with reſpect to the quantity or quality of the lochia; and the patient is frequently troubled with a teneſmus: the urine is very high-coloured, and diſcharged with pain, and in ſmall quantity. The belly ſometimes ſwells to a conſiderable ſize, and is always ſore and tender. When the *fever* has continued for a few days, the ſymptoms of inflammation uſually ſubſide, and the diſeaſe acquires a more putrid form. A bilious or putrid diarrhœa of an obſtinate and dangerous nature comes on, and accompanies the diſeaſe through its future progreſs. In women of plethoric conſtitutions, bleeding will be generally proper at the beginning; but it ſhould be uſed cautiouſly, and not repeated, unleſs the ſymptoms of inflammation riſe high; in which caſe a bliſtering plaſter may alſo be applied to the region of the womb. During the cold fit the patient ſhould drink warm diluting liquors, and warm applications to the extremities of the body, as of heated bricks, bottles or bladders of water, &c. may be uſed with advantage. Emollient clyſters of milk and water, or of chicken-water, ſhould be frequently adminiſtered through the courſe of the diſeaſe. Sometimes a vomit is given for evacuating the bile from the ſtomach; but it will be ſafer to ſubſtitute a gentle laxative; the ſaline draught is proper to be repeated for this purpoſe; and if it runs off by ſtool, or if the patient be reſtleſs, a few drops of laudanum, or ſome ſyrup of poppies may be added: if the ſtools ſhould be ſo frequent as to exhauſt the patient, a ſtarch clyſter, with thirty or forty drops of laudanum in it may be uſed; and her drink may be rice-water, with half an ounce of gum arabic diſſolved in every pint; and if theſe fail, recourſe muſt be had to the columbo-root, or ſome other aſtringent. Dr. Hulme lays the principal ſtreſs in this diſorder on the free and repeated uſe of purgative medicines, ſuch as the ſal catharticus, and oleum Ricini, or the tartarus emeticus, or vinum antimoniale, given in ſmall doſes every two or three hours, till an effectual diſcharge is procured; in conſequence of which, he ſays, that the patient generally finds an immediate relief from pain, kind ſweats come on, gentle ſlumbers ſucceed, and the pulſe becomes more calm and ſlow. When this diſorder has arrived at the putrid ſtate, antiſeptics ſhould be uſed; and particularly the bark, in decoction or infuſion, mixed with tincture of roſes, or other gentle aſtringents; a ſcruple of the extract of bark, with half an ounce of ſpirituous cinnamon-water, two ounces of common water, and ten drops of laudanum, may be made into a draught, and given every ſecond, third, or fourth hour. For a prevention of this *fever*, women in child-bed ſhould be kept very eaſy; their food ſhould be light and ſimple, and their bed-chamber clean, cool, and properly ventilated. To this circumſtance of introducing freſh and cool air into the chamber of the patient Dr. Hulme aſcribes his never having obſerved any petechiæ, exanthemata, or any febrile eruptions attending this *fever*, nor a ſingle inſtance of the *miliary* FEVER in the London lying-in hoſpital, where he has attended more than 1400 women after delivery. Buchan's Dom. Med. p. 587, &c. Hulme's Treatiſe on the Puerperal *Fever*, 1772.

FEVER, *putrid*, is a general denomination, under which may be comprehended the plague, ſpotted or petechial *fevers*, peſtilential, malignant, camp, gaol, &c. Theſe are various names of the ſame kind of diſeaſe, according to the degree in which it prevails, or the different circumſtances that attend it. Thoſe who are moſt ſubject to this *fever* are perſons of a lax habit, cold or phlegmatic conſtitutions, and a melancholy diſpoſition, or who are weakened by watching, faſting, poor or luxurious diet, hard labour, exceſſive venery, &c.

The remote cauſes of this diſeaſe are a ſtagnated and foul air, rendered noxious by putrid animal and vegetable effluvia; and, therefore, it prevails in camps, hoſpitals, gaols, large populous cloſe towns, and low marſhy countries; warm, ſultry weather, with a moiſt atmoſphere; unwholeſome diet, as corrupted grain, putrid fleſh or fiſh, and water which is become putrid by ſtagnation; a long continuance of animal food without a proper mixture of vegetables, whence ſailors in long voyages, and the inhabitants of beſieged cities are peculiarly ſubject to this *fever*; and an exceſſive uſe of alkaline ſalts and other medicines that diſſolve the blood. The proximate cauſe is a diſſolution of the blood, produced by putrid miaſmata that are received into the lungs by inſpiration into the ſtomach with the food, or being generated in ſome part of the body, are abſorbed, as from putrid ulcers, &c.

The ſymptoms of the acceſs of this *fever* are a remarkable weakneſs of body, without any apparent cauſe, and dejection of mind. Theſe are ſucceeded by nauſea, and ſometimes a vomiting of bile; a violent pain of the head, with a ſtrong pulſation or throbbing of the temporal arteries; inflammation of the eyes, with a pain in the bottom of the orbit; noiſe in the ears; difficult reſpiration, accompanied with ſighing; pain in the back and loins, and region of the ſtomach; the tongue at firſt appears white, but afterwards livid and black; and the teeth are covered with a black cruſt. The urine, from being pale, becomes more highly coloured, and at laſt is very brown and blackiſh, and has more or leſs an offenſive ſmell; the ſtools are extremely fœtid, and are ſometimes of a greeniſh, black, or reddiſh caſt. Livid ſpots appear on the ſkin; and there are ſometimes violent hæmorrhages

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or diſcharges of blood from the mouth, eyes, noſe, &c. Patients in this diſorder void worms both upwards and downwards, are affected with tremors, and become delirious.

Putrid *fevers* may be diſtinguiſhed from the inflammatory by the ſmallneſs of the pulſe, the great dejection of mind, the diſſolved ſtate of the blood, the petechiæ or purple ſpots, and the putrid ſmell of the excrements. They may be diſtinguiſhed from the low or nervous *fever* by greater heat and thirſt, by the higher colour of the urine, and by the greater violence of the ſymptoms. In ſome caſes the inflammatory, nervous, and putrid ſymptoms are combined; and *fevers* of the inflammatory and nervous kind, by improper treatment, are converted into malignant and putrid ones. This *fever* ſeems to have no critical time for its termination; ſometimes it terminates between the ſeventh and fourteenth day, and at other times is prolonged for five or ſix weeks.

The favourable prognoſtics are a gentle looſeneſs after the fourth or fifth day, a warm mild ſweat, ſmall miliary puſtules appearing between the purple ſpots, hot ſcabby eruptions about the mouth and noſe, the riſe of the pulſe after the uſe of wine and other cordials, the abatement of the nervous ſymptoms, abſceſſes in the groin or parotid glands, and within the ears occaſioning deafneſs towards the decline of the *fever*. The unfavourable prognoſtics are an exceſſive looſeneſs, with a hard, ſwelled belly, large black or livid blotches, aphthæ in the mouth, wild ſtaring of the eyes, blindneſs, change of the voice, difficulty of ſwallowing, an inability to put out the tongue, a conſtant inclination to uncover the breaſt, cold clammy ſweats, bloody ſweat and ſaliva, black urine that depoſits a black footy ſediment, ſtarting of the tendons, and fœtid, ichorous, involuntary ſtools, attended with a coldneſs of the extremities.

The regimen and medicines proper for patients in this *fever* are ſuch as counteract the putrid tendency of the humours, ſupport their ſtrength and ſpirits, and aſſiſt nature in expelling the cauſe of the diſeaſe, by promoting perſpiration and the other evacuations. For this purpoſe they ſhould be provided with a circulation of freſh air; and their apartments ſhould be ſprinkled with vinegar, lemon-juice, or any other vegetable acid: fumigations of myrrh, and other aromatic and antiſeptic ingredients, may be uſed; and ſtrong ſcented herbs, as rue, tanſy, wormwood, &c. may be diſperſed in different parts of the houſe, both for the relief of the ſick, and for preventing the infection. The food ſhould be light, as panada, &c. mixed with red wine, and ſharpened with acids; and the drink ſhould be orange, lemon, or vinegar-whey, with the addition of wine in ſuch quantity as the patient's ſtrength requires; acidulated negus, or chamomile tea ſharpened with elixir of vitriol or Clutton's FEBRIFUGE ſpirit. If the patient be coſtive, a tea-ſpoonful of cream of tartar may be put into a cup of his drink, or he may drink a decoction of tamarinds. The ſtrength and ſpirits of the patient ſhould be ſupported by frequently taking ſmall quantities of proper aliments. If he be delirious, the hands and feet ſhould be often fomented with a ſtrong infuſion of chamomile flowers, or of the bark.

Bleeding is ſeldom neceſſary, but often hurtful in putrid *fevers*; and in caſes where there are evident ſigns of inflammation in the beginning of the diſeaſe, it ſhould be very cautiouſly admitted. The firſt medicine proper to be preſcribed in this *fever* is an antimonial emetic, the operation of which may be ſucceeded by a doſe of the julep of camphor. Small doſes of the emetic tartar may be repeated every ſecond or third hour, with proper antiſeptics and cordials; the ſafeſt and beſt cordial is good Rheniſh or red wine; and one of the moſt powerful antiſeptics is the Peruvian bark, which ſhould be given early in this diſorder, unleſs ſymptoms of inflammation ſhould appear, and regularly continue. An ounce of the powder may be mixed with half a pint of water, and the ſame quantity of red wine, and ſharpened with the elixir or ſpirit of vitriol; to which may be added two or three ounces of ſyrup of lemon; and two table-ſpoonfuls of this mixture may be taken every two hours, or oftener. Thoſe who cannot take the bark in ſubſtance may infuſe it in wine. If a diarrhœa comes on, the bark ſhould be boiled in red wine, with a little cinnamon, and ſharpened with the elixir of vitriol, or gentle opiates and aſtringents may be uſed. Plenty of acids and medicines that promote a gentle perſpiration are very beneficial in this kind of looſeneſs. If the patient be troubled with a vomiting, a dram of the ſalt of wormwood diſſolved in an ounce and a half of freſh lemon juice, and made into a draught, with an ounce of ſimple cinnamon water and a bit of ſugar, may be given and repeated as often as it is neceſſary. Bliſters are generally uſeful in the early ſtages of theſe *fevers*; when the petechiæ or ſpots ſuddenly diſappear, the pulſe ſinks, and a delirium approaches, they may be applied to the head and inſide of the legs or thighs; but when there is any reaſon to apprehend a gangrene from the uſe of bliſters, warm cataplaſms of muſtard and vinegar may be applied to the feet. When the glands ſwell, as they ſometimes do in this diſeaſe, the ſuppuration of the ſwellings ſhould be promoted by the application of poultices, and at a proper time they ſhould be laid open, and the poultices continued. Ulcerous ſores, of a livid appearance and putrid ſmell, that break out in the decline of this *fever*, may be gradually healed by the plentiful uſe of Peruvian bark and wine, ſharpened with the ſpirits of vitriol.

Opening and antiputreſcent clyſters, and mild laxative medicines, are proper to be adminiſtered during the progreſs of this diſeaſe. Camphor is uſeful both as an antiſpaſmodic and antiſeptic, particularly in the beginning of putrid *fevers*. *Fixed* AIR is a very efficacious antiſeptic; and the introduction of it into the materia medica, in conſequence of the experiments and diſcoveries of Dr. Macbride, Dr. Prieſtley, and others, promiſes to be of great uſe in a variety of diſorders, and eſpecially in thoſe of the putrid kind. Mr. Hey of Leeds, in the year 1772, adminiſtered it with great ſucceſs in a dangerous caſe of the putrid kind, by impregnating the water which his patient drank with fixed air from the atmoſphere of a large vat of fermenting liquor, and by injecting clyſters of it, collected from a fermenting mixture of chalk and oil of vitriol. Dr. Percival of Mancheſter has alſo found the efficacy of fixed air in wines, &c. impregnated with it, for checking the ſeptic ferment, and ſweetening the putrid colluvies of the primæ viæ in malignant *fevers*. Dr. Dobſon of Liverpool, and Dr. Warren of Taunton, have likewiſe made ſucceſsful trials of this medicine in putrid diſorders. Dr. Hulme has ſucceſsfully preſcribed fixed air in caſes of the gout, hectic *fevers* with conſumption, putrid *fevers*, dyſentery, and worms: he makes uſe of no particular apparatus for impregnating water and other liquors with this air; but he does this by the mere mixture of two liquors: theſe liquors are the ſolution of fixed alcaline ſalt and water, containing as much vitriolic acid as he finds, *a priori*, to be ſufficient to neutralize the alkali, and to expel from it all its fixed air. He gradually and cautiouſly mixes theſe with each other, ſo as to prevent the efferveſcence or the diſſipation of the fixed air as much as poſſible. His uſual mixture conſiſts of fifteen or thirty grains of ſalt of tartar diſſolved in three ounces of water; to which are added three ounces of water properly acidulated by means of the vitriolic acid. In putrid *fevers* he alſo recommends half a dram of ſalt of tartar diſſolved in three ounces of a Peruvian bark, with the ſame addition of acidulated water as before. Hulme's Safe and eaſy Remedy for the Stone, &c. 1778. See PYRMONT *waters*.

Mr. Magellan, in a letter to Dr. Prieſtley, recites a remarkable inſtance of the efficacy of fixed air thus adminiſtered in a putrid *fever* by a phyſician in Holland: the decoction of bark, which had been tried without effect, was afterwards mixed with the ſalt of tartar and vitriolic acid, and in three days the bad ſymptoms were removed, and the patient ſoon recovered. Prince Gallitzin, the Ruſſian ambaſſador to the ſtates of Holland, has found by analyſing the bark, that it contains a large quantity of fixed air; and to this quality he conjectures the antiſeptic virtues of it may be owing. Prieſtley's Exp. and Obſ. in Nat. Philoſ. &c. 1779. p. 472.

Dr. Prieſtley's *nitrous* AIR, which is a more powerful corrector of putrefaction than fixed air, may be found on trial to be of ſtill greater ſervice. For preventing putrid *fevers*, a ſtrict regard to cleanlineſs, a dry ſituation, ſufficient exerciſe in the open air, wholeſome food, and a moderate uſe of generous liquors, may be recommended. The infection alſo ſhould be carefully avoided; and a perſon who is apprehenſive of having caught it, ſhould immediately take a vomit, and work it off by drinking plentifully of chamomile tea; and uſe for his ordinary drink an infuſion of the bark and chamomile flowers, with ſtrong negus, or a few glaſſes of generous wine.

Sir John Pringle obſerves, that the plague, and other peſtilential *fevers*, hot ſcurvies, and dyſenteries, have very much abated in Europe within this laſt century, a bleſſing we can aſcribe to no other ſecond cauſe more than to the improvement of every circumſtance relating to cleanlineſs, and to the more general uſe of ANTISEPTICS. In regard to diet too, it may be obſerved, that hopped beer, wine, and ſpirituous liquors, coming more into general uſe, have been a great means of ſuppreſſing putrid and malignant diſeaſes. Greens and fruit are likewiſe more commonly uſed, and ſalted meats make a much leſs part of diet than they did formerly. To which may be added the more general conſumption of tea and ſugar, which are no inconſiderable antiſeptics. With reſpect to the contagious nature of all putrid diſorders, he thinks that the putrid effluvia received into the blood have a power of corrupting the whole maſs; of which he

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he conceives the reſolution of the blood, and ſometimes even its ſmell in the advanced ſtate of a malignant *fever*, the offenſiveneſs of the ſweats and other excretions, the livid ſpots, blotches, and mortifications incident to this diſtemper to be ſufficient proofs. By the acrimony of theſe effluvia, the nerves are affected with various ſpaſms, the pulſe is always quickened, at firſt raiſed, and ſoon depreſſed. Buchan's Dom. Med. chap. 20. Prieſtley's Exp. and Obſ. on different Kinds of Air, vol. i. Appendix, vol. ii. Ap. Pringle's Diſeaſes of the Army, p. 293. 298, &c. Fordyce's Enquiry into the Cauſes, Symptoms, and Cure of putrid *Fevers*. See BILIOUS *fever*, HOSPITAL *fever*, &c.

FEVER, *remitting*, called alſo a *continual fever*, συνεχης, and a *compound continual fever*, is that which continues ſome time without any gradual increaſe of heat, yet is liable to alternate fits of remiſſion and aggravation, either ſtated and periodical, or irregular.

Of this there are divers kinds, denominated from the periods of returning, as the *remitting*, *continual quotidian*, *continual tertian*, *continual quartan*, &c. which are only a continued *fever*, whoſe acceſſes or ſeverer fits return every day, or every other day, or every third day, or every fourth day.

Some enumerate divers other more complicated continual *fevers*; as the *double* or *triple quotidian*, which has two or three paroxyſms every day; the *double* or *triple tertian*, or *quartan*, which have two or three every third or fourth day; the *ſemi-tertian*, by the Greeks called ἡμιτριταῖος, which conſiſts of a *continual*, and two *intermitting fevers*, of different kinds, viz. a *quotidian* and *tertian*; the patient, beſide a *continual fever*, having an extraordinary fit every day, and every other day two.

Others divide the *remitting*, συνεχης, or *compound continual fever*, into *ſimple* and *ſpurious*.

The *ſimple remitter* returns regularly, and is only diſtinguiſhed from an intermitter in that the feveriſh heat in the interval of this latter is never quite extinguiſhed; and that the paroxyſms do not begin with ſo much chillneſs and horror, and go off in profuſe ſweats.

The *ſpurious remitter* is attended with grievous ſymptoms of the nervous kind, reſembling thoſe of the rheumatiſm, cholic, pleuriſy, and other inflammatory and ſpaſmodic diſeaſes; beſide immoderate excretions, vomitings, diarrhœas, &c. whence its returns are uncertain and variable.

The *ſimple* rarely, if ever, kills; the *ſpurious*, frequently: ſometimes it degenerates into a malignant συνοχος.

The firſt is cured with the cortex Peruv. almoſt as infallibly as an intermitter: when it is brought to a regular intermiſſion by bleeding, if there be ſigns of inflammation; or by a vomit, which may be repeated if the nauſea continues, and by clyſters or gentle laxatives: the febrile ferment being much the ſame in both, and the ſame medicine is found almoſt a ſure, though not ſo ſpeedy a remedy of the ſpurious, if properly applied. The diet and medicine in theſe *fevers* muſt be regulated by the predominant ſymptoms, whether they be inflammatory, nervous, or putrid. Whatever is of a heating quality ſhould be avoided, as this *fever* is frequently changed into a continual one by a hot regimen and improper medicines.

Theſe *fevers* prevail in low marſhy countries abounding with wood and ſtagnating water; but they prove moſt fatal in places where great heat and moiſture are combined, as in ſome parts of Africa, the province of Bengal in the Eaſt Indies, &c. where they are generally of a putrid kind, and prove very fatal. The moſt likely way to avoid the *remitting fever*, is to uſe wholeſome and nouriſhing diet, to pay the ſtricteſt regard to cleanlineſs, to keep the body warm, to take ſufficient exerciſe; and in hot countries to avoid damp ſituations, night air, and evening dews. Where it is epidemical, the beſt preventive medicine is the bark, which may be chewed or infuſed in brandy or wine, &c. Buchan's Dom. Med. chap. 22.

FEVER, *ſcarlet*, the name of an eruptive *fever* uſually attacking young perſons, and not attended with any great danger. When it is moderate in degree, it may be left to nature alone, and will go off very well without the aſſiſtance of medicines, only obſerving a good regimen; but if it be more violent, it is to be treated with more care: the patient is to be kept warm in bed, and to be made to drink large quantities of warm diluting liquors, acidulated either with lemon juice or ſpirit of ſulphur or vitriol, and draughts of the attemperating and diluting medicines are to be given every four or ſix hours, together with the attemperating and gently diaphoretic powder; but during the courſe of the cure all hot things are to be carefully avoided, as well in food as medicine, for every thing of this kind renders the diſeaſe worſe, when treated in the proper manner. The *ſcarlet* ſpots, after a few days, dry off, and the ſkin ſcales away, and after this the patient uſually is ſoon well. At this time two or three doſes of ſome gentle purge are to be given; and if the weather be bad, the patient is to be confined to his chamber for ſome days afterwards, that the tranſpiration may be free and uninterrupted; by this means the worſt kinds of this *fever* go well off.

But when this caution is neglected, it is very common to find the patient fall into a ſwelling of the belly after about three weeks, and ſometimes into an anaſarca; ſometimes attended with a *fever*, ſometimes without one, and often with tumours of the glands, and many other dangerous diſorders. The urine in theſe caſes becomes brown and turbid, and many are loſt in this manner. But as this new diſeaſe, as it is uſually called, though it is in reality no other than another period of the *ſcarlet fever*, owes its whole origin to the morbific matter which cauſed the firſt appearance of that, being in part retained in the body, the beſt method of cure is by thoſe remedies which are able to carry thoſe humours out of the body. Gentle purges are to be given at ſhort intervals, and the way nature indicates is to be carefully followed, by giving diuretics in the intermediate days; for the brown turbid urine voided naturally in this caſe is an attempt of nature to carry off the matter that way. The beſt of all diuretics in this caſe is a tincture of ſalt of tartar and ſpiritus nitri dulcis mixed together, and taken twenty drops or more three times a day. In young ſubjects, who will not take purges in the common way, a glyſter made of an infuſion of ſena purges them very well, and anſwers the purpoſe.

The common hot ſudorifics are not to be given in theſe caſes, for ſweat is ſcarce to be obtained by any means in this diſeaſe; and great care is to be taken to keep the fumid parts from the cold air, otherwiſe the patient is often carried off at once by the chilling of them. If there be a *fever* with this ſecond complaint, as is uſually the caſe, the attemperating medicines are to be given in an afternoon and evening, and draughts of gently diuretic liquors to be drank after them.

In this, and in all other eruptive *fevers*, any thing that cools the patient is of the utmoſt conſequence, and the bed is not to be new made, nor the ſhirt changed by any means during the courſe of the diſtemper. Immoderate heat, on the other hand, is almoſt as bad, and the middle regimen is the only proper one to be obſerved. The patient lying quiet, and being kept in an equal and moderate heat in all caſes of eruptive *fevers* as well as in this, may be allowed in the beginning to walk about in his chamber, taking great care to keep out the cold, and need not be confined to his bed ſo long as his ſtrength will permit his keeping up. Heiſter's Compend. Med. p. 83.

FEVERS, *ſlow*, are gentle, but durable ones; they conſume the patient by degrees. They uſually ariſe from diſorders in the lympha or pituita, whence Sylvius calls them *lymphatic fevers*.

The principal of theſe are the catarrhal, attended with a catarrh, cough, hoarſeneſs, &c. and the ſcorbutic *fever*, into which acute *fevers*, and ſometimes intermittent kinds degenerate. See *Nervous* FEVER and HECTIC.

The *ſlow fever*, or *febris lenta*, properly and diſtinctly ſo called, differs from the hectic *fever* in its origin; for it is generally produced by the degeneration of diary *fevers*, ſynochæ, or quotidians improperly treated, and by the common intermittents violently and injudiciouſly ſuppreſſed by aſtringents; but the hectic *fever* is connected with the terrible accidents of vomicæ, empyemas, and apoſtematous inflammations of the viſcera. Nor do they differ leſs in the continent cauſe; for in the *ſlow fever* there is not yet any actual hurt in the viſcera, but only a tendency toward it, and ſuch a diſpoſition as may naturally bring it on; but in the hectic there is always either an obſtinate ſchirrus or an apoſtem, or a ſimple or fiſtulous ulcer. Junker's Conſp. Med.

The ſymptoms of theſe diſeaſes differ alſo as much as their cauſes; for in the *febris lenta* they are all mild, and in the hectic all terrible and violent. The *febris lenta* never is ſo violent a diſeaſe as to confine the patient long to his bed, and uſually grows milder in the continuance than at firſt; but on the contrary, the hectic ever grows worſe by duration; and finally, the *febris lenta* in all caſes, except where it ariſes from the improper uſe of aſtringents in intermittent caſes, is attended with profuſe ſweats; whereas the hectic, unleſs when urged by medicines of a wrong kind, is a dry heat, and never throws out any ſweats till in the laſt ſtages. In *ſlow fevers* of this kind, the ſtools are thin, and not frequent, and uſually have a mucous matter mixed with them. In the hectic, when complete, there uſually come on violent diarrhœas, which carry off the patient. The *lenta febris* is ſubject to degenerate into other diſeaſes, and frequently returns

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returns into the diſtemper from which it firſt aroſe; but the hectic is ſubject to no tranſmutations. And finally, the *lenta febris* often goes off happily of itſelf, nature making her way through the obſtruction, and completing the cure. The hectic is uſually fatal.

Signs of the febris lenta. Theſe are a preternatural heat often ſcarce ſenſible to others, but very troubleſome to the patient; a dryneſs of the mouth, and continual thirſt; a loſs of appetite, and waſting of the ſtrength; a general dullneſs of the face, except for a fluſhing of the cheeks; a waſting of the fleſh; violent ſweats in the night; and a redneſs and foulneſs of the urine when firſt made, but afterwards a precipitation of a pale, red ſentiment, and the remainder then is clear above.

Perſons ſubject to it. Theſe are principally young men who are of a plethoric habit, and who have had an ephemera or ſynocha, or ſome other *fever* of that kind, improperly treated with too hot medicines; and ſuch as in *fevers* of other kinds where nature produced copious ſweats, have ſuppreſſed them either by medicines or by an improper regimen; and finally, people worn down and exhauſted by violent hæmorrhages.

Prognoſtics in it. This kind of *fever*, when it ariſes from an intermittent, and in fine returns into its old ſtate again, is attended with very little danger; but there is much more danger where it continues long in its own appearance, or where it degenerates, as it too frequently does, into an acute one. The degeneracy of this *fever* into a hectic is of all other conditions of it the moſt dangerous; and this is not always readily diſtinguiſhed: this is may be ſuſpected to be the caſe when the patient's appetite turns, and yet all the ſymptoms continue; and eſpecially if there be added to them a ſhort cough and a difficulty of reſpiration; and when there is a ſenſation of a weight in the abdomen, and it is painful to lie otherwiſe than on one ſide, or in ſome particular poſture.

Method of cure. The firſt thing to be done is to attempt the reſolving the ſtaſis, as by pimpernel and elecampane roots, by the gentle alexipharmics, and by the neutral ſalts, as the tartarum vitriolatum, and the like. The viſcid foulneſſes left by intermittent *fevers* are to be carried off by firſt attenuating and inciding them by the gums, as ammoniacum and the reſt; and the tone of the viſcera is to be finally re-eſtabliſhed by the gentler chalybeats and ſtomachics.

When the caſe ariſes from an acute *fever*, powders of tartar of vitriol, crabs-eyes, and diaphoretic antimony, with gentle cathartics in the intermediate days, will often complete a cure; when it ariſes from an intermittent, no happier means can be deviſed for the cure than the bringing it back to its old ſtate of the intermittent again. Etmuller ſays, that the volatile alkalis, ſuch as ſpirit of ſal armoniac, have a great power this way; and Stahl propoſes to effect it by an habitual drinking an infuſion of elecampane, pimpernel, centaury, orange-peel, and ſena, with a ſmall quantity of rhubarb and black hellebore in wine.

Finally, when this caſe has been brought on by violent hæmorrhages, the analeptics alone are to be depended upon, with the teſtaceous powders to abate the ſweats, and the lighter tinctures of ſteel to reſtore the loſt tone of the ſolids. Junker's Conſp. Med. p. 384.

It is obſerved in the Periodical Eſſays of Edinburgh, that in the ſlow *fevers* which prevailed in and near that place, November 1731, attended with a violent pain in the head, a ſmall quick pulſe, deliriums, and watchfulneſs; ſeveral of the elder ſort died, but of the younger, many voided worms and recovered. See Med. Eſſ. Abridg. vol. i. p. 66.

FEVER, *ſtationary*. See STATIONARY.

FEVER, *tooth*. See DENTITION.

FEVER, *yellow*. See *Burning bilious* FEVER.

FEVER, in the *Manege*, is a diſorder to which horſes are very ſubject from a variety of cauſes. The ſymptoms which denote the horſe to be afflicted with a *fever* are great reſtleſſneſs, by reaſon of which he ranges from one end of the rack to another, beating of the flanks, redneſs and inflammation of the eyes, a parched and dry tongue; his breath is hot, and of a ſtrong ſmell; he loſes his appetite, and nibbles his hay without chewing it, and is frequently ſmelling to the ground; he dungs often, but little at a time; and his dung is uſually hard, and in ſmall pieces; he ſometimes ſtales with difficulty, and his urine is highly coloured; he is always craving for water, and drinks often, but little at a time; and his pulſe beats full and hard, fifty ſtrokes and more in a minute. The firſt part of the cure is bleeding; and the quantity, if the horſe is ſtrong and in good condition, ſhould be two or three quarts: then give him four times a day a pint of the following infuſion; take baum, ſage, and chamomile flowers, each a handful; an ounce of liquorice root, ſliced, and three ounces of nitre; and pour on theſe ingredients two quarts of boiling water; when cold, ſtrain it off, and ſqueeze into it the juice of two or three lemons, and ſweeten it with honey; or an ounce of nitre mixed into a ball with honey may be given thrice a day inſtead of the drink, and waſhed down with any ſmall liquor. The horſe's diet ſhould be ſcalded bran in ſmall quantities, or dry bran ſprinkled with water, or a handful of picked hay may be put into his rack. His water ſhould be a little warmed, and given to him often and in ſmall quantities; his covering ſhould be moderate. If the horſe refuſes to feed, in a day or two more blood ſhould be taken away, and the drinks continued, to which may be added two or three drams of ſaffron. If his dung continues hard and knotty, a clyſter may be given, prepared by boiling two handfuls of marſhmallows, one of chamomile flowers, and an ounce of fennel ſeed, in three quarts of water, till it be reduced to two, and adding to the ſtrained liquor four ounces of treacle and a pint of linſeed oil or any common oil. This clyſter ſhould be repeated every other day; and on the intermediate day the following drink may be given: take of cream of tartar and of Glauber's ſalts, of each four ounces; diſſolve them in barley-water, and add an ounce or two of lenitive electary, or a dram or two of powder of jalap. By purſuing this treatment the horſe will begin to recover; and nothing more will be found neceſſary than to give him gentle exerciſe in the air, and plenty of clean litter in the ſtable.

There is another *fever* to which horſes are ſubject, more dangerous than the former: this is a ſlow *fever*, attended with great depreſſion; the horſe is ſometimes inwardly hot and outwardly cold, and at other times hot all over; his eyes appear moiſt and languid; his mouth is continually moiſt, ſo that he has no inclination to drink, and he is ſatisfied with very little. He eats little, moves his jaws in a feeble looſe manner, and grates his teeth; his body is commonly open, his dung ſoft and moiſt; his ſtaling irregular, ſometimes little, and at other times profuſe, and his urine pale, with little or no ſediment. Theſe *fevers* are attended with a running at the noſe, and the matter diſcharged is of a reddiſh or greeniſh duſky colour, and of a conſiſtence like glue. About three pints of blood ſhould be firſt taken away, and bleeding repeated according to the ſtrength and fullneſs of the horſe, the degree of his cough, or any tendency to inflammation. After this the nitre drink already preſcribed may be given, with the addition of an ounce of ſnake-root, and three drams of ſaffron and camphor diſſolved in a little ſpirit of wine.

The horſe's diet ſhould be ſcalded or ſprinkled bran, and the beſt hay, with which he ſhould be fed by hand, as he ſometimes cannot lift up his head to the rack. Drinking plentifully will greatly contribute to dilute the blood; but if the *fever* ſhould increaſe, balls of contrayerva root, myrrh, and ſnake-root, powdered, of each two drams; ſaffron, one dram; mithridate or Venice treacle, half an ounce, mixed with honey, ſhould be immediately given twice or thrice a day, with two or three horns of infuſion of ſnake-root ſweetened with honey; to a pint and a half of which may be added half a pint of treacle water or vinegar: if theſe balls produce no ſenſible effect, let a dram of camphor or of caſtor be added to each of them: or the following drink may be ſubſtituted in their ſtead for ſome days; take a dram of camphor diſſolved in one ounce of rectified ſpirit of wine; then gradually pour on a pint of diſtilled vinegar warmed, and give it at two doſes. If the horſe ſhould be coſtive, recourſe muſt be had to clyſters or the opening drink; and if he purges to a conſiderable degree, diaſcordium may be added to his drinks inſtead of the mithridate. The operation of medicines in this diſeaſe is much promoted by plentiful drinking: the horſe's ſtaling ſhould be reſtrained when it is conſiderable and weakening, by proper aſtringents, or by mixing lime-water with his drinks; and when he is remiſs in this reſpect, and ſtales ſo little as to occaſion a ſwelling of his body and legs, two or three of the following balls may be given at proper intervals, with a decoction of marſhmallows ſweetened with honey: take of ſal prunella or nitre, one ounce; juniper-berries and Venice turpentine, of each half an ounce; and make theſe ingredients into a ball with oil of amber. If with this treatment the horſe's ſkin feels kindly, his ears and feet are moderately warm, his eyes briſk and lively, his noſe becomes clean and dry, his appetite increaſes, he lies down well, and ſtales and dungs regularly, there is a fair proſpect of a ſpeedy recovery; but he ſhould be fed ſparingly, and his diet ſhould be light, and increaſed by degrees as he gains ſtrength.

If the *fever* ſhould intermit, give an ounce of Jeſuit's bark in the interval of the fits, and repeat it every ſix hours till the horſe has taken four or ſix ounces. Bartlet's Farriery, and Farmer's Dictionary.

FEVER-

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FEVER-*root*, *trioſteum*, in *Botany*. See *Falſe* IPECACUANHA.

FEVER-*weed*. See ERYNGO.

FEVERFEW, *Matricaria*, in *Botany*, a genus of the *ſyngeneſia polygamia ſuperflua* claſs. Its characters are theſe: It hath a compound flower; the ray or border is compoſed of female half-florets; and the diſk, which is hemiſpherical, of hermaphrodite florets. The female half-florets are tongue-ſhaped, are indented in three parts at the end, and have a naked germen. The hermaphrodite florets are tubulous, funnel-ſhaped, and cut into five parts at the brim; they have each five hairy ſhort ſtamina, and an oblong naked germen. The germen of both turns to ſingle oblong ſeeds. There are two ſpecies, comprehending ſeveral varieties.

Feverfew grows naturally on banks in ſeveral parts of England, but is frequently cultivated in phyſic gardens to ſupply the markets.

The leaves and flowers of this plant have always been allowed one of the firſt places among the hyſteric and uterine plants, and hence it derives its name from *matrix*, *the womb*. It is preſcribed in powder from a ſcruple to half a dram for the doſe; but the much better way is in a ſlight infuſion made in the manner of tea. Taken in this eaſy manner for a continuance of time, it will bring the menſes, though ſubject to be interrupted and irregular, to their true period; and will remove a number of complaints, the natural conſequence of ſuch an irregularity.

It is alſo an agreeable warm, aperient, carminative bitter. It ſtrengthens the ſtomach, and diſperſes ſtatulences; and the expreſſed juice is ſaid to kill worms. Some likewiſe commend it in diſorders of the head, and in all nephritic complaints. Hoffman gives it great praiſes, uſed as a febrifuge. There were formerly kept ſimple water and ſyrup of *feverfew* in the ſhops; but at preſent they are wholly diſuſed, and the dried herb only kept ready for fomentations, and ſometimes as an ingredient in clyſters. The virtues of *feverfew* are in ſome degree ſimilar to thoſe of chamomile.

Many ſpecies of this plant are cultivated in gardens for the beauty of their flowers. They are propagated by ſowing them in March on a bed of light earth; when they are come up, they ſhould be tranſplanted out into nurſery-beds at about eight inches aſunder; and in the middle of May they ſhould be removed into the flower-beds where they are to ſtand. They flower in July and Auguſt; but they ſhould not be permitted to ſeed, which always weakens, and often deſtroys the roots; ſo that the ſtalks ſhould be cut down to the ground when the flower decays.

FEVERFEW, *baſtard*, *parthenium*, in *Botany*, a genus of the *monoecia pentandria* claſs. Its characters are theſe: it hath a flower compoſed of hermaphrodite florets and female half-florets, which are incloſed in a common five-leaved ſpreading empalement. The hermaphrodite flowers which form the diſk have one tubulous petal cut into five parts at the brim; they have five hair-like ſtamina the length of the tube. The germen is ſituated below the flower, and is ſcarce viſible; ſupporting a ſlender ſtyle having no ſtigma: theſe flowers are barren. The female flowers which compoſe the rays or borders are ſtretched out on one ſide like a tongue; theſe have a large heart-ſhaped compreſſed germen, with a ſlender ſtyle, crowned by two long ſpreading ſtigmas. Theſe flowers are ſucceeded by one heart-ſhaped compreſſed ſeed. There are two ſpecies. Miller.

The firſt ſort grows wild in great plenty in the iſland of Jamaica, and in ſome other of the Engliſh ſettlements in the Weſt Indies, where it is called *wild wormwood*, and is uſed by the inhabitants as a vulnerary herb. The ſecond ſort grows plentifully in ſeveral parts of the Spaniſh Weſt Indies, from whence the ſeeds have been brought to Europe. Theſe plants make no great appearance, ſo are ſeldom cultivated but for the ſake of variety.

FEUILLANS, an order of religious clothed in white, and going bare-foot, who live under the ſtrict obſervance of the rule of St. Bernard.

The name was occaſioned by a reform of the order of Bernardins, firſt made in the abby of *Feuillans*, a village in France, five leagues diſtant from Thouloufe, by the ſieur Barriere, who eſtabliſhed it about the year 1580.

It was approved of by pope Sixtus V. and the popes Clement VIII. and Paul V. granted it its particular ſuperiors. King Henry II. founded a convent of *Feuillans* in the Fauxbourgh St. Honore at Paris in 1587.

There are alſo convents of nuns who follow the ſame reform, called Feuillantes; the firſt of which was eſtabliſhed near Thouloufe in 1590.

FEUILLE *de Scie*, in *Heraldry*, expreſſes that an ordinary, as a feſſe, pale, or the like, is indented only on one ſide; becauſe it then looks like the leaf of a ſaw, as the French phraſe imports.

FEWEL. See FUEL.

FEVILLEA, in *Botany*, the name of a genus of plants of the *dioecia pentandria* claſs, called by Plumier *nhandiroba*; the characters of which are theſe: it produces male and female flowers diſtinct on the ſame plant; in the male flower the perianthium is campanulated; it is compoſed of one leaf, and is round at the bottom, but expanded at the mouth, where it is divided into five ſegments. The flower conſiſts of one leaf, and is of the rotated kind. It is lightly divided into five ſegments at the edge; theſe are convex and rounded, and the umbilicus is covered with a double ſtar. The ſtamina are five filaments. In the female flowers the cup is the ſame as in the male; the flower itſelf is alſo the ſame, but that the ſtar which cloſes the baſe is compoſed of five cordated leaves. The fruit is a very large fleſhy berry with a hard bark, and is of an oval obtuſe figure, and ſurrounded with the calyx. The ſeeds are flatted, and of an orbicular form.

FEWMET. See FUMET.

FIANTS, or FUANTS, the dung of a badger, fox, and other vermin.

FIARSING, in *Ichthyology*, a name given by the Swedes and Danes to the fiſh generally called the *draco marinus* and *araneus marinus*, the ſea-dragon, and the ſea-ſpider. It is a ſpecies of the trachinus, according to Artedi, and is diſtinguiſhed from the others by its lower jaw being longer than the upper, and without beards.

FIAT, in *Law*, is uſed for a ſhort order or warrant of ſome judge for making out and allowing certain proceſſes. Thus, if a certiorari be taken out in vacation, and teſted of the precedent term, the *fiat* for it muſt be ſigned by a judge of the court, ſome time before the eſſoin day of the ſubſequent term, otherwiſe it will be irregular. There is no need for the judge to ſign the certiorari itſelf, but only where it is required by ſtatute.

FIAT *juſtitia*, is an order granted on a petition to the king for his warrant to bring a writ of error in parliament, in which caſe he writes on the top of the petition *fiat juſtitia*, and then the writ of error is made out, &c.

FIATOLA, in *Zoology*, a name given by the Italian fiſhermen to the STROMATEUS.

FIBER, in *Zoology*, or *fiber caſtor* of Linnæus, *beaver*, has ſtrong cutting teeth, ſhort ears hid in the fur, blunt noſe, hair of a deep cheſnut brown, tail broad, almoſt oval, compreſſed horizontally, and covered with ſcales; the fore-feet are ſmall, and the hind feet large: the length of the animal from noſe to tail is about three feet; the tail is eleven inches long and three broad. See BEAVER, and *Tab.* II. *Quad. fig.* 13.

FIBRA *auris*. See EAR.

FIBRARIÆ, in *Natural Hiſtory*, the name of a claſs of foſſile bodies, the greateſt part of which have been very improperly called by the writers of foſſils, fibroſe talcs, they being of a very different ſubſtance and ſtructure of parts from the talcs, and having none of their diſtinguiſhing characters.

The word is derived from the Latin, *fibra*, *a fibre* or *filament*, theſe bodies being all compoſed of arrangements of parallel filaments or fibres. See *Tab. of Foſſils*, *Claſs* 1. The *fibrariæ* in general are foſſils compoſed of parallel filaments, uſually remaining ſo diſtinct as to preſerve in the whole maſſes a thread-like texture, but ſometimes uniting ſo as to form plates or flakes reſembling thoſe of the talcs in external figure. They are bright, and in ſome degree tranſparent, not giving fire with ſteel, nor fermenting with, or ſoluble in acid menſtrua. Hill's Hiſt. of Foſſ. p. 88.

Of this claſs of bodies there are two diſtinct orders, and under theſe four genera. To this claſs belong the amianthus, aſbeſtos, lachnides, and tricheriæ.

FIBRÆ, in *Anatomy*, a ſimple part of the animal body, called alſo *filament*; and when very ſmall, *fibrilla* or *capillament*.

A *fibre* is a long, ſlender, white thread; which, being variouſly interwove or wound up, forms the various ſolid parts of an animal body; ſo that the *fibres* are the ſtamen or matter of the animal.

Anatomiſts uſually diſtinguiſh four kinds of *fibres*, viz. *carnous* or *fleſhy*, *nervous*, *tendinous*, and *oſſeous* or *bony*; of one or other of which all the other parts conſiſt. See FLESH, NERVE, TENDON, BONE, MUSCLE, and SENSATION.

Fibres, again, are divided with reſpect to their ſituation into *direct* or *longitudinal*, which proceed in right lines; *tranſverſe*, which cut or go acroſs the former at right angles; and *oblique*, which interſect or croſs them at unequal angles.

Some anatomiſts reduce the animal *fibres* to two ſpecies, viz. *muſcular* or *motive*, and *nervous* or *ſenſitive*.

FIBRES, *nervous*, are the minute threads whereof the nerves are compoſed. They ariſe from the medulla of the brain, as that does from the cortex; and that again from the

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the laſt fineſt ramifications of the carotid and vertebral arteries; ſo that, it is probable, theſe nerves are, in reality, only continuations of thoſe arteries.

From every point of the cortex there ariſes a fine medullary *fibrilla:* theſe, uniting in their progreſs, form the medulla of the cerebrum, cerebellum, and oblongata; and *fibrillæ*, ariſing from each point of theſe again, form the ſpinal marrow.

From the medullary ſubſtance of all theſe parts ariſe nerves, which are combinations, or aſſemblages, of a number of theſe minute medullary *fibres* incloſed, after they are got out of the cranium, in a common membrane, or coat, from the pia mater; and it is probable, that, to each nerve, there concur *fibres* from all three; as, alſo, that theſe *fibres* are ſo many fine hollow tubuli, or canals, for the conveyance of a fine juice, or ſpirit, from the brain, throughout the body. See NERVE.

FIBRES, *muſcular*, are thoſe whereof the muſcles, or fleſhy parts of the body, are compoſed. Every muſcle is diviſible into other leſs ones; and theſe into others, ſtill leſs beyond all imagination. The laſt and ſmalleſt are the muſcular *fibres*; concerning which it is queſtioned, whether or no they be vaſcular.

Mr. Lewenhoek ſays, that he could plainly diſtinguiſh the fibrils, of which each muſcular *fibre* is compoſed, to be vaſcular; for, if he cut acroſs their length, the light appeared through the mouths of the veſſels; but if he cut them obliquely, no light was to be ſeen; and he alſo found that each fibril is inveſted with a minute membrane, which is only a congeries of blood-veſſels, conveying juices and nutrition to it, though their fineneſs renders them inviſible; and that the *fibres* are through their whole length encompaſſed with circular wrinkles. Phil. Tranſ. N° 367. Lewen. Op. tom. i. p. 49. tom. ii. p. 61, &c. ed. 1772.

That the muſcular *fibres* are vaſcular has alſo been ſuppoſed by Malpighius, Borelli, Gorter, and Hooke, to whom they appeared like ſtrings of pearls; and alſo by Dr. A. Stuart, in his treatiſe De Motu Muſculorum, where from ſuch a ſtructure, and by the influx of the nervous fluid, he endeavours to account for the elaſtic force, the contraction, diſtenſion, and all the actions of the MUSCLES.

Now there are nerves propagated to every muſcle, and diſtributed through the body thereof; ſo that there is no aſſignable point wherein there is not ſomewhat of a nerve. Add, that all the nerves here diſappear; and that in other parts of the body, the extremities of the nerves are expanded into membranes. It is therefore probable, that the muſcular *fibres* are only continuations of the nervous ones.

The animal *fibres* have different properties; ſome are ſoft, flexible, and a little elaſtic; and theſe are either hollow, like ſmall pipes; or ſpongious, and full of little cells, as the nervous and fleſhy *fibres* above mentioned.

Others are more ſolid, flexible, and endowed with a ſtrong elaſticity, or ſpring; as the membranous and cartilaginous *fibres*.

A third ſort are hard and inflexible; as the *fibres* of the bones.

Of all theſe, ſome again are very ſenſible, and others wholly deſtitute of ſenſe; ſome ſo very ſmall, as not to be eaſily perceived; and others, on the contrary, ſo big, as to be plainly ſeen; and moſt of them, when examined with a microſcope, appear to be compoſed of ſtill ſmaller *fibrillæ*.

Theſe *fibres* firſt conſtitute the ſubſtance of the bones, cartilages, ligaments, membranes, nerves, veins, arteries, and muſcles. And again, by the various texture, and different combination, of ſome or all of theſe parts, the more compound organs are framed; ſuch as the lungs, ſtomach, liver, legs, and arms, the ſum of all which make up the body.

The great property of *fibres*, is elaſticity, or a power of contraction, after the diſtractile force is removed; upon the knowlege of which that of the animal mechaniſm greatly depends.

To underſtand this, it may be obſerved, that any membrane or veſſel may be divided into very ſmall *fibres*, or threads; and that theſe threads may be drawn out into a very conſiderable length, without breaking; and that when ſuch external force is removed, they will again reſtore themſelves to their proper dimenſions. It is farther alſo manifeſt, that this property is preſerved to them by a convenient moiſture; becauſe if one of thoſe threads be dried, it immediately loſes it; ſo that upon the application of any force to ſtretch it, it will break; its lying ſoaked in liquor too much will, on the other hand, render it flaccid, and deſtroy all its power of reſtitution, when diſtended.

Now, ſome hints of that configuration of parts, upon which this property depends, Dr. Quincy maintains, may be had from the contrivance and properties of a ſyringe; with the reaſon why it is ſo difficult to draw back the embolus, when the pipe is ſtopped; and the neceſſity of any liquor's following it, wherein the pipe is immerſed.

All that is neceſſary hereto, is, that the embolus be ſo exactly adapted to the inner ſurface of the barrel, as to prevent any air paſſing between them, when it is drawn up: it matters not what figure the barrel is of, ſo that the embolus be well fitted to it. A caſe of ſyringes therefore might be contrived, wherein every barrel may alſo ſerve as an embolus to the exterior one, which immediately includes it.

In this manner it is not difficult to imagine a continued ſeries of particles ſo put together, that they may be moved, and drawn upon one another, without ſuffering the air immediately to enter into the interſtices made by their diſtraction; whereupon as ſoon as that force, which drew them, is removed, they will, for the very ſame reaſon as the embolus of a ſyringe, ruſh up again into their former contacts.

As ſuppoſe AB *(Tab. Nat. Hiſt. fig. 6.)* two particles touching one another in *ef*, and CD two others, covering the oppoſite ſides of their contacts. It is alſo to be ſuppoſed, that on the other ſides they are covered with other particles in the ſame manner, as by CD, ſo that the places of their contacts are on all ſides covered from the air, or the inſinuation of any fluid body.

If now AB by an external force, greater than that of their coheſion, be drawn from each other, as far as GI and HK *(fig. 7.)*; as ſoon as that force is removed, they will again run into their former contacts in *ef (fig. 6.)*; that is, if they be not ſo far ſeparated as to bring their tranſverſe ſurfaces to coincide with C and D; for then the air, or circumambient fluid, will interpoſe, and prevent their re-union; ſo that by this contrivance, ſo much of A and B as is incloſed by other ſurrounding particles, is as the embolus of a ſyringe, and the particles ſurrounding them as its barrel. And therefore when A and B are diſtracted from their contacts in *ef*, it will be with ſome difficulty; and when the diſtracting force is taken away, they will again run into their former contacts; juſt as the embolus of a ſyringe, and for the ſame reaſon.

It is not rigidly contended, that this muſt exactly be the contexture of a *fibre*, but only ſomething like this; whereby the interſtices of the interior orders are covered by the exterior in ſuch a manner, that when the thread is diſtended, that is, when its conſtituent parts are drawn from their tranſverſe contacts, neither the air, nor any other external fluid, can get between them, ſo as to hinder their re-union as ſoon as ſuch force is withdrawn; that is, if their diſtraction, as was before ſaid, be not ſo far as to bring their tranſverſe ſurfaces to a coincidence with one another; for then the circumambient fluid will interpoſe, that is, the thread will be broke.

But beſides this peculiar arrangement of a determinate ſet of particles to compoſe the main ſubſtance of an animal *fibre*, endowed with the properties above mentioned; it ſeems not at all unreaſonable to conjecture, that into their compoſition there alſo enters a common capſula, or covering, which aſſiſts in the wrapping up, and holding together, thoſe faſciculi, or aſſemblages of particles already deſcribed, not much unlike the perioſteum of the bones; the contexture of which covering, reſembling that of a net, cannot any ways hinder either the tranſverſe, or longitudinal diſtractions of the other parts.

Suppoſing this, then, the contexture of a *fibre*, it will be neceſſary to conſider, what farther requiſites are needful to put them into that ſtate, which they are in, in a living body; to ſhew how they are maintained in continual motion, and what are the conſequences of it.

And, 1. It is neceſſary to take notice, that all the *fibres* in a living body are in a ſtate of diſtention; that is, they are drawn out into a greater length than they would be in, if ſeparated from the part, and taken out of the body; which is demonſtrable upon any ſolutio continui, as in the tranſverſe diviſion of a nerve, or artery; for immediately the divided parts run up, and leave a great diſtance between them; and the fluids contained between them, upon ſuch contraction, are ſqueezed out. This alſo ſhews, that their natural diſtractions are owing to ſome fluids being propelled into the veſſels which they compoſe, with a force greater than their endeavours of reſtitution, ſo far as to obtain a cloſe contact of all their tranſverſe ſurfaces, but yet leſs than that which is neceſſary to diſtract them, ſo as to bring them into a coincidence; for then the veſſels would break.

2. This ſtate of diſtraction muſt neceſſarily leave vacuola between all the tranſverſe ſurfaces; as between GI and HK (in *fig. 7.*) which may be repreſented by the ſe-

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veral ſeries of particles (*fig.* 8.); which vacuola will continue as long as the longitudinal ſurfaces of the component parts continue ſo cloſe to one another, as to prevent the inſinuation of any foreign matter, how ſubtle ſoever, between them.

For the ſame reaſon, therefore, as when the embolus of a ſyringe is drawn, and the pipe is ſtopped, there muſt be continually a *niſus reſtituendi*, or an endeavour of contraction. There is alſo this farther neceſſity of their being continued in a ſtate of diſtraction; becauſe if they were cloſely to touch one another in all parts, they could not be put into, and continue in, thoſe undulatory motions, which they are always in, in a living body, without being altered in their figures and contextures.

3. It being manifeſt, that all animal *fibres* are continued by the perpetual ſucceſſive impulſe of the fluids, in ſuch undulatory motions; beſides this neceſſity of their diſtraction, they muſt alſo neceſſarily be continually moiſtened with ſome convenient fluid; becauſe otherwiſe their continual attritions againſt one another would wear them out, as well as render it difficult to move them; the fluid alſo, for this purpoſe, muſt be very ſoft and ſubtle, becauſe otherwiſe it could not inſinuate itſelf into all the interſtices of the *fibres*, without ſo far ſeparating their parts, as is inconſiſtent with that contexture and mechaniſm here laid down.

Upon this view there ariſes a very natural explication of ſeveral terms, much uſed by mechanical writers; ſuch as *diſtraction*, *contraction*, *vibration*, *undulation*, *tonic motion*, *concuſſion*, *relaxation*, *corrugation*, and *elaſticity* of the ſolids; all which are but different ways of expreſſing the various modifications and diſpoſitions of thoſe machinulæ, whereof all the *fibres* are compoſed.

Thus much being granted of the contexture of a *fibre*, and the requiſites for its office, it is to be conſidered, how it comes firſt to be ſet in motion, and by what mechaniſm that motion is afterwards carried on. Suppoſe then the *fibre* (*fig.* 8.) in ſuch a ſtate of diſtraction, as before mentioned; it is certain by *req.* 2. that in all parts there is a *niſus reſtituendi*; where, then, any external impulſe is made againſt it from R to S, ſucceſſively, thruſting it from P towards Q, it is certain that againſt 1, for inſtance, the thread will be more diſtracted than in any other part; and thus there will be a greater endeavour of reſtitution; and therefore the impulſe paſſing on towards S, all the conſtituent machinulæ, 1, 2, 3, 4, will ſucceſſively move one after another.

To make this matter ſtill more plain, let a portion of an artery be repreſented by *fig.* 9. through which the blood is continually propelled in a direction parallel to its axis; nothing is more certain than that if it were not for the reſiſtance of the ſides of the artery at E, F, the blood ſetting out at A, B, would go on by the pricked lines C, D; and therefore it cannot but ſtrike againſt the ſides of the artery at E, F, and diſtract them there more than any where elſe; whereby their endeavours of reſtitution will be there the greateſt; and therefore, when the impulſe of the blood has raiſed them to a certain meaſure, wherein their endeavours of reſtitution will exceed the impulſe which raiſed or diſtracted them, their contractile powers will draw them again into the ſame dimenſions; and conſequently the blood will be thruſt forward into the next ſection of the artery, and ſo on ſucceſſively from one to another, through the whole courſe of its circulation; the contraction of one ſection of an artery being the true cauſe of the blood's impulſe againſt, and raiſing the next. See MUSCLE and *Muſcular* MOTION.

FIBRE is alſo applied, in *Phyſics*, to thoſe long, fine parts, or threads, whereof other natural bodies are compoſed, and which prevent their being friable or brittle.

Trees, plants, and fruits, have their *fibres*, or capillaments; which are modifications of their woody ſubſtance, penetrating and terminating in the parenchyma, or pith.

In the common ſenſe, *fibre* is chiefly applied to the ſlender capillary roots of plants.

Kepler even gives *fibres* to the ſtars; and explains ſeveral of their motions from the ſituation of their *fibres*.

FIBRILLA, a little FIBRE, or capillament.

FIBROSE *roots*, thoſe which conſiſt wholly of ſmall fibres, ſuch as the roots of the meadow-graſs, pinks, and ſeveral other flowers. When a *fibroſe* root penetrates ſtraight into the ground, it is called *perpendicular*; when it creeps under the ſurface, *horizontal*; when ſomewhat thick, it is called *fleſhy*; when very thin, *capillary*; when it runs all the way undivided, *ſimple*; when divided, or when it ſends off ſmaller roots, *branched*; when its ſurface is covered with extremely ſhort and fine fibres, *hairy*. See ROOT.

FIBULA, in *Anatomy*, one of the bones of the leg, called alſo *perone*, *ſura*, and *focile minus*. See *Tab. Anat. (Oſteol.) fig.* 3. *n.* 24. 24. *fig.* 7. *n.* 27. 27.

The *fibula* is the outer and ſlenderer of the two bones of the leg; and yet, notwithſtanding its being more expoſed, and its being much weaker, than the inner bone, or tibia, it is not ſo often broken, as being more pliant and flexible; whence the tibia often breaks, leaving the *fibula* entire.

The *fibula* is joined or articulated with the tibia, at both ends. It is divided into three parts. The upper extremity of this bone is a kind of tuberoſity or head, obliquely flatted by a ſmall cartilaginous plane, by which it is articulated with the cartilaginous ſurface, at the lower part of the external condyle of the tibia. It terminates backward by a kind of ſhort blunt point directly upward. The lower extremity is broader, flatter, and more oblong than the upper; it is partly a continuation of the body of the bones, and partly an epiphyſis in children; the marks of which are quite loſt in a more advanced age. It has in a manner three ſides, one rounded like a tuberoſity, one flat, and the third narrow; when it is placed in the lateral cavity of the baſis of the tibia, it makes the outer ankle oppoſite to the inner ankle.

In its natural ſituation, it reaches much lower down than the baſis of the tibia, and ends in a point turned a little backward. The flat ſide is cartilaginous, and turned toward the cartilaginous ſide of the inner ankle, with which, and with the inferior ſide of the baſis of the tibia, it completely forms the cavity by which the leg is articulated with the foot. The narrow ſide is turned backward, and near its lower part is a ſmall, oblong, unequal foſſula, formerly believed to be for the paſſage of a tendon, in which a ſmall mucilaginous gland is lodged. The point by which the baſis of the *fibula* ends, has a ſmall ſmooth ſurface immediately below the narrow ſide, for the inſertion of an annular ligament.

The body of this bone is long and ſmall, more or leſs contorted, and irregularly triangular. Near the two extremities it contracts into a kind of neck, and a little below the middle it is often bent inward; but this curvature ſeems chiefly owing to the method of dreſſing children, for we ſometimes meet with the bone very ſtraight. It is diſtinguiſhed in an irregular manner into three ſides, and three angles, principally towards its lower part. The outſide is the moſt conſiderable; the upper part of it is more or leſs hollowed; afterwards it grows round, and altering its direction, becomes almoſt poſterior in the lower half. The poſterior ſide is more or leſs convex toward the upper part, thence it grows flat, and turning in the ſame manner as the former, it becomes nearly internal toward the lower part. The inner ſide has likewiſe a turn near its middle, and becomes anterior from thence downward; and this turn is marked by an oblique line, which runs down on this ſide, from behind, forwards, and divides it into two. Theſe ſides ſerve partly for muſcles to lie upon, and partly for their inſertions. The internal angle of the *fibula* anſwers to the external poſterior angle of the tibia, and both ſerve for the inſertion of the interoſſeous ligament of the leg; the other two angles are more or leſs acute, eſpecially the anterior, which is ſometimes like a kind of criſta, and terminates below in a ſmall triangular ſurface.

The internal ſtructure of the *fibula*, though a very ſmall bone, is like that of the other long bones; it is articulated by its upper extremity, with the inferior ſurface of the external condyle of the tibia; this articulation is an arthrodia, with a very ſmall degree of motion. The inferior extremity is articulated by its cartilaginous ſide, partly with the lateral depreſſion in the baſis of the tibia, and partly with the firſt bone of the foot, completing the ginglymus between the leg and that bone. Winſlow's Anatomy, p. 95.

FIBULA, *cartilages of the*. The *fibula* has two cartilages, one lying on the upper extremity of that bone, for its articulation with the ſmall cartilaginous ſurface in the head of the tibia; the other cartilage covers the inſide of the inferior extremity, or the outer ankle, near the point of which, poſteriorly, there is a ſuperficial cartilaginous incruſtation for the paſſage of the tendons of the muſculi peronæi. The cartilage at the upper extremity ſeems thicker than that at the lower. Winſlow's Anatomy, p. 128.

FIBULA, *ligaments of the*. This bone is joined to the tibia by nine ligaments, four at each end, and one in the middle, called the interoſſeous ligament. The four at the upper extremity are ſhort, very ſtrong, more or leſs oblique and compound; two of them are anterior and two poſterior, and they lie on each other; the ſuperior ligaments ſurrounding the articulation more cloſely than the inferior, which have a ſmall void ſpace, and are weaker than the former; they are all faſtened to the capſular ligament, which runs in between them and the articulation, and they are inſerted round the edges of the cartilaginous ſurfaces in each bone.

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The ligaments of the lower extremity of the *fibula*, which runs below the tibia, and forms the outer ankle, are much ſtronger, thicker, more complex, broader, longer, and more oblique, than thoſe of the ſuperior extremity; and are like thoſe diſperſed, two before, and two behind. They are fixed to the anterior and poſterior edge of the lateral depreſſion at the inferior extremity of the tibia, and from thence they run down on the lower end of the *fibula*. The two inferior ligaments are longeſt, and they are fixed anteriorly and poſteriorly at the lower end of the outer ankle; the two ſuperior are fixed more cloſely, and nearer each other, but there is ſtill a ſmall ſpace between them, which is filled with fat. As the two bones touch each other only by the upper part of the cartilaginous ſurface of the outer ankle, and the ſmall cartilaginous border in the lower edge of the depreſſion of the tibia, the middle ſpace between them is filled by a capſular ligament, which lines each ſide of the bones, and is continued down to the true articulation of the external ankle, with the inferior edge of the baſis of the tibia.

The middle or interoſſeous ligament of the two bones of the leg, ſo called, becauſe it fills up all the ſpace left between them, being ſtretched from one to the other, is fixed along the poſterior external angle of the tibia, and the neighbouring angle of the *fibula*. It is made up chiefly of two planes of very oblique ligamentary fibres, which croſs each other, and at different intervals ſeem to be multiplied. It is perforated both above and below, and ſometimes in ſeveral places beſide, for the paſſage of the blood-veſſels and nerves. It is not a ligament intended for the tying theſe two bones together, but is rather a ligamentary ſeptum for the inſertion of muſcles, ſupplying in this reſpect the place of a bone, and ſeeming indeed to be partly a continuation of the periоſteum of the tibia and *fibula*. At the lower part of each ankle, there are commonly three ſtrong ligaments for the connection of the bones of the tarſus with thoſe of the leg; one of theſe runs downward, one backward, and one forward. Winſlow's Anat. p. 130.

FIBULA, *luxation of the.* Sometimes the *fibula* is ſeparated by external violence from the thigh bone, and is then diſtorted either upwards or downwards: this generally happens, when the foot has been luxated outwards. Whenever this happens the bone is to be firſt reſtored to its natural place, and then properly bound up, and left to the aſſiſtance of nature and reſt, till it be grown firm again to the tibia and leg. The patient in this and the like caſes muſt be always ſtrictly cautioned not to uſe or bear any ſtreſs upon the diſordered leg too ſoon; the conſequence of which may be worſe than the firſt misfortune. Heiſter's Surg. p. 172.

FIBULA, in *Natural Hiſtory*, a name given to a claſs of the *echinodermata*, which have their mouth in the middle of the baſe, and the aperture of the anus on one edge. Theſe are found principally among the foſſile kinds, and ſeem to have had their ſhells of the aſſulated kind, or compoſed of ſmall plates joined tranſverſely to one another. Of this claſs there are two genera, the CONULUS and DISCOIDES.

FIBULA, in *Surgery*, an inſtrument in uſe among the ancients, for the cloſing of gaping wounds.

Celſus ſpeaks of the *fibula*, as to be uſed when the wound was ſo patent as not eaſily to admit of being ſewed. Op. lib. vii. cap. 25. apud fin.

Authors are ſomewhat at a loſs as to the form of the ancient *fibulæ*. Guido ſays, they were iron circles, or ſemicircles, bent backwards both ways; the hooks whereof, being faſtened on both ſides to the wound, anſwered exactly to each other; but as this muſt have been an inſupportable pain to the patient, this deſcription is generally ſet aſide.

Fallopius, Sanctorius, and others, take the word *fibula* to have ſignified, in reality, no more than the ſewing up of the wound with a needle and thread, as uſed at this day.

FIBULÆUS, in *Anatomy*, a muſcle of the leg, called alſo PERONÆUS *primus*.

FICARIA, in *Botany*, a name uſed by ſome authors for the ſmall celandine, pilewort, or figwort.

FICEDULA *cannabina*, in *Zoology*, a name by which ſome authors have called the CANNEVAROLA, or leſſer *reed-*SPARROW.

FICHANT, *Figens*, a French term, uſed in *Fortification*: thus, a flank *fichant*, or a line of defence *fichant*, is a place, whence the ſhots made do not only raſe the oppoſite face to be defended, but alſo enter within it.

The word is formed of *ficher, to ſtick a thing in.*

FICHE', in *Heraldry*. See FITCHEE.

FICOIDES, a name uſed by different authors in botany for different plants; many underſtanding by it the *opuntia* or Indian fig, as it is vulgarly called. See *Prickly* PEAR. And ſome, as Herman and others, making it the name of the muſa or PLANTAIN-*tree*.

FICTION. See FABLE.

FICTION *of a perſon*, in *Rhetoric*. See PROSOPOPEIA.

FICTION *of law, Fictio Juris*. *Fictions* are allowed of in law, in ſeveral caſes, but muſt be framed according to the rules of law, not what is imaginable in the conceptions of man; and there ought to be equity and poſſibility in every legal *fiction*. There are many of theſe *fictions* in the civil law; and by ſome civilians it is ſaid to be an aſſumption of law upon an untruth for a truth, in ſomething poſſible to be done, but not done. Godolphin and Bartol. The ſeiſin of the conuſee in a fine, is but a *fiction* in our law; it being an invented form of conveyance only. 1 Lill. abr. 610. And a common recovery is *fictio juris*, a formal act or device by conſent, where a man is deſirous to cut off an eſtate tail, remainders, &c. 10 Rep. 42. The proceedings in ejectments are alſo grounded on a *fiction of law*.

FICUS, in *Botany*. See FIG-*tree*.

FICUS, in *Conchyliology*, a name given by authors to a peculiar ſpecies of ſea-ſhell. It is of the genus of the *dolium*, and has a remarkably depreſſed clavicle.

FICUS, in *Surgery*, a kind of fleſhy excreſcence, growing ſometimes on the eye, or eye-brows, or chin; but more uſually on the anus, or at the fingers ends.

It is alſo called *ſycoſis*, *ſycoma*, *ficatio*, *ficoſus tumor*, and *mariſca*.

FIDD, an iron pin uſed at ſea to ſplice or faſten ropes together; it is made tapering and ſharp at one end.

There are alſo *fidds* of wood, which are much larger than the iron ones.

The pin alſo in the heel of the topmaſt, which bears it upon the cheſs-tree, is called a *fidd*.

FIDD-*hammer*, is uſed for a hammer, the handle of which is a *fidd*, or made tapering into that form.

FIDDLE. See VIOLIN.

FIDDLE *dock*, in *Botany*. See DOCK.

FIDDLE-*wood*. See CITHAREXYLON.

FIDE-*juſſores aſſidui*. See ASSIDUUS.

FIDE-*juſſor*, in the *Civil Law*, is a ſurety; or one that obliges himſelf in the ſame contract with a principal, for the greater ſecurity of the creditor, or ſtipulator.

FIDEI-*Commiſſum*, in the *Roman Law*, the appointing of an heir, or bequeathing a legacy to a perſon, on this condition, that he ſurrender the inheritance or legacy to another perſon, for whom the ſame is originally meant; or, it is an inheritance left in truſt with any one, for the uſe of another.

Fidei-commiſſa were much uſed among the Romans. In the French law the thing is become odious; as being ordinarily, no other than an expedient in favour of perſons to whom the laws forbid any thing to be given. In order to this, ſome truſty friend is choſen to be made legal heir, under a tacit agreement, to deliver the inheritance to the perſon incapacitated by law. But of later times the ſame expedient has come in uſe with regard to perſons capable of inheriting; to whom the teſtator, for particular reaſons, does not care to leave the inheritance directly.

As it happened, that the *fidei-commiſſioners* did not always faithfully reſtore what was truſted to them, Auguſtus took proper meaſures to oblige them thereto: to this end a prætor was erected, whoſe buſineſs was reſtrained to the ſingle matter of *fidei-commiſſions*.

As a teſtament was null without the inſtitution of an heir; and it frequently happening, that the *fidei-commiſſioner* refuſed to accept the truſt, upon which the teſtament fell to the ground; to engage ſomebody to accept it from a conſideration of advantage, the Pegaſian ſenatus-conſultum decreed, that the *fidei-commiſſioner* ſhould be at liberty to retain a fourth of the *fidei-commiſſum*.

FIDELES, in *Church Hiſtory*. See BELIEVERS.

FIDICINALES, in *Anatomy*, a name given to ſeveral muſcles of the fingers, called alſo LUMBRICALES.

FIDICULÆ, in *Antiquity*, is often uſed to ſignify the ſame with EQUULEUS, a kind of puniſhment uſed among the ancients.

FIDICULÆ, in a more proper ſenſe, denotes the cords wherewith the criminal's limbs were diſtended on the EQUULEUS.

FIEF, the ſame with *feud*, or FEE.

FIELD, in *Agriculture*, a piece of land incloſed, and fit for tillage, to bear corn, hay, &c.

For the method of finding the contents of a *field*, ſee AREA, CHAIN, and SURVEYING.

FIELD-*ale*, or FILCTALE, in our *Ancient Cuſtoms*, a kind of drinking in the field, by bailiffs of hundreds; for which they gathered money of the inhabitants of the hundred to which they belonged. But this cuſtom has been long ſince prohibited.

FIELD, *Campus*, in *Antiquity*, is frequently uſed for a public place, or ſquare in a city, &c.

Such were the *Field* of Mars, *Campus Martius*; and *Field* of

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of Flora, *Campus Floræ*, in Rome; and the *Field* of May, *Campus Maii*, among our anceſtors, &c.

FIELD *of Mars* was denominated from a temple of that deity, built therein: it was the ſcene, or place, of the aſſemblies called *comitia*. Tarquin the Proud at length appropriated it to his own uſes; but after the expulſion of the kings, the conſuls Brutus and Collatinus reſtored it to the public uſe again, for aſſemblies and elections.

Originally it was no more than a meadow on the banks of the Tiber, where horſes grazed, and the Roman youth were exerciſed to war. But it was afterwards erected into a magnificent ſquare, adorned with ſtatues, &c. See CAMPUS *Martius*.

FIELD *of Flora*, was the place where the laws, edicts, and conſtitutions, were publiſhed.

For FIELD *of May*, ſee CAMPUS *Maii*.

FIELD *baſil*, in *Botany*. See CLINOPODIUM.

FIELD *baſil*, *American*. See MONARDA.

FIELD *baſil*, *Syrian*. See BASIL.

FIELD, *cloſe*, was anciently a place encloſed, or railed in with a barrier, for juſts and tournaments to be performed in.

FIELD, *Elyſian*. See ELYSIUM.

FIELD *fort*. See *Field* FORT.

FIELD *works*, in *Fortification*, are thoſe thrown up by an army, in the beſieging of a fortreſs; or elſe by the beſieged, in defence of that place. Such are the fortifications of camps, thoſe of highways, &c.

FIELD, in *Heraldry*, is the ſurface, or face of the ſhield, or eſcutcheon: thus called, as containing the atchievements anciently acquired in the *field* of battle.

The *field* is the ground whereon the colours, bearings, metals, furs, charges, &c. are repreſented. In blazoning a coat, we always begin with the *field:* he bears ſable, &c.

Among the more modern heralds, *field* is leſs frequently uſed than ſhield, or eſcutcheon.

FIELD *colours*, in the *Military Art*, are ſmall flags about a foot and a half ſquare, which are carried along with the quarter-maſter-general for marking out the ground for the ſeveral ſquadrons and battalions of an army. They are placed on the right and left of the parade of a regiment when in the field; they are of the ſame colour with the facing of the regiment, and have the number of the regiment upon them. See FLAG.

FIELD-*marſhal* is the denomination of a modern military rank in England, but ſuperior to all others; having the chief command of the whole army.

FIELD *officers*. See OFFICERS.

FIELD-*fare*, in *Ornithology*, the Engliſh name of a bird of the thruſh kind, called by authors *turdus pilaris*. It is larger than the common thruſh, and is of a bluiſh grey colour on the neck; the head is ſpotted with black, and the ſhoulders and back are of a yellowiſh brown, variegated with black; the throat is variegated with black and yellow, the lower part of the belly is white, and but a little ſpotted; and on each ſide of the neck, and near each eye, it has a large black ſpot; thoſe on the neck are on its lower part near the inſertions of the wings; its wing-feathers are variegated with black, white, and a yellowiſh brown, and the tail is of a bluiſh black, with ſome variegations of black and white; the legs are black, and the talons very ſtrong. Theſe birds generally weigh about four ounces; their length is ten inches, and their breadth ſeventeen.

It is a bird of paſſage, and viſits us in England toward the end of autumn in vaſt flocks, and leaves us in ſpring; it is not certainly known where they breed. They feed on berries, particularly thoſe of the holly, and are a well-taſted bird.

This bird is eaſily taken with water bird-lime in the following manner: take out a gun, and kill two or three *field-fares* with it; by that time the gun has been diſcharged two or three times, the reſt of theſe birds will be ſo ſhy, that there will be no coming near them; then tie one or two of thoſe that were ſhot to the upper branches of ſome buſhy tree, in ſuch manner, that they may ſeem alive and ſitting there. Then prepare two or three hundred twigs, covering them well with the water bird-lime, made warm for that purpoſe; take a good birchen bough, and in that place all the twigs; tie this faſt to the tree, juſt underneath where the other *field-fares* are tied, and let this be in a place where they come in a morning to feed, for they always uſe one haunt for feeding ſo long as there is any food left there. By this means the *field-fares* will ſettle in whole flocks, near thoſe which they ſee tied to the buſh; and two or three dozen may be in this manner taken at a time. See BIRD and LIME.

FIELD *of a painting*, &c. is more uſually called the GROUND thereof.

FIELD-*pieces* are ſmall cannon, uſually carried along with an army in the *field:* ſuch as one, one and a half, two, three, ſix, nine, and twelve pounders; which being light and ſmall, are eaſily carried.

The ſmall pieces differ in length and weight: the dimenſions of the others are exhibited in the following table.

Braſs *field-pieces*.

Calibre.	Length. Feet.	Inch.	Weight. C.	Q.	lb.
12	5	0	8	3	8
6	4	6	4	3	10
3	3	6	2	3	10

See CARRIAGE and GUN.

FIELD-*ſtaff*, is a ſtaff carried by the gunners, in which they ſcrew lighted matches, when they are on command; which is called arming the *field ſtaffs*. See LINSTOCK.

FIELD *of viſion*, in *Optics*, is that conical ſpace indefinitely extended before us, ſo as to include all objects that can be ſeen at one view, or without turning the eyes. The preciſe limits of this ſpace are not eaſily aſcertained. In looking at a ſmall diſtance, we have an imperfect glimpſe of objects through almoſt the extent of a hemiſphere, or at leaſt for above ſixty degrees each way from the optic axes; but towards the extremity of this ſpace, objects are very imperfectly ſeen; and the diameter of the *field* of diſtinct viſion does not ſubtend an angle of more than five degrees at moſt, ſo that the diameter of a diſtinct image on the retina is leſs than ,06 of an inch; but it is probably much leſs. See VISION.

FIELD-*book*, in *Surveying*, a book uſed for ſetting down angles, diſtances, and other things, remarkable in taking ſurveys.

The pages of the *field-book* may be conveniently divided into five columns. In the middle column the angles at the ſeveral ſtations taken by the theodolite are to be entered, with the diſtances from the ſtations. The diſtances taken by the off-ſet ſtaff, on either ſide of the ſtation line, are to be entered into the columns on either ſide of the middle column, according to their poſition with reſpect to that line. The names or characters of the objects, with proper remarks, may be entered in the columns on either ſide of theſe laſt mentioned.

FIELD, in *War*, the place where a battle was fought. The general remained maſter of the *field* of battle.

FIERI *facias*, in *Law*, a judicial writ, which lies at all times within the year and day, for him that hath recovered in an action of debt and damages: it is directed to the ſheriff, commanding him to levy the debt and damages on him, againſt whom the recovery was had.

FIFE, in *Muſic*, a ſort of wind inſtrument, being a ſmall pipe.

FIFE-*major*. See MAJOR.

FIFE-*rails*, in a *Ship*, are thoſe that are placed on baniſters on each ſide of the top of the poop, and ſo along with *hances* or falls. They reach down to the quarter-deck, and to the ſtair of the gangway.

FIFTEENTH, *Decima quinta*, or *Quinzieme*, an ancient tribute, or impoſition of money, laid upon any city, borough, or other town, through the realm; not by the poll, or upon this or that man, but in general upon the whole city, or town.

It is ſo called, becauſe it was ſuppoſed to amount to a *fifteenth* part of that which the city hath been valued at of old; or to a *fifteenth* part of every man's perſonal eſtate, according to a reaſonable valuation.

This was impoſed by parliament, and every town through the realm knew what a *fifteenth* for themſelves amounted to, becauſe it was always the ſame; whereas the ſubſidy, which was raiſed of every particular man's lands, or goods, muſt needs be uncertain.

The *fifteenth* ſeems to have been a rate, anciently laid upon every town, according to the land or circuit belonging to it. Camden mentions many of theſe *fifteenths* in his Britan. viz. p. 171. *Bath geldabat pro viginti hidis, quando ſchira geldabat*, &c. And p. 181. *Old Sarum pro quinquaginta hidis geldabat*, &c. Which rates are according to Domeſday. But in after-times the *fifteenth* came to be underſtood as impoſed only on goods and chattels, not on lands. It was firſt granted by parliament, 18 Edw. I. viz. *Computus* quintæ decimæ *regi, an.* 18. *per archiepiſcopos, epiſcopos, abbates, priores, comites, barones, & omnes alios de regno, de omnibus bonis mobilibus conceſſæ*. The city of London paid that year for the *fifteenth*, 2866*l.* 13*s.* 8*d.* and the abbot of St. Edmund's 666*l.* 13*s.* 4*d.* which was by compoſition; and thereupon had all the temporal goods of their diſtrict diſcharged of the *fifteenth*.

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In the 8th of Edw. III. it was reduced to a certainty, when, by virtue of the king's commiſſion, new taxations were made of every townſhip, borough, and city, in the kingdom, and recorded in the exchequer; which rate was, at the time, the *fifteenth* part of the value of every townſhip, and the whole amounted to about 29,000*l.*

The way of collecting it was by two aſſeſſors appointed in every county by the king, who appointed twelve more in every hundred to make a true valuation of every man's perſonal eſtate upon which the *fifteenth* part was levied.

FIFTH, in *Muſic*, one of the harmonical intervals, or concords.

The *fifth* is the third, in order, of the concords. The ratio of the chords that produce it, is 3 : 2.

It is called *fifth*, becauſe it contains *five* terms, or ſounds, between its extremes, and four degrees; ſo that in the natural ſcale of muſic it comes in the *fifth* place, or order, from the fundamental.

The ancients called this interval DIAPENTE.

The *imperfect*, or *defective fifth*, by the ancients called *ſemi-diapente*, is leſs than the *fifth* by a mean ſemitone.

FIG-*tree*, *Ficus*, in *Botany*, a genus of the *polygamia polyoecia* claſs. Its characters are theſe: it hath male and female flowers included within the ſkin of the fruit, ſo that they do not appear, unleſs the covering be opened; the male flowers are but few in number, and are ſituated in the upper part of the fruit; the female flowers are numerous, and ſituated in the lower part. The male flowers ſit each upon a ſeparate foot-ſtalk, and have no petals, but three briſtly ſtamina; the female flowers ſit upon diſtinct foot-ſtalks; they have no petals, but a germen, which afterward becomes a large ſeed, ſitting in the empalement. There are eleven ſpecies; ſome of which are cultivated in the gardens of England, but many more in thoſe of France and Italy, where the fruit is in very high eſteem, as it is alſo with the nicer palates here; though ſo much out of favour with the vulgar, that it ſtands ſafe on trees planted in places where every other ſpecies of fruit would be ſtripped by robbers.

One great diſcouragement to their more frequent propagation in England, is the unſkilfulneſs of the generality of our gardeners in their culture and management. To obviate which, it may not be amiſs to ſay ſomewhat at large here, of the proper management of all the ſpecies of this tree.

The common method has been to propagate theſe trees by ſuckers from the roots of the old ones, but they are much more ſucceſsfully raiſed from cuttings. Theſe ſhould be taken from the trees in autumn, and choſen from ſuch branches as are compact, with their joints near each other; they ſhould have a part of the former year's wood at their bottom, and the top of each ſhould be left entire. They then ſhould be planted, eight or nine inches deep, in a bed of loamy earth, warmly ſituated; the ſurface of the ground ſhould be covered with old tanner's bark, three or four inches thick, and in ſevere froſt their tops ſhould be covered with ſtraw, &c. which ſhould be removed in the ſpring, but the tan ſhould be ſuffered to remain. In the following autumn, they will be fit to remove. This is the proper ſeaſon to tranſplant them; and the beſt ſoil is ſuch as has a gravelly, chalky, or ſtony bottom, with a light ſurface; the tree will ſeem to flouriſh indeed more in a better ſoil, but in this poor one it will produce the fineſt and moſt plentiful fruit. They ſhould always be planted in a free open ſituation, not ſhaded by trees or buildings, and will never ripen their fruit well, unleſs againſt a good ſouth, ſouth-eaſt, or ſouth-weſt wall. They ſhould be planted at twenty feet diſtance, and the height for the wall they ſtand againſt is about fourteen feet; the middle ſpaces between the trees may be planted with vines to fill up the vacant part of the wall till the *figs* are grown, and then theſe ſhould be taken up. In the ſummer, as the branches ſhoot, they muſt be trained horizontally againſt the walls, and no foreright ſhoots ſhould be ſuffered to come, but the buds of ſuch ſhould be rubbed off as faſt as they appear. At Michaelmas they ſhould be always pruned and nailed up. The great care to be had in pruning the old trees, is always to have a ſupply of young branches; for thoſe only produce fruit. None of the ſhoots of the former autumn pruning muſt be ſhortened; for it is on the two year old wood, that the fruit is produced; the young branches muſt be always brought very cloſe to the wall, and this will ſcreen them from injuries by froſts, and much forward the early ripening of their fruit. The old branches ſhould never be laid in too thick, which is a great fault among moſt gardeners; the diſtance ought to be at leaſt a foot between branch and branch; and as the young ones grow ſtrong, the old ones ſhould be always cut away. In April, or the beginning of May, ſeveral of the leading ſhoots ſhould be ſtopped, which makes them throw out ſide branches. In autumn the trees may be looſened from the walls, and the branches may be laid down and tied to ſtakes, ſo as to keep them from the damp ground: and thus in very hard weather be covered with ſtraw, peas-halm, or the like; and that not to be removed till the weather is milder, and then not all at once, but only by a little at a time. In mild weather the covering ſhould be removed; or elſe the *figs* will come out too early, and be damaged by the cold of April and May. In the ſpring, when the *figs* begin to puſh out, the trees may be faſtened to the wall again. The higher the wood runs up the wall, uſually ſo much the better taſted is the fruit; and no trees ſucceed better in fruiting, than thoſe which are nailed up againſt chimnies, where, beſide the height, they have ſome advantage from the heat.

Fig-trees are always planted as ſtandards in warm countries; but in England they are generally planted againſt walls; however, ſince ſome of the varieties are found to ripen their fruit well upon the ſtandards, and the crop of *figs* is often greater upon them than on thoſe trees that are planted againſt walls, it is a deſirable object to plant them either in ſtandards or eſpaliers. The latter will be the moſt likely to ſucceed, if they are managed as in Germany, where they untie the *fig-trees* from the eſpalier, and lay them down, covering them in winter with ſtraw or litter; and this covering is gradually removed in the ſpring. They ſhould not be faſtened up again till the end of March.

The principal and moſt valuable varieties of the common ſort of *fig* are the brown or cheſtnut-coloured Iſchia *fig*, the black Genoa *fig*, the ſmall white early *fig*, the large white Genoa *fig*, the black Iſchia *fig*, the Malta *fig*, the Murrey or brown Naples *fig*, the green Iſchia *fig*, the Madona *fig*, commonly called here the Brunſwick or Hanover *fig*, the common blue or purple *fig*, the long brown Naples *fig*, the yellow Iſchia *fig*, the ſmall brown Iſchia *fig*, and the Gentile *fig*. The firſt, ſecond, third, ninth, and tenth ſorts, will ripen their fruits on ſtandards, in a warm ſituation; but the others require the aſſiſtance of walls expoſed to good aſpects, otherwiſe their fruit will not ripen in England. Miller.

Figs contain a great quantity of phlegm, a little volatile, alkali ſalt, and a moderate quantity of oil.

They are moderately nouriſhing, grateful to the ſtomach, eaſier of digeſtion than any of the other ſweet fruits, and ſoften the aſperities of the breaſt, &c. and accordingly are uſed in medicine, to make gargariſms againſt diſorders of the throat and mouth; and as an ingredient in pectoral decoctions, and in lenitive electaries. They are alſo applied externally, to ſoften, digeſt, and promote maturation.

Figs are dried either by a furnace, or in the ſun, having firſt dipped them in ſcalding hot lye, made of the aſhes of the *fig-tree*. The Latins call them *caricæ*, or *ficus paſſæ*, when thus dried.

In this condition they are uſed both as medicine and food; being both the wholſomer, and eaſier of digeſtion, when thus cleared of a quantity of their aqueous and viſcid parts.

The beſt *figs* are the produce of Turky, Italy, Spain, Provence, &c. The iſlands of the Archipelago yield *figs* in great abundance; but they are much inferior in goodneſs to thoſe of Europe. Yet the Greeks in thoſe iſlands cultivate them with wonderful care and attention; as making the principal food, and a conſiderable part of the riches of the country.

They have two kinds of *fig-trees*; the firſt called *ornos*, or the *wild fig-tree*; the ſecond, the *domeſtic fig-tree*.

The method of cultivating and ripening theſe *figs*, makes a peculiar art, by the ancients called *caprification*; often ſpoken of among them in terms of admiration. Some of the modern naturaliſts have looked on it as a chimera; but Monſ. Tournefort has aſſured us of the contrary, and given us that proceſs, as he learned it upon the ſpot. See CAPRIFICATION.

The generation of the *fig* is ſomewhat anomalous; the parts ſubſervient to the office in other plants, i. e. the flower, not being here apparent. But the anatomy of the fruit helps us out of the difficulty.

Monſ. de la Hire the younger, in the Memoirs of the French Academy, ſhews, that the *fig* is a flower, as well as a fruit. By diſſection, it diſcovers all the eſſentials of a flower, viz. ſtamina, apices, and farina fœcundans.

The common dried *figs* afford two very curious phænomena; the one is, that within thoſe which are ſomewhat decayed, and indeed often in thoſe which appear moſt ſound, there are a peculiar ſort of mites, which live on the pulp of the fruit, and we eat millions of theſe unknowingly in this fruit.

Theſe are different from the common mites, in that they are rounder bodied and more tranſparent, and are very beautiful little creatures when examined.

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The other object is the ſeed, in which the plantula ſeminalis is very elegantly to be ſeen. For this purpoſe the largeſt *fig* muſt be choſen, for the ſmaller are commonly ſuch as are pulled off the tree before they are ripe. Out of one of theſe large and ripe *figs* a fair ſeed is to be ſelected; and on cutting this carefully, the whole pulpy part may be ſeparated from the hard huſk; and on examining it, there will be found lodged in it a very perfect and beautiful little plant, conſiſting of two leaves, and of a part which is to be the root, and another which is to be the ſtalk, and in fine the trunk of the tree. The pulpy matter of this ſeed is covered with a delicate thin membrane, and this muſt be carefully taken off, before the plantule can be ſeen. After this, all the reſt is only a ſort of pith, deſtined to give place and nouriſhment to the young ſhoot, before it is committed looſe to the earth.

FIG-*tree cloth of Otaheite*, in the South ſea, is a coarſe and harſh cloth, of the colour of the darkeſt brown paper, made of the bark of a tree which reſembles the wild *fig-tree* of the Weſt Indies. This cloth has the quality of reſiſting water; and the greater part of it is perfumed, and worn by the chiefs as a morning dreſs. For the method of manufacturing and colouring this cloth, ſee AOUTA. Hawkeſworth's Voyag. vol. ii. p. 210, &c.

FIGS, in *Antiquity*, were uſed in divination. See SYCOMANTIA.

FIG, in the *Manege*, is a ſort of wart on the fruſh, and ſometimes all over the body of a horſe. The *figs* that appear in the fruſh or ſole, make an evacuation of ſtinking malignant humours, that are very hard to cure.

FIG, *Indian*, in *Botany*. See *Prickly* PEAR.

FIG, *infernal*. See *Prickly* POPPY.

FIG, *marygold*. See MESEMBRYANTHEMUM.

FIG, *Pharaoh's*. See PLANTAIN-*tree*.

FIG-*inſect*, in *Natural Hiſtory*, a name given by the Engliſh to the creature called by the French, after Mr. Reaumur, the *faux puceron*, or *falſe puceron*, from its very much reſembling the puceron in external appearance, but being extremely different from it when nearly examined. Theſe inſects are when at their full growth of the bigneſs of the head of a pin of the largeſt ſize, but there are uſually found among them ſeveral that are ſmaller, down to ſuch as are ſcarce perceivable to the naked eye. They are found in great plenty on the back, or underſide of the leaves of the *fig-tree*, but they never are ſeen in cluſters like the pucerons.

The body and breaſt of this inſect are green, and the caſes of the wings are white, and beſet with hairs. This creature has two antennæ or horns, which it can exert at pleaſure; but they uſually are lodged under the furrows of the wings, and are not to be ſeen, unleſs the animal be turned belly upwards; the head alſo is bent downwards, and the eyes ſeem directed to look at objects only placed under them.

It has ſix legs, and a fine ſmall trunk iſſuing from the extremity of the head; this is but ſhort, and is of a lively green; it is terminated by a ſharp point, and has a fine brown filament like a hair, which it thruſts out of the body of the trunk at pleaſure, and which ſeems a ſort of engine or organ deſtined to convey into the body the juices extravaſated by the wound and ſuction of the trunk. The creature uſually remains in perfect quietneſs on the leaf on which it is found; but has this peculiarity in its poſition, that it is always found with its head reſting upon one of the ribs of the leaf, and its body on the plain part; by this means the anterior part of the head is raiſed above the ſurface of the plain part of the leaf, and the creature can by that advantage move his trunk about at pleaſure, and fix it into different parts of the leaf, while his body is perfectly ſtill at the time.

Theſe creatures throw off their ſkins many times in their growth, the furrows marking the places where their wings are, and the protuberances made by their caſes are always ſeen, however young they are examined.

In the months of May and June theſe inſects all become winged, and afford a peculiar ſpecies of a four-winged fly, which is remarkable for hopping; but as its hinder legs are not greatly larger than the reſt, it leaps but a little way at a time. The body of this fly is green, its wings are bordered with yellow, and its legs are white; it has a trunk of the ſame nature with that of the creature before its winged ſtate, and with this it continues to ſuck the juices of the leaves of the *fig-tree* as it did before.

The manner in which theſe animals propagate their ſpecies is not yet known. The pucerons, to which they more approach in figure than to any other animals, have always young ones found within them; but theſe, if examined in whatever ſtate, never have any ſuch appearance, not even ſo much as eggs being found in them; it ſhould ſeem that their eggs are too minute for our inſpection, but that they are oviparous, not viviparous animals. Reaumur's Hiſt. vol. vi. p. 98.

FIG-*ſhell*. See DOLIUM.

FIG-*wort*, in *Botany*, *Scrophularia*, a genus of the *didynamia angioſpermia* claſs. Its characters are theſe: the flower has a permanent empalement, cut into five parts at the top; it hath one unequal petal, with a large globular tube. The brim is cut into five ſmall parts, the two upper large and erect, the two ſide ones ſpread open, and the under one reflexed. It hath four ſlender deflexed ſtamina, two of which are the length of the petal, and two ſhorter, terminated by twin ſummits; and an oval germen ſupporting a ſingle ſtyle, crowned by a ſingle ſtigma. The germen afterward turns to a roundiſh pointed capſule, with two cells, which open at the top, and are filled with ſmall ſeeds. There are eighteen ſpecies. Miller.

The root and leaves of *ſcrophularia* have been eſteemed externally as a remedy for the piles, inflammation, ſcrophulous tumors, and cold ulcers. It is generally made into an ointment for theſe purpoſes; but ſome give it alſo internally in diet drinks. At preſent they are both among us diſregarded.

This root is of a very ſingular figure, by which it is eaſily diſtinguiſhed at ſight from all other medicinal roots. It is uſually of the thickneſs of a man's finger, or more, of an oblong figure, nearly as thick at the one end as the other, and full of protuberances on the ſurface, reſembling a kind of little kernels; and between theſe there are a great many fibres, which ſtrike deep into the ground. The root itſelf has no great ſmell, but its taſte is ſomewhat acrid and diſagreeable.

FIG-*wort worm*, in *Natural Hiſtory*, the name of an inſect, which feeds on the leaves of the *ſcrophularia*, or *fig-wort*, and which is uſually eſteemed a caterpillar, but is one of thoſe inſects called by the French FAUSSE *chenilles*.

FIGHT. See BATTLE and ENGAGEMENT.

FIGHTS, in a *Ship*, are the waſte-cloths which hang round about her in a fight, to hinder the men from being ſeen by the enemy.

FIGHTS, *cloſe*, denote thoſe bulkheads afore or abaft the ſhip, which are put up for men to ſtand ſecure behind, and fire on the enemy, in caſe of boarding.

FIGHTS, *running*, at *Sea*, thoſe where the enemy do not ſtand the battle, but are continually chaſed.

FIGHTWITE, *Fihthwita*, in the Saxon times, ſignified a mulct for making a quarrel, to the diſturbance of the peace. *Mulcta ob commiſſam pugnam in perturbationem pacis, quæ in exercitu regis* 10 *ſolidorum erat.* Blount and Jacob in tranſcribing this paſſage, have inſerted 120 ſols.

FIGURAL, or FIGURATE *numbers*, ſuch as do or may repreſent ſome geometrical figure, in relation to which they are always conſidered; as triangular, pentagonal, pyramidal, &c. NUMBERS.

FIGURATE, or FIGURATIVE, that which has a relation to figure, or that teaches under ſome obſcure reſemblance.

Thus a *figurative ſtyle* is that which abounds in figures.

The *figurative* ſtyle, F. Bouhours obſerves, is neither the moſt juſt, nor the beſt. For this reaſon Cicero directs us to the ancients, who, not having yet bethought themſelves to uſe *figurative* expreſſions, but keeping to the moſt proper and natural way, have almoſt all wrote well. *Sunt enim illi veteres, qui nondum ornare poterant ea, quæ dicebant, omnes prope præclare locuti.*

Long uſe, ſay the grammarians, renders that proper in all languages, which at firſt was *figurative*. The ſame thoughts appear more lively when expreſſed by a figure, than when in ſimple terms. The reaſon is, that *figurative* expreſſions denote not only the principal matter, but alſo the emotion and paſſion of the perſon who ſpeaks.

FIGURATIVE is alſo much uſed in ſpeaking of the myſteries and figures of the old law. In this ſenſe manna is ſaid to be *figurative* of the euchariſt.

FIGURATIVE is alſo uſed in the Greek grammar for what we otherwiſe call characteriſtic, viz. a letter that characterizes certain tenſes of the Greek verbs; or that diſtinguiſhes and ſpecifies them.

In the firſt conjugation of the BARYTONOUS verbs, the φ is characteriſtic, or *figurative* of the præter tenſe, and the ↓ of the future.

FIGURATIVE, or FIGURATIVE *counter-point*, in *Muſic*, is that wherein there is a mixture of diſcords along with the concords. See COUNTER-POINT and SUPPOSITION.

Where the diſcords are uſed as a ſolid and ſubſtantial part of the harmony, the *counter-point* is properly called the harmony of diſcord.

FIGURE, FIGURA, in a general ſenſe, denotes the ſurface or terminating extremes of a body.

All bodies have ſome *figure*; whence, figurability is generally ranked among the eſſential properties of body, or matter. A body without *figure*, would be an infinite body.

The corpuſcular philoſophers account for every thing from the

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the *figure*, bulks, and motions of the atoms, or primary corpuſcles of bodies.

For the *figures* of bodies, conſidered as objects of ſight, ſee VISION.

The ſchoolmen diſpute, whether or no the quality of *figure* be the ſame with that of form; and if they differ, what it is that conſtitutes the difference? Boethius will have *figure* only predicated of inanimate bodies, and form of animate. Others extend *figure* to all natural things, and form to all artificial ones: whence the verſe,

Formam viventis, picti dic eſſe figuram.

Others apply *figure* indifferently to all kinds of bodies, but not in all relations. If only the bare circumference, or circumſcription, be conſidered, they call it *figure*; but if the circumference be conſidered as endowed with colour, then they call it FORM.

FIGURES, in *Architecture* and *Sculpture*, denote repreſentations of things made in ſolid matters; ſuch as ſtatues, &c.

We ſay, *figures* of braſs, of marble, of ſtucco, of plaiſter, &c.

But, in this ſenſe too, the term is more uſually applied to human repreſentations than to other things. Thus we ſay, an equeſtrian *figure*, for a man on horſeback.

Daviler obſerves, that thoſe, either repreſented ſitting, as popes, &c. or kneeling, as on monuments, &c. or laid all along, as rivers, &c. are more properly called *figures* than ſtatues.

Figures, in *Architecture*, are ſaid to be detached, when they ſtand ſingly, in oppoſition to thoſe compoſitions which are called GROUPES.

FIGURES, in *Arithmetic*, are the numeral characters; or the characters whereby numbers are expreſſed, or written.

Thus the number four hundred and fifty is written, or expreſſed, by three *figures*, 450.

The *figures* in arithmetic are the nine digits; 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0.

Theſe *figures* were firſt brought into Europe by the Moors of Spain, and into England, as Dr. Wallis apprehends, about 1130. See ARITHMETIC and CHARACTER.

However, from ſome ancient dates, ſuppoſed to conſiſt wholly or in part of Arabian *figures*, ſome have concluded, that theſe *figures*, originally Indian, were known and uſed in this country at leaſt as early as the tenth century. The moſt ancient date diſcovered by Dr. Wallis was that on a chimney-piece, at Helmdon, in Northamptonſhire, M133, i. e. 1133. Other dates diſcovered ſince, are 1090, at Colcheſter, in Eſſex, 1016, with the Roman M for a thouſand, at Widgel-hall, near Buntingford, in Hertfordſhire, 1011 on the north front of the pariſh-church of Rumſey in Hampſhire, and 975 over a gate-way at Worceſter. Dr. Ward has urged ſeveral objections againſt the antiquity of theſe dates. As no example occurs of the uſe of theſe *figures* in any ancient manuſcript, earlier than ſome copies of Johannes de Sacro Boſco, who died in 1256, he thinks it ſtrange, that workmen ſhould have made uſe of theſe *figures* ſo long before they appear in the writings of the learned; and he alſo diſputes the fact. The Helmdon date, according to him, ſhould be 1233; the Colcheſter date 1490; that at Widgel-hall has in it no Arabian *figures*, the 1 and 6 being I and G, the initial letters of a name; and the date at Worceſter, he ſuppoſes to conſiſt of Roman numerals, and to be really MXV. Martyn's Abridg. of Phil. Tranſ. vol. ix. p. 420, &c.

FIGURE, in *Aſtrology*, a deſcription, or draught, of the ſtate and diſpoſition of the heavens, at a certain hour; containing the places of the planets and ſtars, marked down in a *figure* of twelve triangles, called *houſes*.

This is alſo called a HOROSCOPE and THEME.

FIGURE *of an eclipſe*, in *Aſtronomy*, denotes a repreſentation of the path or orbit of the ſun, and the moon, during the time of the eclipſe, upon paper; with the number of digits eclipſed, and the beginning, middle, and end, of darkneſs.

FIGURE *of the diameter*. The rectangle under any diameter, and its proper parameter, is in the ellipſis and hyperbola called the *figure of that* DIAMETER.

FIGURE, or *Delineation*, of the full moon, ſuch as, viewed through a teleſcope with two convex glaſſes, is of conſiderable uſe in obſervations of eclipſes, and conjunctions of the moon with other luminaries. In this *figure* of the moon are repreſented the maculæ, or ſpots, of the moon, marked by numbers; beginning with the ſpots, which uſually enter firſt within the ſhade at the time of the great eclipſes, and alſo emerge the firſt.

FIGURE, in *Conics*, denotes the rectangle, made under the latus rectum and tranſverſum, in the hyperbola and ellipſis.

FIGURE, in *Dancing*, denotes the ſeveral ſteps which the dancers make in order, and cadence; conſidered as they mark certain *figures* on the floor.

FIGURES, in *Fencing*, are the divers guards, poſtures, attitudes, or diſpoſitions, of the body, arm, or ſword. See FENCING.

FIGURE, in *Fortification*, is the plan of any fortified place; or the interior POLYGON, &c.

When the ſide and angles are equal, it is called a *regular*; when unequal, an *irregular figure*.

FIGURE, in *Geomancy*, is applied to the extremes of points, lines, or numbers, thrown, or caſt at random: on the combinations or variations whereof the ſages of this art found their fantaſtical divinations.

FIGURE, in *Geometry*, denotes a ſurface incloſed, or circumſcribed with one or more lines.

Such are triangles, ſquares, polygons, circles, ellipſes, &c.

Wolfius defines *figure* a continuum terminated by a perimeter. In which ſenſe *figure* is applicable both to ſuperficies and ſolids. In the former caſe, the perimeter is of lines; in the ſecond, of ſurfaces.

Figures are either rectilinear, curvilinear, or mixt, according as the perimeter conſiſts of right lines, curve lines, or both.

The ſuperficial parts of a *figure* are called its *ſides*; the loweſt ſide, its *baſe*; and the angle oppoſite to the baſe, the *vertex*.

The height of a figure is the diſtance of the vertex from the baſe.

FIGURE, in *Grammar*, is an expreſſion that deviates from the common and natural rules of grammar; either for the ſake of elegance or brevity.

The beſt grammarians only reckon four *figures*; the ELLIPSIS, PLEONASM, SYLLEPSIS, and HYPERBATON. Others add two more; viz. ANTIPTOSIS, and ENALLAGE.

FIGURE, in *Heraldry*, a bearing in a ſhield. Of theſe *figures* there is almoſt an infinite variety: ſome are natural; ſuch as the celeſtial *figures* of the ſun, moon, ſtars, &c. and their parts; the effigies of men, women, &c. and their parts; animals, as lions, ſtags, foxes, boars, &c. and their parts; birds, as eagles, ſwans, ſtorks, pelicans, &c. and their parts; fiſhes, as dolphins, whales, ſturgeons, trouts, &c. and their parts; reptiles and inſects, as tortoiſes, ſerpents, graſhoppers, &c. and their parts; vegetables, as trees, plants, flowers, herbs, &c. and their parts; and ſtones, as diamonds, rubies, pebbles, rocks, &c. Theſe charges, as well as ordinaries, have divers attributes or epithets, which expreſs their qualities, poſitions, and diſpoſition. Thus, the ſun is ſaid to be *in his glory*, *eclipſed*, &c. the moon *in her complement*, *in creſcent*, &c. Animals are ſaid to be *rampant*, *paſſive*, &c. BIRDS have alſo their denominations; fiſhes are deſcribed to be *hauriant*, *naiant*, &c. Beſides theſe natural *figures*, there are alſo artificial *figures*; the principal of which are warlike inſtruments, as ſwords, arrows, battering rams, gauntlets, helmets, ſpears, poleaxes; ornaments uſed in royal and religious ceremonies, as crowns, coronets, mitres, wreaths, croſiers; towers, caſtles, arches, columns, plummets, battlements, churches, portcullis, borrowed from architecture and fortification; and ſhips, anchors, rudders, pendants, ſails, oars, maſts, flags, gallies, lighters, &c. derived from navigation; all theſe bearings have different epithets, denoting their poſition, ſtructure, &c.

There are likewiſe chimerical or imaginary *figures* uſed in heraldry, that are the reſult of fancy and caprice; ſuch as centaurs, hydras, phœnixes, griffons, dragons, &c. Porny's Elem. Herald. p. 132, &c. 172, &c.

FIGURE, in *Logic*, denotes a certain diſpoſition of the terms of a ſyllogiſm; particularly of the medium, with regard to the extremes.

Hence it follows, that there are as many *figures* of ſyllogiſms, as there are different connexions of the extremes with the medium; ſo that, though the ſchoolmen ordinarily only reckon three, yet a fourth might be admitted.

In the *firſt figure* the medium or middle term is the ſubject of the major propoſition, and the predicate of the minor. This contains four MOODS, and applies to the proof of all ſorts of queſtions, whether univerſal or particular, affirmative or negative. In the *ſecond figure* the middle term is the predicate of both the premiſſes, and this contains four moods, admitting only of negative concluſions.

The *third figure* requires that the middle term be the ſubject of both the premiſſes, and has ſix moods, admitting only of particular concluſions. The ſpecial rules of theſe three *figures* are the following: in the firſt, the major propoſition muſt always be univerſal, and the minor affirmative; in the ſecond alſo the major muſt be univerſal, and one of the premiſſes, together with the concluſion, muſt be negative; in the third *figure* the minor muſt be affirmative, and the concluſion always particular.

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In the *fourth figure*, called by the Peripatetics the *indirect*, and by others, the *Galenical figure*, as varying too much from the natural form, the middle term is predicated in the major propoſition, and ſubjected in the minor. Some logicians will allow this to be nothing elſe but a mere inverſion of the *firſt figure*. It has five moods. Watts's Logic, part iii. chap. 2. § 3.

FIGURE, in the *Manufactures*, is applied to the various deſigns repreſented or wrought on velvets, damaſks, taffaties, ſattins, and other ſtuffs and cloths.

The moſt uſual *figures* for ſuch deſigns are flowers, imitated from the life; or groteſques, and compartiments of pure fancy. Repreſentations of men, beaſts, birds, and landſcapes, have only been introduced ſince the taſte for the Chineſe ſtuffs, particularly thoſe called *furees*, began to prevail among us.

It is the woof of the ſtuff that forms the *figures*; the warp only ſerves for the ground. In working *figured* ſtuffs, there is required a perſon to ſhew the workman how far he muſt raiſe the threads of the warp, to repreſent the *figure* of the deſign with the woof, which is to be paſſed acroſs between the threads thus raiſed. This ſome call *reading the* DESIGN.

For the *figures on tapeſtry*, *brocade*, &c. ſee TAPESTRY, &c.

For thoſe given by the *calenders*, *printers*, &c. ſee CALENDER, &c.

FIGURE, *Figura*, Σχημα, in the *Ancient Muſic*, is uſed for the different diſpoſitions of the tones and ſemitones in a conſonance.

FIGURE, *apparent*, in *Optics*, that figure, or ſhape, which an object appears under when viewed at a diſtance, being often very different from the true figure; for a ſtraight line viewed at a diſtance may appear but as a point; a ſurface as a line; and a ſolid as a ſurface; and each of theſe of different magnitudes, and the two laſt of different *figures*, according to their ſituation with regard to the eye. Thus an arch of a circle may appear a ſtraight line; a ſquare or oblong, a trapezium, or even a triangle; a circle, an ellipſis; angular magnitudes, round; a ſphere, a circle, &c.

Alſo any ſmall light, as a candle, ſeen at a diſtance in the dark, will appear magnified, and farther off than really it is. Add to this, that if ſeveral objects are ſeen at a diſtance, under angles that are ſo ſmall as to be inſenſible, as well as each of the angles ſubtended by any one of them, and that next to it; then all theſe objects will appear not only to be contiguous, but to conſtitute, and ſeem but one continued magnitude.

FIGURE, in *Painting* and *Deſigning*, denotes the lines and colours, which form the repreſentation of a man, or other animal.

But the term *figure* is in a more immediate and peculiar manner underſtood of human perſonages: thus, a painting is ſaid to be full of *figures*, when it abounds with repreſentations of men; and a landſcape is ſaid to be without *figures*, when there is nothing but trees, plants, mountains, &c.

FIGURE is alſo applied to repreſentations, or images of things in prints, &c.

Some readers chooſe to have the *figures*, eſpecially the mathematical ones, in wood, for the convenience of having them immediately annexed to the matter they refer to: others rather chooſe to be at the pains of turning over, and having recourſe to another part of the book, that they may have the *figures* more neat and accurate on copper.

The author of a collection of diſſertations, printed at Paris, in 1715, ſhews, in the firſt diſſertation on the Hebrew medals, p. 66. that the Jews were allowed to make any kind of *figures*, or images of trees, plants, flowers, buildings, &c. but not thoſe of animals, or of the ſun, moon, and ſtars.

FIGURES, *brimſtone*. See BRIMSTONE.

FIGURES, *caſting of*. See CASTING.

FIGURE *circumſcribed*, and *inſcribed*. See CIRCUMSCRIBING, and INSCRIBED.

FIGURES, *equal*. See EQUAL.

FIGURE, *equilateral*. See EQUILATERAL.

FIGURES, *plain*. See PLAIN.

FIGURE, *regular* and *irregular*. See REGULAR and IRREGULAR.

FIGURES, *ſimilar*. See SIMILAR.

FIGURE, in *Rhetoric*, is a phraſe, or turn of ſpeech or diſcourſe, more beautiful and emphatical than what is uſed in common or ordinary ſpeaking.

Figures, by the Greeks called σχηματα, *ſchemata*, are the enrichments of diſcourſe, and we only uſe them when raiſed and moved with the conſideration of ſomething extraordinary.

There are two kinds of *figures*; the one of *ſentences*, and contained in the ſenſe itſelf, without any immediate dependence on any particular words; the other are only in the *words* themſelves.

FIGURES *of ſentences*, *of the*, ſome are principally adapted for reaſoning and inſtruction, and others to move the paſſions.

Among the ancients, Demoſthenes is moſt celebrated for expreſſing the force and energy of the former, and Iſocrates excelled in the beauties and delicacies of the latter.

Cicero lays ſo great ſtreſs on theſe *figures*, that he repreſents them as the brighteſt parts of oratory; and makes the power and efficacy of the art to depend in a great meaſure on a thorough knowlege and application of them.

Of the firſt kind the moſt conſiderable are ſix; viz. PROLEPSIS, or *anticipation*; HYPOBOLE, or *ſubjection*; ANACOINOSIS, or *communication*; *epitrope*, or CONCESSION; *parabole*, or SIMILITUDE; and ANTITHESIS, or *oppoſition*. Thoſe of the ſecond kind are EPANORTHOSIS, or *correction*; PARALEPSIS, or *omiſſion*; PARRHESIA, or *reprehenſion*; APARITHMESIS, or *enumeration*; EXERGASIA, or *expoſition*; HYPOTYPOSIS, or *imagery*; APORIA, or DOUBTING; APOSIOPESIS, or *concealment*; *erotеſis*, or INTERROGATION; *ecphoneſis*, or EXCLAMATION; EPIPHONEMA, or *acclamation*; APOSTROPHE, or *addreſs*; PROSOPOPEIA, or *the fiction of a perſon*.

Of FIGURES *of words*, ſome are tropes, i. e. tranſlations of words from their proper ſignification, to ſome more remote and extraordinary one. See TROPES.

Others are *figures of words*, more properly ſo called, and not tropes; being ſo inherent in the words, that upon changing of the words, or ſometimes only their ſituation, the *figure* is deſtroyed: as in *amantes ſunt amentes*, where the *figure* would be loſt, if inſtead of *amentes* you ſhould put *ſtulti*.

Thus alſo, *to loſe all reliſh of life*, is *in effect to loſe life*; the *figure* is loſt by changing the order of the words; as, *to loſe all reliſh of life*, is *to loſe life in effect*.

The principal of theſe verbal *figures* may be arranged into three claſſes; ſuch as conſiſt in a deficiency of words, in a redundancy, or a repetition. To the firſt claſs belong the ELLIPSIS and ASYNDETON. Under the ſecond diviſion are comprehended the PLEONASMUS and POLYSYNDETON. The third kind of verbal *figures* include thoſe by which the ſame word in ſound, or ſenſe, is repeated; or one of a like ſound or ſignification, or both. Of the firſt ſort in this ſubdiviſion there are ten, called ANTANACLASIS, PLOCE, EPIZEUXIS, CLIMAX, ANAPHORA, EPISTROPHE, SYMPLOCE, EPANALEPSIS, ANADIPLOSIS, and EPANODOS. To the ſecond claſs belong the PARONOMASIA, the HOMOIOPTOTON, the SYNONYMIA, and DERIVATIO; the two firſt of which reſpect words that are ſimilar in ſound only, the third in ſenſe, and the laſt in both. With regard to the proper uſe of *figures*, we may obſerve, that they ſhould always be accommodated to the ſentiments, and riſe in proportion to the images deſigned to be conveyed by them; it is alſo better, in general, to be nervous than copious, that the images, by their cloſer union, may impreſs the mind with greater energy, though in ſuch *figures* as are deſigned for ornament or illuſtration, a more diffuſive way of painting is ſometimes agreeable. The too frequent uſe of *figures* ſhould be avoided; and they ſhould be ſo interwoven in a diſcourſe as not to render the ſtyle rough and uneven, ſometimes high and at other times low; now dry and jejune, then pompous and florid. In every caſe they ſhould ſeem to ariſe more from nature than *art*, to offer themſelves rather than to be the effect of ſtudy. Ward's Orat. Lect. 30, 31, 32, 33, 34.

Of theſe the principal are, repetition, converſion, complexion, gradation, ſynonymy, polyſyndeton, and polyptoton, reticency, disjunction, ſimilitude, paronomaſy, and tranſition. See each *figure* under its proper article, as METAPHOR, &c.

To FIGURES *of proſody* belong the SYNALOEPHA, ECTHLIPSIS, CRASIS, SYNÆRESIS, DIÆRESIS, SYSTOLE, and DIASTOLE.

FIGURE is uſed, in *Theology*, for the myſteries repreſented or delivered obſcurely to us under certain types or actions in the Old Teſtament.

Thus manna is held a *figure* or type of the euchariſt; and the death of Abel a *figure* of the ſuffering of Chriſt.

Many divines and critics contend, that all the actions, hiſtories, ceremonies, &c. of the Old Teſtament, are only *figures*, types, and prophecies, of what was to happen under the New. The Jews are ſuppoſed to have had the *figures* or ſhadows, and we the ſubſtance.

FIGURE is alſo applied in a like ſenſe to profane matters; as the emblems, enigmas, fables, ſymbols, and hieroglyphics, of the ancients.

FIGURED, in *Heraldry*, is an epithet applied to thoſe bearings which are depicted with a human face.

FIGURED,

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FIGURED, in the *Manufactures*. A *figured* CAMLET, ſtuff, tabby, &c. is that whereon there are divers deſigns of flowers, figures, branches, &c. impreſſed by means of hot irons.

FIGURED *ribbands* firſt came into faſhion about the year 1680. The method of performance was by ſucceſſively applying ſteel plates engraven with divers ornaments, as flowers, birds, groteſques, &c.

But one Chandelier, a ribband-maker of Paris, invented a much better and readier way of doing it, by a machine not unlike the flatter uſed in coining to flatten the pieces of metal, only much ſimpler.

The principal parts thereof were two ſteel cylinders, engraven with the figures intended to be repreſented. Theſe cylinders were placed over each other like the rolls of a rolling-preſs, having each of them, at one of its extremes a little dented wheel, one of which catching into the other, the whole was put in motion by means of a winch or handle faſtened to the firſt.

The machine thus prepared, the workman heats the cylinders, and places the ribband in the little place remaining between the two, which he contracts yet farther by a ſcrew that preſſes the upper part down upon the lower; then turning the rolls by the handle, a whole piece of RIBBAND was *figured* in leſs time than a ſingle yard could be done in the ordinary way.

FIGURED *velvet*. See VELVET.

FILACEOUS, in *Botany*, a term applied to ſuch roots of plants as are full of filaments. See FILAMENT.

FILACIUM. See FILE.

FILAGO, in *Botany*. There are ſeveral ſpecies of this genus, ſome of which grow naturally on barren land in moſt parts of England. They are called by ſome cotton-weed; by others cud-weed, their leaves being white, and when broken, appearing to conſiſt of cottony threads. Moſt botaniſts have ranged them under the genus of *gnaphalium*. See CUDWEED. Linnæus makes the *filago* a diſtinct genus of the *ſyngeneſia polygamia neceſſaria* claſs, with a naked receptacle, no down, an imbricated calyx, and ſmall female flowers placed between the folds of the calyx.

FILAMENT, in *Medicine, Anatomy, Natural Hiſtory, &c.* a term uſed in the ſame ſenſe with FIBRE for thoſe fine threads whereof fleſh, nerves, ſkins, plants, roots, &c. are compoſed.

FILANDERS, in *Falconry*, a diſeaſe in hawks, &c. conſiſting of filaments or ſtrings of blood coagulated and dried, occaſioned by a violent rupture of ſome vein, by which the blood extravaſating, hardens into the figures above mentioned, to the great annoyance of the reins, hips, &c.

The word is French, *filandres*, formed from *fil, thread*.

FILANDERS are alſo a ſort of fine ſmall worms which greatly incommode the hawk in the gorge, and about the heart, liver, and lungs; but which, on ſome occaſions, are ſuppoſed to be of ſervice, and to feed on the ſuperfluities of certain parts. See BACK-*worm*.

There are four kinds of theſe *filanders* or *vermiculi*. The firſt, in the gorge or throat; the ſecond, in the belly; the third, in the reins; the fourth are called needles, on account of their exceeding fineneſs. The ſymptoms that diſcover the diſeaſe are the bird's gaping frequently, ſtraining the fiſt or perch with her pounces, croaking in the night, ruffling her train, rubbing her eyes, wings, noſtrils, &c. As the worms are very reſtleſs, the bird is frequently endeavouring to caſt them up; and in opening its mouth you will readily diſcover them. From the throat, &c. they will aſcend to the larynx, brain, &c. and finally over the whole body.

The ordinary cauſe is bad food. The proper remedy, they ſay, is not by killing them, for fear of impoſthumes from their corruption; but chiefly by ſtupefying them, that they may be offenſive but ſeldom.

This is beſt effected by making the bird ſwallow a clove of garlic, after which ſhe will feel nothing of the *filanders* for forty days. Others uſe rue, worm-ſeed, aloes, vervain, ſaffron, &c.

FILAWS, among the modern Ægyptians, villages inhabited by the original natives of the country.

FILAZER, FILACER, or FILIZER, an officer in the court of common pleas, ſo called becauſe he *files* the writs whereon he makes out proceſs.

Of theſe there are ſixteen in the ſeveral diviſions and counties of England. They make out all writs and proceſs upon original writs, iſſuing out of the chancery as well real as perſonal and mixed, returnable in that court.

In actions merely perſonal, where the defendants are returned ſummoned, they make out pones or attachments, which, being returned and executed, if the defendant appears not, they make out a diſtringas, and ſo *ad infinitum*, or till he does appear.

If he be returned *nihil*, then proceſs of capias infinite if the plaintiff will; or after the third capias the plaintiff may proceed to outlawry in the county where his original is grounded, and may have an exigent with proclamation.

The *filazers* likewiſe make out all writs of view in real actions where the view is prayed; and upon replevins and recordaris, writs of retorno habendo, ſecond deliverance, and writ of withernam. In real actions they make out writs of grand and petite cape before appearance.

They enter all appearances and ſpecial bails upon any proceſs made by them. They make the firſt ſcire facias upon ſpecial bails, writs of habeas corpus, diſtringas nuper vicecomitem vel balivum, and duces tecum; and all ſuperſedeaſes upon ſpecial bail or appearance, &c. writs of habeas corpus cum cauſa upon the ſheriff's return that the defendant is detained with other actions, and writs of adjournment of a term, in caſe of peſtilence, war, or public diſturbance.

Till an order of court made 14 Jac. I. which limited the *filazers* to all matters and proceedings before appearance, and the prothonotaries to all after, they alſo entered declarations, imparlances, judgments, and pleas, whereto a ſerjeant's hand was not requiſite, and made out writs of execution and divers other judicial writs after appearance.

FILBERDS, or FILBUDS, the beſt ſort of ſmall nuts, proper for planting in orchards or gardens.

They are raiſed from nuts ſet in the earth, or ſuckers from the roots of an old tree, or they may be grafted on the common HAZLE-*nut*.

They delight in a fine, mellow, light ground, but will grow almoſt any where, eſpecially if defended from violent and cold winds.

The tree is eaſily propagated, bears well, and is of two ſorts, the *white* and the *red*; but the former is the beſt.

FILE, an inſtrument of ſteel, cut in little hatches or furrows, uſed by the workman in metals, to ſmooth, poliſh, and otherwiſe faſhion the ſame.

The word is French, *file*, literally ſignifying a long ſeries or ſucceſſion of any kind of things, of *fil, thread*.

Files bear a near reſemblance to raſps: the only difference between them is, that the former are cut with edged tools, and the latter are punched with pointed ones. See RASP.

The *file* is a principal inſtrument in all the kinds and parts of ſmithery. It ſhould be forged of the beſt ſteel; after which, rubbing it with greaſe, to make it more ſoft under the chiſſel, they cut it with chiſſels and a mallet this and that way, and of this or that depth, according to the grain or tooth required.

After cutting the *file*, it remains to be tempered; which, being the principal myſtery in the making of *files*, will deſerve to be particularly deſcribed.

Files, then, are tempered with a compoſition of chimney-ſoot, very dry and hard, diluted and worked up with urine and vinegar, to which is added common ſalt: the whole is to be reduced to the conſiſtence of muſtard.

The *files* being cut, and rubbed over with vinegar and ſalt to ſcour off the greaſe laid on for the cutting, they cover them over with this compoſition; and having laid ſeveral of them together in a packet, and covered them in loam, they put them in a charcoal fire; from which they are taken out again by that time they have acquired a cherry-colour, which is known by a little red rod of the ſame ſteel put in along with them. Upon taking them out, they caſt them into the coldeſt ſpring water they can get.

Iron *files* require a more intenſe heat than ſteel ones.

When the *files* are cold, they clean them with charcoal, a rag, &c. to take away any of the ſoot or fæces left in the cuttings; then, drying them before the fire, they put them up carefully in a box of wheat bran, to keep them from ruſting.

Files are of different forms, according to the different uſes and occaſions they are made for. Thoſe in common uſe are the ſquare, flat, triangular, half-round, round, thin *file*, &c. all which are made of different ſizes, as well as different cuts and degrees of fineneſs, to take place according as the work is more or leſs advanced; ſome cutting faſter, as the *rough-toothed file*, &c. others more ſlowly, as the *fine-toothed file*, &c.

FILE is alſo a thread or wire whereon writs or other exhibits in courts or offices are faſtened or filed, for the more ſafe keeping and ready turning to the ſame.

A *file* is a record of the court, and the filing of the proceſs of a court makes a record of it.

FILE, or *label*, in *Heraldry*, a bearing repreſented in *Tab. Herald. fig.* 23. though ſometimes of more, and ſometimes of fewer points, being the difference or diſtinction of the eldeſt ſon.

It is ſometimes alſo born as a charge in a coat-armour, of which Guillim gives many inſtances; but it is oftener the difference or mark of diſtinction which the elder bro-

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ther bears in his coat during his father's life.
Some diſtinguiſh *file* and *label*, calling the *file* the upper horizontal line, and the *label* the points which iſſue from it.

FILE *of three*, or more, *labels*. See LABEL.

FILE, in a *Military Senſe*, is a row of men ſtanding one behind or below another from front to rear.
Or, *file* is a line or ſeries of ſoldiers, placed one before another, and thus compoſing the DEPTH of a battalion or ſquadron. The *files* which bind the right and left are called the flanks.
They ſay, *cloſe the files*; that is, bring the men nearer each other. *Double the files*; that is, double the depth of the battalion, and diminiſh its breadth or front by one half. The laſt or hindermoſt perſon is ſaid *to bring up the file*. To *file off*, is to wheel off from marching in a ſpacious front, and to march in length by *files*.

FILE-*leaders* are the foremoſt men in each *file*.

FILE-*leaders, half*, are the men of the fourth rank; the fourth, fifth, and ſixth ranks being called the *rear half-files*, as the firſt, ſecond, and third are the *front half-files*.

FILIAL, ſomething belonging to the relation of a ſon.
The divines uſually diſtinguiſh between a ſervile and a *filial* fear. The moſt abandoned may have a ſervile fear of God, ſuch as that of a ſlave to his maſter; but not a *filial* fear, i. e. a fear reſulting from love and reſpect.

FILICULA, in *Botany*. See *Dwarf* FERN.

FILIGRANE, or FILLIGREE, *work*, a kind of enrichment on gold or ſilver, wrought delicately, in manner of little threads or grains, or both intermixed.
The word is compounded of *fil* or *filum*, *thread*, and *granum*, *grain*.
In Latin it is called *filatim elaboratum opus*, *argentum*, *aurum*.
We have vaſes, &c. of *filligree* work.

FILING, one of the principal operations in ſmithery, &c. ſucceeding to forging.
The coarſer cut files are always to be ſucceeded by finer; and in all the kinds the rule is to lean heavy on the file in thruſting it forward, becauſe the teeth of the file are made to cut forwards; but in drawing the file back again for a ſecond ſtroke, it is to be lightly lifted juſt above the work, becauſe it cuts not coming back.
The rough or coarſe-toothed file (which, when large, is called a rubber) ſerves to take off the unevenneſſes of the work left by the hammer in forging.
The baſtard-toothed file is to take out the too deep cuts and file-ſtrokes made by the rough file; the fine-toothed file takes out the cuts or file-ſtrokes the baſtard file made; and laſtly, the ſmooth file thoſe left by the fine file.
In this order the files of ſeveral cuts are to ſucceed each other till the work is as ſmooth as it can be filed; after which it may be made yet ſmoother with emery, tripoli, &c. See POLISHING.

FILIPENDULA, in *Botany*. See DROPWORT and SPIRÆA.

FILIUS *ante patrem*, q. d. the ſon before the father, a denomination applied by botaniſts and floriſts to plants whoſe flowers come out before their leaves. Such are the ſeveral ſpecies of colchicum or meadow-ſaffron, the colt's-foot, butterbur, &c.

FILIX, in *Botany*. See FERN.

To FILL, in the *Sea-language*, is to brace the ſails in ſuch a manner, that the wind, entering their cavities from behind, dilates them, ſo as to advance the ſhip in her courſe, after the ſails had been for ſome time ſhivering or braced back.

FILLAR, or THILLER, *Horſe*. See THILLER.

FILLET, in *Anatomy*. See FRÆNUM.
The word is French, *filet*, formed of *fil*, *thread*.

FILLET, or FILET, in *Architecture*, denotes a little ſquare member or ornament uſed in divers places and on divers occaſions, but generally as a ſort of corona over a greater moulding. See *Tab. Archit. fig.* 25. N°. 1.
The *fillet* is the ſame with what the French call *réglet*, *bande*, and *bandelette*; the Italians, *liſta*, or *liſtella*.

FILLET, in *Botany*. See THREAD.

FILLET, *teniola*, in *Heraldry*, a kind of orle or bordure, containing only a third or fourth part of the breadth of the common BORDURE.
It is ſuppoſed to be withdrawn inwards, and is of a different colour from the field. It runs quite round, near the edge, as a lace over a cloak.

FILLET is alſo uſed for an ordinary drawn like the bar from the ſiniſter point of the chief acroſs the ſhield, in manner of a ſcarf; though it is ſometimes alſo ſeen in the ſituation of a bend, feſſe, croſs, &c.
According to Guillim, the *fillet* is a fourth part of the chief, and is placed in the chief point of the eſcutcheon.

FILLET is alſo uſed among *Painters*, *Gilders*, &c. for a little rule or reglet of leaf-gold, drawn over certain mouldings; or on the edges of frames, panels, &c. eſpecially when painted white, by way of enrichment.

FILLETS, in the *Manege*, are the loins of a horſe, which begin at the place where the hinder-part of the ſaddle reſts.

FILLY, a term among *Horſe-dealers*, to denote the female or mare colt. See FOAL.

FILM, a thick ſkin or pellicle.
In plants it is often uſed for that thin woody ſkin which ſeparates the ſeeds in the pods, and keeps them apart.

FILM, *white*, on *the eye of a horſe*, may be removed by lifting up the eye-lid, after the eye has been waſhed with wine, and ſtroking it gently with the thumb with wheat-flour: common ſalt and ſalt of lead, beaten fine, and put into the eye, is proper to conſume a *film*; or the horſe's eye may be waſhed with the ſpittle in the morning, faſting, having firſt put a little ſalt into your mouth; but there is nothing ſo effectual as ſal ammoniac, beaten and put into the eye, and repeated every day till the *film* is gone.

FILTER, or FILTRE, in *Chemiſtry*, &c. a piece of woollen cloth, linen, paper, or other matter, ſome of which are in the form of hollow inverted cones, uſed to filtrate or ſtrain liquors through.
The *filtre* has the ſame uſe and effect with regard to liquids that the ſieve or ſearce has in dry matters.
Filtres are of two ſorts: the firſt are ſimple pieces of paper or cloth, through which the liquor is paſſed without farther trouble.
The ſecond are twiſted up like a ſkain or wick, and firſt wetted, then ſqueezed, and one end put in the veſſel that contains the liquor to be filtrated; the other end is to be out, and hang down below the ſurface of the liquor; by means hereof the pureſt part of the liquor diſtils drop by drop out of the veſſel, leaving the coarſer part behind.
This *filter* or *philter* acts as a ſiphon.

FILTER is alſo a charm, ſuppoſed to have a virtue of inſpiring love.
The word is derived from φιλτρον, which ſignifies the ſame thing, of φιλεω, *amo*, *I love*.
The Greeks, when their love was without ſucceſs, had ſeveral arts to procure the affections of their beloved. The Theſſalian women were famous for their ſkill in this, as well as other magical practices. The means whereby it was effected were of divers ſorts; it was ſometimes done by potions called φιλτρα, which are frequently mentioned in authors of both languages. Juvenal ſpeaks thus:

Hic magicus affert cantus, hic Theſſala vendit
Philtra, *quibus valeant mentem vexare mariti*.

Their operations are violent and dangerous, and commonly deprived ſuch as drank them of their reaſon. Plutarch and Cornelius Nepos report, that Lucullus the Roman general firſt loſt his reaſon, and afterwards his life by one of them. Lucretius the poet ended his life by the ſame way; and Caius Caligula, as Suetonius reports, was driven into a fit of madneſs by a *philtre* given him by his wife Cæſonia, which ſtory is mentioned by the ſame poet. Ovid likewiſe aſſures us, that this was the uſual effect of ſuch potions.
The ingredients they were made of were of divers ſorts, ſeveral of which applied by themſelves were thought effectual.

FILTRATION, the act of paſſing any liquor through a filtre, called alſo *colature*, *percolation*, and *tranſcolation*. See FILTRE.
The end of *filtration* is of two kinds; the one to free fluids from any ſolid bodies of a feculent nature with which they are mixed; and the other to ſeparate any precipitated powder or other ſolid body from ſuperfluous fluid; and the means muſt be varied accordingly. Such liquors as are incorporated with particles that adhere to them are rendered capable of *filtration* by coagulating and collecting the heterogeneous parts. This is effected either by boiling or by mixing whites of eggs and boiling them with the turbid liquors. See CLARIFICATION.
The moſt commodious way of *filtrating* is by whited-brown paper faſtened over the mouth or aperture of a funnel; the ſmallneſs of the pores of this paper admits only the finer parts through, and keeps the reſt behind.
There are alſo *filtrations* through ſand, pulverized glaſs, &c. Spirits of vitriol, ſalt, and nitre, are *filtrated* through a quantity of beaten glaſs in the bottom of a funnel.
Filtration is alſo performed by a woollen or linen bag, called Hippocrates's ſleeve: the choice of theſe muſt be directed by the liquor to be *filtered*.
Dr. Papin contrived a method by which *filtrations* through cap-paper might be made ſuddenly, and with great quantities of liquor, by the help of the air-pump. For this purpoſe he made uſe of the following contrivance: A A (*Tab.* II. *Hydraulics*, &c. *fig.* 9.) is a glaſs receiver,

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ceiver, BB a cover fitted to it, CCC is a pipe forming the communication between the receiver AA and the air-pump, DD a ſhallow veſſel full of little holes, EEE a pipe that makes the communication between the veſſel DD and the receiver AA, FF a veſſel to contain the liquor to be filtrated, and GG the plate of the pump. When this inſtrument is uſed, the ſhallow veſſel DD ought to be tied about firſt with linen cloth, and then with cap-paper, ſo that no liquor may get into the holes of the ſaid veſſel but through the cap-paper and linen cloth; this muſt be wholly placed within the liquor to be filtrated: let the air be extracted by means of the air-pump out of the veſſel AA. Then the liquor in the veſſel FF muſt be drawn through the cap-paper, and the linen cloth into the veſſel DD, and from thence through the pipe EEE into the veſſel AA; and this operation muſt be quick, on account of the great preſſure of the atmoſphere that drives the liquor; beſides, the ſediment of the liquor ſubſiding at the bottom of the veſſel FF will not be ſo apt to ſtop the pores of the cap-paper as in ordinary *filtrations*. Birch's Hiſt. of the Royal Society, vol. iv. p. 366, &c.

The ſecretion of the divers juices in the body from the maſs of blood ſeem to be little elſe but *filtration*. Pitcairn, and other late authors, hold, that the diverſity of *filtration* does not depend on the different configurations of pores, but on their different ſizes or diameters.

Springs, alſo, ſeem to be raiſed from the ocean by the ſame principle of *filtration*.

FILTRATION, in *Pharmacy*, is chiefly concerned in tinctures; as when ſome portion is drawn from the ingredients or ſuſpended in the tincture which is not neceſſary thereunto, but diſturbs and renders the reſt unpleaſant both to the palate and ſight. Beſides this, there is a *filtration* which has much tortured the philoſophy of ſome ages to account for; this is that performed by the aſcent of the finer parts of a liquor up a cord or ſkain of cotton, or ſuch like matter, which is contrived to drop over another veſſel and leave the groſſer behind.

After the ſame manner it is, without doubt, that the humidity of the earth is drawn up into the ſubſtance of the roots of vegetables, which we know conſiſts of long and very minute fibres, ſo diſpoſed as to form a great number of tubular interſtices; theſe act in the nature of this ſort of *filtre*, and attract the juices and moiſture appointed for the nutriment and increaſe of the plant.

Some ſay, that the cauſe of this aſcent is becauſe the liquor ſwells thoſe parts of the filter that touch it, by entering into the pores of the threads which compoſe it, whereby they riſe up, touch, and wet thoſe next above them; and theſe again the next threads; and ſo on to the brim of the veſſel, when the liquor runs over, and deſcends in the other part of the filter which hangs down by its own natural gravity.

But this account is liable to many objections, eſpecially as liquors riſe after the like manner in glaſs tubes much above the ſurface of the liquor they are immerſed in, where the glaſs cannot be imagined thus to ſwell.

Others account for it, by conſidering every filter as compoſed of a great number of long, ſmall, ſolid bodies, which lie very cloſe together; ſo that the air getting in between them loſes much of its preſſure, and cannot gravitate ſo ſtrongly as it doth on the fluid without them; the conſequence is, that the parts of the water between the threads of the filter muſt be preſſed upwards, and aſcend till they come ſo high, as, by their weight, to counter-balance the general preſſure on the other parts of the ſurface of the water.

Laſtly, the retainers to Sir Iſaac Newton's philoſophy deduce the phenomenon from the principle of attraction. According to them, the cauſe of this *filtration* is, doubtleſs, the ſame with that whereby fluids aſcend up heaps of aſhes, ſand, &c. the ſame with that whereby water is raiſed in form of vapour, the ſap riſes in vegetables, and the blood circulates through the capillary arteries, and the extremely minute glandular ſtrainers. See ASCENT *of fluids*.

FILTRUM, in *Natural Hiſtory*, the name of a ſtone much in uſe in the eaſtern parts of the world, and ſometimes with us for the filtrating water intended for drinking. The Japoneſe are extremely fond of this ſtone, and impute their uninterrupted health, and particularly, their being always free from the ſtone and gravel to their drinking the water thus cleared of all its heterogeneous and miſchievous particles. The people of this, and many other places thereabouts, have a ſettled opinion, that moſt diſeaſes ariſe from impurities of water, and are well aſſured, that theſe impurities are all lodged in the ſtone-filtre, and left behind by the water in its paſſage.

The manner of uſing the ſtone is this; they form a ſort of mortars with very thick bottoms out of the largeſt pieces of it, and the water is poured into theſe, and the ſtone being of a very lax and ſpungy texture, it ſoon makes its way through, and is received into a veſſel placed underneath for that purpoſe. It being found, therefore, an eaſy thing for us to have our water filtered in the ſame manner that the Japoneſe have, it remains to try whether it will have all thoſe ſalutary effects which the people of that part of the world give it; and this ſeems not to be imagined from reaſon and analogy. We very well know that water is frequently impregnated with ſaline particles, and that it alſo frequently diſſolves by this means earthy and other matters which it otherwiſe could not do. But we alſo know, that ſalts diſſolved in water are not to be ſeparated by filtration; and it is equally certain, that earthy, ſparry, or other matter, that is ſuſpended in water when clear, will in like manner paſs through the filter with it.

Upon the whole, we are happy enough to have no occaſion for filtering ſtones, ſince our ſprings and rivers afford us water already pure enough to our hands; and in places where this is not the caſe, it is always poſſible to ſave rain-water, which will keep a long time with proper management, and is much purer than all the art in the world can make ſuch as has once been foul. Valentini Muſæum Muſæorum, lib. i. cap. 22.

The only inſtance in which a filtering-ſtone can be of real uſe, is, when there is no water to be had but that of ſome muddy river; in this caſe, the mud being a foreign body not diſſolved in, but only floating among the water, it will be left behind in its paſſing the cloſe ſtructure in the filtre; but this is always to be as well obtained by letting it ſtand a while to ſubſide. Ephem. Germ. Cent. iii. p. 76.

FILUM *Aquæ*, the thread or middle of the ſtream where a river parts two lordſhips: *Et habebunt iſtas buttas, uſque ad* filum aquæ *prædictæ*. *File du mer*, *the high tide of the ſea*. Rot. Parl. 11 Hen. IV.

FIMBRIÆ, *Fringes*. The extremities or borders of the tubæ Fallopianæ were formerly thus called, the word ſignifying a *fringed border*, which that part reſembles. See *Tab. Anat. (Splanch.) fig. 9. lit. d d*.

FIMBRIATED, a term in *Heraldry*, ſignifying that an ordinary is edged round with another of a different colour.

Thus, he beareth or, a croſs-pattee gules, *fimbriated* ſable.

FIN, *Pinna*, in *Natural Hiſtory*, the name of that part of a fiſh which diſtinguiſhes it from other aquatic creatures, no animal but a fiſh having *fins* and wanting legs.

The *fin* is properly a part ſtanding out or hanging from the body of the fiſh, and conſiſting of a membrane ſupported by ſeveral rays or oblong bones, which are in ſome hard and firm, and in others cartilaginous.

This definition of a *fin* properly excludes all thoſe other parts of a fiſh which may be prominent from the body, and may be of a membranaceous ſtructure, and even bear the appearance of a *fin*, though they have none of the rays or little bony ſubſtances within them, and therefore cannot ſerve the creature in the office of *fins* in ſwimming; for the cartilages or bones which ſupport the membranes of the *fins* are what give them their due and neceſſary ſtrength and firmneſs to bear againſt the water for the motion of the body of the fiſh; thoſe other membranaceous appendages to the bodies of fiſhes cannot do this; for wanting the ſupport of theſe rays, the ſimple and ſoft membrane has no more power of moving the water than the water has of moving it. Hence appears the uſe of the bones or rays ſupporting the *fins*, and the truth of the definition, that nothing is properly a *fin* which wants them.

The *fins*, by their differences, make very obvious diſtinctions among the ſeveral ſpecies of fiſh; and theſe differences are in regard to number, ſituation, figure, and proportion.

The number of the *fins*, including the tail, is very different in different fiſh. 1. In ſome there is only one *fin* to the whole fiſh: this is the caſe in the ophidium lumbriciforme, and in the muræna. 2. The *fins* are two in number in others, as in the petromyzæ, and the like. 3. There are many which have three *fins*, as the conger, the eel, the common ophidium, the Greenland whale, the ſea-cow, and the like. 4. Many have four *fins*; of the number of which are the dolphin, the phocæna, and the ſecond kind of the acus Ariſtotelis. 5. Several have five *fins*, as the ammodytes or ſand-eel, the ſword-fiſh, the lupus marinus, the mola or ſun-fiſh, and many others. 6. The lump-fiſh gives us an inſtance of ſix *fins*; for the ſeeming firſt *fin* on the back of that fiſh is not a real *fin*, but only a cutaneous prominence. 7. Many fiſh have ſeven *fins*, as the gudgeon, the pleuronectes, the cyprinus, the clupea, the coregones, the oſmeri, the ſalmons, the cobites, the eſoces, the cernua fluviatilis, the gaſteroſteæ, the ſpari, the labri, the ſilurus,

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rus, the mugil alatus, the remora, the capriſcus, the hippurus, the pompilus, and the accipenſer. 8. Many fiſh alſo have eight *fins* each; of this number are ſome of the pearches, the clarea, the cottus, the mugil, the labrax, the ſudis, the mulli, the ling, the trachurus, the ſcyæne, the trachinus, the uranoſcope, and that little fiſh called the anguella by the Venetians. 9. The ſcorpæna of Rondeletius gives us an inſtance of the *fins* being nine in number; and finally, the ſcombri and thynni give us inſtances of eleven *fins* in the ſame fiſh.

The differences in ſituation are leſs numerous than theſe as to number, but they are not leſs obvious and eſſential. 1. They are generally placed both on the back and belly, as we ſee in moſt of the ſpecies of fiſhes. 2. They are ſometimes placed only on the back: this is the caſe in the petromyzæ, the acus lumbriciformis, and ſome others. 3. Some have them, on the contrary, only on the belly; of this kind are the Greenland whale, the ſea-cow, and the like: and to this it is to be added, that the back and belly *fins* differ greatly in the ſeveral fiſh, in their being placed more or leſs backward or forward.

The differences of ſhape or figure in the *fins* of fiſhes are alſo very obvious. 1. They are in ſome nearly triangular, as in the cyprini, and ſalmons, &c. 2. Some few fiſh have them round. And 3. Some have them of an oblong ſquare or parallellogram figure.

Finally, the difference in proportion is not to be omitted, for they are in ſome much ſhorter and ſmaller than the body, as is the caſe in the generality of fiſh; but in others they are of an equal length with the body. Of this kind are the pectoral *fins* in ſome of the legyræ, and the ventral *fins* in the mugil alatus of Rondeletius and other authors. Artedi, Ichthyol. p. 4.

FIN-*fiſh*, the *balena phyſalis* of Linnæus, is a ſpecies of WHALE, diſtinguiſhed from the common whale by a *fin* on the back, placed very low and near the tail.

The office of the *fins* has commonly been ſuppoſed to be analogous to that of feathers in fowls, and to aſſiſt the fiſh in its progreſſive motion or ſwimming; but the latter naturaliſts find this a miſtake.

It is the tail that is the greateſt inſtrument of ſwimming; the *fins* only ſerve to keep the fiſh upright, and prevent vacillation or wavering. See SWIMMING *of fiſh*.

FINS, *whale*, are commonly taken for that part of the whale which the populace call WHALE-*bone*; but whence the miſtake ſhould ariſe is not eaſy to determine.

Theſe *whale-fins*, as ſome have erroneouſly called them, are the moſt valuable part of the animal. See *Whale* FISHERY and WHALE-*bone*.

FINAL, that which terminates or comes laſt in any thing, as a *final* judgment, *final* ſentence, &c.

FINAL *cauſe*, is the end for which the thing is done. The *final cauſe* is the firſt thing in the intention of a perſon who does a thing; and the laſt, in the execution. See CAUSE.

FINAL *letters* are thoſe which cloſe words.

The Hebrews have five *final* letters, which, when at the end of a word have a different figure from what they have at the beginning or in the middle thereof. Theſe are the ך, ם, ן, ף, ץ, *caph*, *mem*, *nun*, *pe*, *tſdae*, which every where but at the end of words, are wrote כ, מ, נ, פ, צ.

FINANCES, in the *French Polity*, denote the revenues of the king and ſtate; much the ſame with the treaſury or exchequer of the Engliſh, and the fiſcus of the Romans. The word is derived from the German, *finantz*, *ſcraping*, *uſury*; though Du-Cange chooſes rather to deduce it from the barbarous Latin, *financia*, *præſtatio pecuniaria*.

FINANCES, *council of the*, correſponds to our lords commiſſioners of the treaſury; the comptroller general of the *finances*, to our lord high treaſurer, &c.

The French have a peculiar kind of figures or numeral characters, which they call *chiffre de finance*. See CHARACTER.

FINANCES, *Britiſh*. See FUND.

FINCH, in *Ornithology*. See FRINGILLA.

FINDERS, in our *Old Statutes*, are ſuppoſed to be the ſame with thoſe we now call ſearchers, who are employed for the diſcovery of goods imported or exported without paying cuſtom. Stat. 18 Ed. III. 14 Ric. II. 17 Ric. II. &c.

FINDER, among *Sportſmen*. See *Water*-DOG.

FINDING *of a bill of indictment*, in *Law*. See INDICTMENT.

FINE, that which is pure, and without mixture. The term is particularly uſed in ſpeaking of gold or ſilver. See GOLD and SILVER.

FINE, in *Law*, denotes a covenant made before juſtices, and entered on record, for conveyance of lands, tenements, or any thing inheritable, being *in eſſe tempore finis*, in order to cut off all future controverſies.

A *fine*, then, appears to be a concord, acknowledged and recorded before a competent judge, touching ſome hereditament or thing immoveable that was in controverſy between the parties to the ſame concord; and for the better credit of the tranſaction, it is ſuppoſed to be made in the preſence of the king, becauſe levied in his court.

Hence it binds women covert, being parties, and others whom ordinarily the law diſables to tranſact, only for this reaſon, that all preſumption of deceit or evil-meaning is excluded where the king and his court of juſtice are ſuppoſed to be privy to the act.

Originally this *final* concord was inſtituted and allowed, in regard that by the law and ancient courſe of proceedings, no plaintiff could agree or end the cauſe without licence of the court: ſo that *fines* have been anciently levied in perſonal actions, and for no greater a ſum of money than 11*l*.

But time has produced other uſes of *fines*, viz. to cut off entails, bar dowers, and with more certainty to paſs the intereſt or title of any land or tenement, though not controverted, to whom we think good, either for years or in fee; inſomuch, that the paſſing a fine in moſt caſes now is but a *fictitio juris*, ſuppoſing an action or controverſy, where, in truth, none is, and ſo not only operating as a preſent bar and concluſion againſt the cognizor or perſon who paſſes the *fine*, and his heirs; but at five years end, againſt all others, not expreſsly excepted, and not claiming (if it be levied upon good conſideration, and without covin); as women covert, perſons under twenty-one years, priſoners, or ſuch as are out of the realm at the time of its acknowleging; and perſons *non ſanæ memoriæ*, who are allowed the ſame time after their malady is removed.

To this purpoſe a *fine* after the engroſſing muſt be openly read and proclaimed in the court of common pleas, once in the term when they were engroſſed, and once in each of the three ſucceeding terms, and a tranſcript of it ſent to the juſtices of aſſize, and another to the juſtices of the peace of the county where the land lies, to be proclaimed there. The day and year of acknowleging a *fine* and warrant of attorney for ſuffering a recovery are to be certified with the concord; and an office hath been appointed for the inrollment of writs for *fines*; and the chirographer, on the firſt day of every term, is to fix in the court of C. B. or common pleas, a table containing the *fines* paſſed in the term before in every county, by ſtat. Eliz. cap. 3.

Every *fine* hath in it five eſſential parts: 1. An original writ, uſually a writ of covenant. 2. The king's licence, giving the parties liberty to accord; for which he hath a *fine* called the *king's ſilver*, being accounted part of the crown revenue. 3. The concord itſelf, which begins thus, *Et eſt concordia talis*, &c. 4. The note or abſtract of the *fine*, beginning thus, K. *inter* R. *querentem*, & S. & T. *uxorem ejus deforcientes*, &c. (where inſtead of *deforcientes*, anciently *impedientes* was uſed). 5. The foot of the *fine* (*Hæc eſt finalis concordia facta in curia domini regis apud Weſt. a die Paſchæ in quindecim dies, anno*, &c.) concludes all, containing the day, year, and place, and before what juſtice the concord was made.

Fines are either with proclamations, called *fines* according to the ſtatutes, which are the beſt ſort, and moſt uſed; or without proclamations, called *fines* at the common law.

Fines are either *ſingle* or *double*.

FINE, *ſingle*, is that by which nothing is granted or rendered back again by the cogniſees to the cogniſors, or any of them.

FINE, *double*, contains a grant and render-back, either of ſome rent, common, or other thing out of the land, or of the land itſelf, to all or ſome of the cogniſors for ſome eſtate, limiting thereby remainders to ſtrangers not named in the writ of covenant.

In this kind of *fine* called *ſur* DONE, grant and render, both the *fines ſur cognizance*, &c. and *ſur conceſſit*, are formed into one; and it is partly executed and partly executory.

Sometimes alſo a *double fine* is when the lands lie in ſeveral counties.

Fines, with regard to their effect, are divided into *executed* and *executory*.

FINE *executed*, is ſuch as of its own force gives a preſent poſſeſſion (at leaſt in law) to a cogniſee; ſo that he needs no writ of *habere facias ſeiſinam* for execution of the ſame; of which ſort is a *fine ſur cogniſance de droit come ceo*, &c. that is, upon acknowlegement, that the thing mentioned in the concord is *jus ipſius cogniſati, ut illa quæ idem habet de dono cognitoris*. Weſt. § 51. K.

The reaſon is, becauſe this *fine* paſſeth by way of releaſe of a thing which the cogniſee hath already (at leaſt by ſuppoſition) by virtue of a former gift to the cogniſor, which is, in truth, the ſureſt *fine* of all.

FINES *executory*, are ſuch as of their own force do not execute

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cute or give the poſſeſſion to the cogniſee without entry or action, but require a writ of *habere facias ſeiſinam*; as a *fine ſur cogniſance de droit tantum*, unleſs the party be in poſſeſſion of the lands. This kind of *fine* is commonly made uſe of to paſs a reverſion. There is alſo another executory *fine*, called *ſur conceſſit*, which is uſed to grant away eſtate for life or years, when the cogniſor is ſeiſed of the lands contained therein, and the cogniſor hath no freehold in it, but it paſſeth by the *fine*.

Fines in England are now levied in the court of common pleas at Weſtminſter, in regard to the ſolemnity thereof, ordained by the ſtatute of 18 Ed. I. ſtat. 4. before which time they were ſometimes levied in the county-court, court barons, and in the exchequer, as may be ſeen in Origines Juridiciales, &c.

Fines, are alſo taken by commiſſioners in the country, impowered by *dedimus poteſtatem*. 15 Ed. II. ſtat. *de fin.* Though by the common law all *fines* were levied in the court. *Fines* levied before the juſtices in Wales, or in the counties palatinate of Cheſter, Durham, &c. have the ſame effect as thoſe that are levied before the juſtices of C. B. Plowden ſays, that there were *fines* levied before the Conqueſt: Fulbeck aſſures us alſo, that he has ſeen the exemplification of one of Henry the Firſt's time; though Dugdale affirms, there were none till Henry the Second.

FINE *adnullando levato de tenemento quod fuit de antiquo dominico*, a writ directed to the juſtices of C. B. for diſannulling a *fine* levied of lands in ancient demeſne to the prejudice of the lord. Reg. Orig. 15.

FINES *for alienation*, are reaſonable *fines* formerly paid to the king by his tenants in chief, for licence to alienate their lands; according to the ſtatute 1 Edw. III. cap. 12. but taken away by ſtatute 12 Car. II. cap. 24.

FINE *capiendo pro terris*, &c. a writ lying where a perſon upon conviction of any offence by jury hath his land and goods taken into the king's hands, and his body is committed to priſon, to be remitted his impriſonment, and have his lands and goods re-delivered him on obtaining favour for a ſum of money. Reg. Orig. 142.

FINE, *force*, is an expreſſion in ſtat. 35 Hen. VIII. cap. 12. denoting that a perſon is *forced* to do that which he can in no way avoid.

FINE *levando de tenementis tentis de rege in capite*, &c. a writ directed to the juſtices of the common pleas to admit of a *fine* for the ſale of land holden of the king *in capite*. Reg. Orig. 167.

FINE *non capiendo pro pulchre placitando*, a writ to inhibit officers of courts to take *fines* for fair pleading. Reg. Orig. 179.

FINE *pro redisſeiſina capienda*, &c. a writ lying for the releaſe of one impriſoned for a redisſeiſin, on payment of a reaſonable fine. Reg. Orig. 222.

FINES *le roy*, in *Law*, are all *fines* to the king. Under this head are included *fines* for original writs. Thus, for every writ of plea of land, if it be not of right patent, which is for the yearly value of five marks, and for all original writs in debt and treſpaſs where the debt or damage is 40*l.* a *fine* is due to the king of 6*s.* 8*d.* and more proportionably when the writ is for greater value.

FINE alſo, according to Cowel, ſignifies a ſum of money paid as an income for lands or tenements let by leaſe, anciently called *gerſuma*.

FINE, is alſo uſed to denote an amends, pecuniary puniſhment, or recompence, for an offence committed againſt the king and his laws, or againſt the lord of a manor.

In which caſe a man is ſaid, *facere* finem *de tranſgreſſione cum rege*, &c.

In all the diverſities of the uſe of the word *fine*, it hath but one ſignification; and that is, a *final* concluſion, or end of differences between parties. In the laſt ſenſe, where it denotes the ending and remiſſion of an offence, it is uſed by Bracton, who ſpeaks of a *common fine* that the country pays to the king for falſe judgments or other treſpaſſes, which is to be aſſeſſed by the juſtices in eyre before their departure, by the oaths of knights and other good men, upon ſuch as ought to pay it.

There is alſo a *common fine* in courts leet.

FINE-*drawing*, or *rentering*, a very nice way of ſewing up or rejoining the parts of any cloth, ſtuff, or the like, torn or rent in the dreſſing, wearing, &c.

It is prohibited to *fine-draw* pieces of foreign manufacture upon thoſe of our own, as has formerly been practiſed.

FINE-*ſtiller*, in the *Diſtillery*. That branch of the art which is employed on the diſtilling the ſpirit from treacle or other preparations or recrements of ſugar, is called *fine-ſtilling*, by way of diſtinction from malt-ſtilling; and the perſon who exerciſes this part of the trade is called a *fine-ſtiller*.

The operation in procuring the ſpirit from ſugar is the ſame with that uſed in making the malt ſpirit; a waſh of the ſaccharine matter being made with water from treacle, &c. and fermented with yeaſt. It is uſual to add in this caſe, however, a conſiderable portion of malt, and ſometimes powdered jalap, to the fermenting backs. The malt accelerates the fermentation, and makes the ſpirit come out the cheaper, and the jalap prevents the riſe of any muſty head on the ſurface of the fermenting liquor, ſo as to leave a greater opportunity for the free acceſs of the air, and thus to ſhorten the work, by turning the foamy into a hiſſing fermentation. Shaw's Lect. p. 220.

FINERS *of gold and ſilver*, are thoſe who purify and part thoſe metals from other coarſer ones by fire and acids.

They are alſo called *parters* in our old law-books, and ſometimes *departers*.

FINERY, in the *Iron-works*, is one of the two forges at which they hammer the ſow or pig iron.

Into the *finery* they firſt put the pigs of iron, placing three or four of them together behind the fire, with a little of one end thruſt into it; where, ſoftening by degrees, they ſtir and work them with long bars of iron, and expoſe at different times different parts to the blaſt of the bellows, in order to refine it as equally as poſſible, till the metal runs together with a round maſs or lump, which they call a *half*-BLOOM. They then take this out, and give it a few ſtrokes with their ſledges; afterwards they carry it to a great heavy hammer, raiſed by the motion of a water-wheel; where, applying it dexterouſly to the blows, they preſently beat it out into a thick ſhort ſquare. This they put into the *finery* again, and heating it red-hot, they work it out under the ſame hammer till it comes to be in the ſhape of a bar in the middle, but with two ſquare knobs at the ends, which they call an ANCONY. It is then carried into the other forge, called the CHAFERY. Phil. Tranſ. N° 137. or Abr. vol. ii. p. 559.

FINEERING. See VENEERING.

FINESSE, a French term, of late current in Engliſh. Literally, it is of no farther import than our Engliſh *fineneſs*; but among us it is chiefly uſed to denote that peculiar delicacy or ſubtlety perceived in works of the mind, and the niceſt and moſt ſecret and ſublime parts of any ſcience or art.

It is ſometimes uſed to expreſs that kind of ſubtilty made uſe of for the purpoſes of deception.

FINGERS, *Digiti*, the extreme part of the HAND, divided into five members.

The *fingers* conſiſt of fifteen bones, diſpoſed in three rows or ranks, each *finger* having three bones.

The joints or jointures are called *condyli* and *internodia*; and their arrangement or rows, *phalanges*; the uppermoſt of which is the longeſt and largeſt; the ſecond leſs, but yet longer and larger than the third.

The firſt *finger* is called the *pollex* or the THUMB; the ſecond, *index*, ſometimes *ſalutarius digitus*, and ſometimes *numerans*; the third, the middle *finger*, *infamis*, *obſcœnus*, *impudicus*, and *famoſus*, becauſe uſed in mocking and deriſion; the fourth, *annularis*, the ring *finger*, *medio proximus* and *medicus*, becauſe the ancients uſed to ſtir and mix their medicines therewith; the fifth, the little *finger*, *auricularis*, becauſe the ear is picked therewith.

FINGERS, *bones of the*. The phalanges of the bones of the four *fingers* are all of nearly the ſame ſtructure, differing only in ſize. The firſt phalanges are made nearly in the ſame manner with the ſecond of the thumb, only that they are lower on their concave ſides, and more rounded at their convex ſides. They are alſo larger in proportion; and the edges of the flat ſides have the ſame rough line as the ſecond phalanx of the thumb. Their baſes are more hollow for their articulations with the metacarpal bones, and their heads are formed like pullies. The ſecond phalanges are ſhorter, narrower, and thinner than the firſt; both phalanges are gently incurvated, and reſemble each other in ſtructure, except that the ſecond contract by degrees from their baſes to the heads, which are very ſmall, and that their bones have a double cavity for their articulation by ginglymus, with the heads of the firſt phalanges. Their flat ſides have all the before mentioned rough lines. The third phalanges are in every thing like that of the thumb (which ſee) but that they are ſmaller, each of them being proportioned to the *fingers* they belong to. It is to be obſerved of all the phalanges, that their baſes have ſmall tuberoſities; and their heads, except thoſe of the laſt phalanges, have on each ſide a ſort of roundiſh foſſula, bordered with ſmall eminences. Winſlow's Anatomy, p. 88.

Mr. Hunauld has given us obſervations on the ſtructure and action of ſome MUSCLES of the *fingers* in the Mem. Acad. Sciences for 1729.

FINGERS, *ſuperfluous*. Infants are often born with ſuper-

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fluous or ſuper-numerary *fingers*, which are uſually miſhapen and miſplaced; ſome of theſe are found to have nails and bones like the other *fingers*; others have none of theſe, but are mere maſſes of fleſh.

Theſe ſhould always be amputated in the infancy of the child; but if they are many in number, and the child but weakly, it may be better not to take them all off at one time, but to ſtay ſome time between each amputation, that one may be almoſt well before another is taken off. They are to be cut off with the ſcalpel or ſciſſars, and the hæmorrhage ſtopped with dry lint or with the ſame dipped in ſpirit of wine, and afterwards healed as common wounds with vulnerary balſams. Heiſter's Surgery, p. 330.

FINGERS, *carious*. The *fingers* when carious, or affected by a ſpina ventoſa, are to be amputated three ways. 1. By a pair of ſtrong ſciſſars or ſharp-edged pinchers. 2. By a chiſſel ſtruck by a leaden mallet, by which they are ſeparated at one blow; or laſtly, by dividing the next ſound joint with a ſcalpel, and drawing back a part of the ſkin to wrap over the ſtump that it may heal the ſooner; and this is the beſt method of all, as by this you are in no fear about any ſplinters of the bone being left. Heiſter's Surgery, p. 331.

FINGERS, *fractured*. When one or more of the bones in the *fingers* are broke, the ſurgeon's buſineſs is carefully to replace what has been removed, and to roll up the *finger* a little way with a narrow bandage, and then to bind it firmly to the next ſound *finger*. But it is much more proper, when the *finger* is maſhed ſo as to give no hope of a good cure, to take it off at once. Heiſter's Surgery, p. 129.

FINGERS, *luxated*. The bones of the *fingers* and thumbs are liable to luxations of each of their articulations, and that in ſeveral directions; but theſe are accidents not only eaſily diſcovered, but very eaſily remedied alſo; for the ligaments being not very robuſt, the fat and muſcles thin, and the ſinuſes of the articulations ſhallow, the extenſion is very eaſy, and the reduction of them into their former places not leſs ſo. The beſt method is to extend ſufficiently the *finger* with one hand, and to replace the luxated bone at the ſame time with the other, and to retain it ſo by a proper bandage. Heiſter's Surgery, p. 166.

FINGER's *breadth*, a meaſure, of two barley-corns in length, or four laid ſide to ſide.

FINGERY, in *Ichthyology*. See BRANLIN.

FINGITES, a name given by ſome of the barbarous writers of the middle ages to the phengites, a very tranſparent ſort of marble uſed by the Romans in building.

FINGRIGO, *Piſonia*, in *Botany*, a genus of the *polygamia dioecia* claſs. Its characters are theſe: the male flowers grow upon different plants from the fruit. The male flowers are funnel-ſhaped, the tube is ſhort; the brim is expanded, and cut into five acute parts; they have five awl-ſhaped ſtamina, which are longer than the petal, terminated by obtuſe ſummits: the female flowers are of the ſame form; they ſit upon the germen, which is ſituated under the receptacle, ſupporting a cylindrical ſtyle longer than the petal, crowned by five oblong ſpreading ſtigmas. The germen afterwards turns to an oval capſule, having five angles and one cell, containing one ſmooth, oblong, oval ſeed.

We have but one ſpecies at preſent in England, viz. the prickly piſonia, called *fingrigo* in the Weſt Indies. Theſe plants are very common in the ſavannas and other low places in the iſland of Jamaica; as alſo in ſeveral other iſlands in the Weſt Indies, where they are very troubleſome to any one who paſſes through the places of their growth, faſtening themſelves by their ſtrong crooked thorns to the clothes of perſons; and their ſeeds being glutinous and burry, alſo faſten themſelves to any thing that touches them; ſo that the wings of the ground-doves and other birds are often ſo loaded with the ſeeds as to prevent their flying, by which means they become an eaſy prey. Miller.

FINING. See REFINING.

FINING *of wines*. The uſual method of *fining* down wines, ſo as to render them expeditiouſly bright, clear, and fit for uſe, is this: take an ounce of iſinglaſs, beat it into thin ſhreds with a hammer, and diſſolve it by boiling in a pint of water; this when cold becomes a ſtiff jelly. Whiſk up ſome of this jelly into a froth with a little of the wine intended to be fined, then ſtir it well among the reſt in the caſk, and bung it down tight; by this means the wine will become bright in eight or ten days. This method, however, is found to be beſt ſuited to the white wines; for the red ones, the wine coopers commonly uſe the whites of eggs beat up to a froth, and mixed in the ſame manner with their wines. The method by which theſe viſcous bodies act in the operation is this; they entangle themſelves among the flying lee or light fæculencies that float in the wine, and thus forming a maſs ſpecifically heavier than the wine, they ſink through the body thereof like a net, carrying down all the foulneſs they meet in the way to the bottom; but when the wine is extremely rich, ſo that its ſpecific gravity is greater than that of the maſs formed by the ingredients uſed in *fining* and the dregs or lee; this maſs then riſes upward, and floats at the ſurface of the wine, which will in this caſe alſo draw off fine. See CLARIFICATION and FORCING.

FINIRE, in *Law*, was uſed to fine, or pay a fine upon compoſition and making ſatisfaction. It is the ſame with *finem facere*, mentioned in Leg. Hen. 1. cap. 53.

FINISHING, in *Architecture*, &c. is frequently applied to the CROWNING or ACROTERIA over a piece of building, placed there to terminate and finiſh it.

FINITE, ſomething bounded or limited, in contradiſtinction to infinite.

The ſchoolmen make two kinds of *finite*.

The one as to *extenſion*, which is applied to things that have not all poſſible or conceivable extenſion.

The other as to *perfection*, applied to things which have not the laſt perfection.

To get an idea of a thing *finite* in point of perfection, we firſt conceive the thing as having certain perfections; and then conceive ſome other perfection which it has not, or ſome perfection in a farther degree.

After the ſame manner I conceive a room to be *finite*, by having an idea of extenſion beyond what is contained therein.

FINITO, in the *Italian Muſic*. A CANON or FUGUE is ſaid to be *finito* when it is not perpetual; but when at ſome certain places all the parts join or unite, after having followed one another for ſome time.

FINITOR, in *Aſtronomy*, the HORIZON; thus called, becauſe it finiſhes or bounds the ſight or proſpect.

FINNIKIN, the name of a particular ſpecies of pigeon, called by Moore the *Columba in gyrum flectens*. It is of the ſhape and ſize of the common pigeon. The crown of its head has ſomething of the reſemblance of a ſnake's head; and it is gravel-eyed, and has a tuft of feathers on the hinder part of its crown, which runs down its neck not unlike a horſe's main. It is not feather-legged, and is in colour always either a black or blue pied.

They have their name from their ſingular manner of courting the female, which is always by riſing over her, and making three or four turns, flapping the wings, and then turning as many times round the other way.

FINOCHIA, in *Gardening*, the name of a plant which has of late years been introduced into the Engliſh gardens, and cultivated as a ſallad herb. See FENNEL.

The culture of it is this: good ſeeds muſt be firſt procured from Italy, for thoſe of Engliſh ripening are very apt to degenerate. In March ſome of theſe ſhould be ſowed for the firſt crop on a light rich earth, and in a warm ſituation. The manner of ſowing theſe ſeeds is firſt to rake the bed very ſmooth, then draw a ſmall rill along it, and in this ſcatter them pretty thin, for the plants are not to ſtand nearer than ſix inches to one another; cover this with half an inch of earth, and at the diſtance of eighteen inches make another rill, and ſo on throughout the bed. In about a month the plants will come up, and they muſt be then cleared of weeds, and cut up to four inches diſtance; a month after this they muſt be thinned to ſix or ſeven inches diſtance; the ſtalks will now begin to ſwell to a large bulk juſt above the ground, this part muſt be earthed up in the manner of celery about a fortnight before it is uſed, which will make it eat very tender and criſp.

A ſecond crop ſhould be ſown three weeks after the firſt; and in that manner till July: every three weeks or month a new crop ſhould be ſown, to keep a conſtant ſupply for the table. The crops ſown in the hotter weather ſhould be watered and ſhaded from the great heats. Miller.

FINSCALE, an Engliſh name for the river fiſh, more uſually called the RUDD, the *rutilus latior*, or *rubellio fluviatilis* of authors.

FINTO, in the *Italian Muſic*, ſignifies a feint, or an attempt to do ſomething, and not to do it; as *cadenza finta*, is when having done every thing proper for a true cadence, inſtead of falling on the right final, another note, either higher or lower, is taken, or perhaps a pauſe brought in.

FIOL, or FIAL. See PHIAL.

FIR-*tree*, *Abies*, in *Botany*, a genus of the *monoecia monadelphia* claſs. To this genus Linnæus refers the pine and larch trees, making them as well as the *fir-tree* only different ſpecies of the PINUS. Its characters are theſe: there are male and female flowers on the ſame tree; the male flowers are produced at remote diſtances from the cones on the ſame tree; they are compoſed of many ſtamina ſupporting great ſummits, and diſpoſed in a conical ſpike. The female flowers are collected in a ſcaly cone, each

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each ſcale covering two flowers, having no petals; but from the embryo there ariſes a ſingle ſtyle, covered with a blunt ſtigma; which embryo afterwards turns to an oblong ſeed or nut, incloſed between the pales of the cone, each ſcale having commonly two ſeeds under it. The diſtinguiſhing character of this genus is, that the leaves ariſe ſingly from their baſe, whereas the pines have two or more riſing from the ſame point. There are nine ſpecies now in the Engliſh gardens. The moſt common are the ſilver or yew-leaved *fir-tree* and the pitch-tree, or the Norway or ſpruce *fir*. The firſt grows in great plenty about Straſburgh and other parts of Germany, from whence the turpentine is brought to England; but the moſt beautiful of theſe trees grow on mount Olympus. The ſecond ſort is common in the woods of Norway, and affords the white deals. Of this tree there are two or three varieties; from this the pitch is drawn, whence its name. There are two ſpecies natives of America, one called the black ſpruce *fir*, and the other the white ſpruce *fir*, becauſe the leaves of both are uſed indifferently for making of SPRUCE-*beer*. Theſe two ſpecies alſo yield a fine clear ſtrong-ſcented turpentine, which the native Indians uſe to cure green wounds, and for ſome internal diſorders. The phyſicians of North America have lately adopted it into their practice. There is another ſpecies the native of America, called the balm of Gilead *fir*, becauſe it affords a clear fragrant turpentine, commonly ſold in England for the balm of Gilead.

The manner of propagating *fir*, pines, and other trees of that kind from ſeeds is this: the ripe cones of theſe trees are to be either expoſed to a gentle heat, or ſoaked for twelve hours in warm water; after which the ſeveral cells will open, and the ſeeds fall out.

Theſe ſeeds ſhould never be taken out till the time of ſowing them, which is the latter end of March. The ground they are to be ſown in muſt be carefully turned ſeveral times to deſtroy the roots of weeds. For a large plantation, this is beſt done by ploughing ſeveral times; after this, the earth is to be levelled with a ſpade in ſmall ſpots at every ſix feet ſquare; in each of which ſpots ten or twelve ſeeds are to be ſown, and covered with ſome of the ſame mould broken fine, but not ſifted; then they are to be covered with a furze buſh or other ſuch covering; and this is to remain for ſome time after the plants are come up, but they muſt not be covered too cloſe by it; when this covering is taken off, a little looſe earth is to be drawn about the ſtems of the plants, and a little furze ſtuck about them, to keep off the too great heat of the ſun. Uſually from twelve ſeeds there are eight plants or thereabouts, and theſe may be left ſtanding together till the third year. In March or April, the third year after ſowing, the plants are to be removed to the place where they are to ſtand, and planted at eight foot ſquare diſtance, or greater, if deſired. Two plants ſhould, however, be left in the plantation in each cluſter, and great care taken not to injure the roots of theſe. The others alſo muſt be taken up with as much earth about their roots as poſſible. When they are ſet in the new plantation, there muſt be ſtakes fixt near them to tie them to, that the wind may not blow them down, and the roots muſt be covered with litter, and they muſt have a gentle watering to ſettle the earth to their roots. If the weather prove very dry, this may be repeated two or three times, but a little at a time; over-watering kills all new-ſet trees; and the cutting away of the heads or branches of thoſe of the reſinous kind is a very dangerous thing.

The Scotch pine delights in a chalky ſoil on the ſide of a hill, but will alſo grow in gravel, and in any ground that is not too wet.

The common *fir* loves a loamy ſtrong ſoil, and is a native of low flat grounds; and moſt of the American *firs* and pines love a looſe moiſt ſoil. The ſilver *fir*, and the manured pine, love a dry ſituation, but muſt have a deeper ſoil than the Scotch pine, and muſt be ſheltered from the north winds. The two trees left in each ſpot of the place where they were ſown may be left together ſeven years, then the leaſt flouriſhing tree is to be carefully removed. Miller.

FIR, *moſs, upright*. See LYCOPODIUM.

FIR, *Scotch*, in *Botany*. See PINE.

FIRDFARE. See FERDFARE.

FIRDWITE. See FERD-WIT.

FIRE, in *Phyſiology*. The moſt univerſal and ſenſible character of *fire*, and that which beſt defines and diſtinguiſhes it from every other thing, is, its giving heat.

Fire, therefore, may be generally defined to be whatever warms or heats bodies.

Again, as heat is ſomething whoſe preſence we beſt perceive by the dilatation of the air, ſpirit, or mercury in the thermometer; *fire* may be defined to be that whoſe preſence we perceive by the expanſion of theſe in the thermometer.

Whence it follows, that *fire* is an elaſtic body, compoſed of infinitely ſmall particles, ſcarcely if at all adhering to each other, and a body in motion. Its motion is argued from its expanding the air, which is not effected without communicating motion thereto; and its corporeity is proved by experiment. For pure mercury being incloſed in a phial with a long neck, and kept in a gentle heat for the ſpace of a year, is reduced into a ſolid; and its weight is conſiderably increaſed; which increaſe, ſome have ſuppoſed, can ariſe from nothing but the acceſſion of *fire*. See the ſequel of this article, and CALCINATION.

Its ſolidity is alſo evinced by its reflection from burning-glaſſes: the ſmallneſs of its conſtituent particles by the facility with which it penetrates any body however denſe, or ſeparates itſelf from any ſuch body.

Fire makes one of the vulgar or peripatetic elements, defined to be hot and dry; or it is that part or ingredient in all bodies which is hot in the higheſt degree, and dry in an inferior one.

What the ſchool-philoſophers add farther as to the nature of *fire*, is, that it is a ſimple body, as not including any contrariety of qualities; and a body abſolutely light, as tending naturally upward; for which reaſon they hold its natural place to be above all the other elements, between the extremity of our atmoſphere and the moon; and the fund of *fire* is ſuppoſed to reſide in that ſphere, which they call *elementary fire*.

Fire, according to the Carteſians, is an aſſemblage of the more ſolid, earthy particles, which, ſwimming in the rapidly fluid matter of the firſt element, become vehemently agitated thereby; and by this intenſe agitation or motion are diſpoſed to give the ſenſation of heat, light, &c.

Fire, according to Sir Iſaac Newton, is a body heated ſo hot as to emit light copiouſly; for what elſe, ſays that philoſopher, is red-hot iron, but *fire?* And what elſe is a *fiery* coal than red-hot wood? By which he ſuggeſts, that bodies which are not *fire* may be changed and converted into *fire*.

It is a diſpute of ſome ſtanding among philoſophers, whether *fire* be any ſpecific ſubſtance, originally diſtinct from all other; or whether it be of the common matter of other bodies, only under certain peculiar modifications; i. e. whether *fire* be ſuch by its own nature, or by motion? See HEAT, under which article the reader will find this controverſy more largely ſtated and explained. See alſo *Theory of* ELECTRICITY and PHLOGISTON.

According to ſome of the lateſt philoſophers, *fire* is a certain ſubſtance or body, *ſui generis*, originally ſuch, and not producible by any motion or alteration of other bodies.

Theſe authors deſcribe *fire* as a very ſubtle, moveable, penetrating body, the cauſe or inſtrument of HEAT and LIGHT.

Some of them add, that when *fire* enters the eye in right lines it produces or excites the idea of light, which rectilinear motion they account abſolutely neceſſary to the idea of light.

Whereas, to produce heat, and the other effects of *fire*, ſuch rectilinear motion is not required; but on the contrary, an irregular, various motion is fitter to produce the ſame.

Others diſlike the uſe of the term *fire* as a conſtituent principle of natural bodies, becauſe in the general application of it heat has alſo been included; and therefore the term has become ambiguous, and it is neceſſary to diſtinguiſh continually between *fire* in a ſtate of action and inactive or quieſcent *fire*. They have, therefore, preferred the term PHLOGISTON for denoting one and the ſame unknown cauſe of certain well known effects. Prieſtley's Exp. and Obſ. &c. vol. i. p. 282, &c.

The nature of *fire* is ſo wonderful and abſtruſe, that the ancients generally revered it as a god: among the moderns we can ſcarce name one point in all philoſophy of more importance, or one that is leſs underſtood.

Fire, in effect, is the univerſal inſtrument of all the motion and action in the univerſe; without *fire* all bodies would become immoveable; as in a ſevere winter we actually ſee our fluids become ſolid for want thereof. Without *fire* a man would harden into a ſtatue, and the very air would cohere into a firm rigid maſs.

Fire, then, is the univerſal cauſe of all mutation or change; for all mutation is by motion, and all motion by *fire*.

Several authors have laboured to ſet this grand agent in its juſt light; and particularly the excellent Boerhaave, in a new courſe of experiments and lectures expreſsly on the ſubject, De Igne. The ſum of his doctrine we ſhall here ſubjoin:

Fire, then, is diſtinguiſhed into two kinds; as it is in itſelf

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itſelf called *elementary fire*; and as it is joined with other bodies, called *culinary fire*.

FIRE, *pure* or *elementary*, is ſuch as exiſts in itſelf, which alone we properly call *fire*, and has lately been denominated abſolute HEAT.

FIRE, *common* or *culinary*, is that exiſting in ignited bodies, or excited by the former in combuſtible matters, the minute particles whereof joining with thoſe of the pure *fire* conſtitute pure flame.

This latter is improperly called *fire*, in regard only a ſmall part of it is real or pure *fire*.

Pure *fire* is ſuch as collected in a burning-glaſs yields no flame, ſmoke, aſhes, or the like; conſequently, in ignited bodies, that which flames, ſmokes, &c. is not ſimply *fire*.

The effects, nature, properties, &c. of each ſhall be conſidered: 1. *Pure* or *elementary fire* of itſelf is imperceptible, and only diſcovers itſelf by certain effects which it produces in bodies, which effects are only learnt by obſerving the changes that ariſe in thoſe bodies.

The firſt effect of *elementary fire* on bodies is heat, which ariſes wholly from *fire*; and in ſuch manner as that the meaſure of heat is always the meaſure of *fire*, and that of *fire* of heat. So the heat is inſeparable from *fire*.

The ſecond is dilatation in moſt ſolid bodies, and rarefaction in all fluids.

That both theſe are inſeparable from heat, is evident from numerous experiments. An iron-rod or bar being heated, increaſes in all its dimenſions; and the more ſo as it is farther and farther heated: upon expoſing it to the cold again, it contracts, and returns ſucceſſively through all the degrees of its dilatation till it arrives at its firſt bulk, being never two minutes ſucceſſively of the ſame magnitude. See HEAT and PYROMETER.

The like is obſerved in the heavieſt of all bodies, gold, which, when fuſed, takes up more ſpace than before; ſo mercury, the heavieſt of all fluids, we have known to aſcend in a narrow tube over the *fire* to above thirty times its height.

The laws of this expanſion are, 1. That the ſame degree of *fire* rarefies fluids ſooner, and in a greater degree than it does ſolids. Without this the thermometer would be of no uſe, ſince the cavity of the tube would then be dilated in the ſame propoprtion as the fluid is rarefied. 2. The lighter the fluid, the more it is dilated by *fire*. Thus air, the lighteſt of all fluids, expands the moſt; and next after air, ſpirit of wine. See THERMOMETER.

Some ſubſtances are capable of a greater dilatation or diminution of their ſpecific gravity than others by *fire*. Thus, certain matters are ſo much rarefied by even a moderate heat, that they ſeem to loſe all their ſpecific gravity, or become at leaſt ſpecifically lighter than all the ſurrounding bodies; hence theſe ſubſtances, when heated to a certain degree, are raiſed as bodies would be without gravity. All ſubſtances which have this property are called in general volatile ſubſtances. See VOLATILISATION. Other bodies are ſo little dilatable by *fire* relatively to their denſity, that the greateſt heat which can be given them produces almoſt an inſenſible diminution of ſpecific gravity. Theſe, being almoſt unalterable in this reſpect by *fire*, are called fixed bodies. See FIXITY.

The third effect of *fire* on bodies is motion; for *fire*, in warming and dilating bodies, muſt of neceſſity move their parts.

In effect, all the motion in nature ariſes from *fire* alone; and, taking this away, all things become immoveable. Upon the abſence of only a certain degree of *fire*, all oils, fats, waters, wines, ales, ſpirits of wine, vegetables, animals, &c. become hard, rigid, and inert; and the leſs the degree of *fire*, the ſooner and more violently is this induration made.

Hence, if there were the greateſt degree of cold, and all *fire* were abſolutely taken away, all nature would grow into one concrete body, ſolid as gold, and hard as diamond; but upon the application of *fire*, it would recover its former mobility.

Conſequently, every diminution of *fire* is attended with a proportionable diminution of motion, and *vice verſa*.

This *fire*, whoſe effects we have been relating, needs no air or pabulum to ſuſtain or preſerve it. For putting ſome calx of tin or lead in the exhauſted receiver of an air-pump, and applying a burning-glaſs, ſo that the focus ſhall fall on the calx, the conſequence will be a vehement dilatation of the calx from the center towards the circumference, whereby the receiver will be broken into a thouſand pieces; and if a quantity of any eſſential aromatic oil be poured, *in vacuo*, upon ſpirit of nitre, there will immediately ariſe a violent *fire*, to the great danger of the by-ſtanders.

All the abovementioned effects of *elementary fire* may be increaſed divers ways, viz.

1. By attrition, or a ſwift agitation or rubbing of one body againſt another. This is apparent in ſolids; a vehement attrition of a flint and ſteel, every body knows, will produce ſparks. So alſo in fluids, cream, by long churning, to ſeparate the butter, will grow inſenſibly warm; the barometer renders this effect ſtill more diſcernible.

In effect, all the heat of an animal, ſays Boerhaave, is owing to the agitation and attrition of the parts of its juices againſt each other, and againſt the ſides of the veſſels.

The more ſolid, hard, and elaſtic, the bodies thus agitated are, the more points of contact they have; the more intenſe the force whereby they are ſtruck againſt each other is, the greater is their motion; and the quicker the returns of their ſtrokes, and the longer they are continued, the greater is the heat produced.

Thus, a piece of ſponge rubbed lightly, and for a little while againſt another, acquires no ſenſible heat; but a large heavy piece of iron briſkly rubbed againſt another in a cold ſeaſon (when bodies are the denſeſt) will preſently acquire an intenſe heat ſufficient to *fire* ſulphur, gunpowder, or the like.

So a knife whetted briſkly on a dry rough ſtone ſhall yield ſparks of *fire*; but if oil, or any other fatty matter be interpoſed, no ſenſible heat ſhall ariſe; and the points of two needles rubbed againſt each other ever ſo ſtrongly, or ſo long, will never grow warm, as only touching in a few parts.

In New Holland they produce *fire* with great facility by means of two pieces of dry ſoft wood; one of which is a ſtick about eight or nine inches long, and the other is flat; the ſtick they ſhape into an obtuſe point at one end, and preſſing it upon the other, turn it nimbly by holding it between both their hands as we do a chocolate-mill, often ſhifting their hands up, and then moving them down upon it, to increaſe the preſſure as much as poſſible. By this method they get *fire* in leſs than two minutes. Hawkeſworth's Voyages, &c. vol. iii. p. 234.

Hence, 1. The globules of the cruor or red blood driven by the force of the heart againſt each other, or againſt the ſides of the arteries, excite more heat than the globules of the ſerum, or any other humour in the animal. Hence, 2. Thoſe parts abounding moſt with theſe globules thus agitated, as the heart, liver, and head, will be the hotteſt of all others; and the denſer the blood, *cæteris paribus*, the greater the heat, &c. 3. The quicker the contractions of the heart are repeated, the greater will the heat be. For the more probable cauſe of animal heat, ſee *Animal* HEAT.

The ſecond manner of increaſing the effect of *elemental fire*, is, by throwing a quantity of moiſt or green vegetables, cut down while full of ſap, into a large heap, and preſſing them cloſe down, the reſult of which is, that they grow warm, hot, ſmoke; and finally, will break out into flame.

The third way is by the mixture of certain cold bodies. Thus, water and ſpirit of wine firſt warmed, grow much hotter by the mixture; ſo any of the heavy, aromatic oils, as of cloves, cinnamon, ſaſſafras, guaiacum, &c. mixed with ſpirit of nitre, grow exceedingly hot, and burſt forth like volcanos; and the ſame may be ſaid of ſpirit of nitre and ſteel-filings.

It is poſſible to produce *fire* and flame by the bare mixture of two cold liquors, in the following manner: take two drams of ſtrong and freſh ſpirit of nitre prepared with oil of vitriol, and putting it into a clean and dry gallipot, ſet it under a chimney, then pour to it at once of the oil of cloves one dram, there will be immediately produced a loud noiſe and a conſiderable flame; and when that is gone, a dry reſin is formed in the pot. See INFLAMMABILITY.

The like effect may be had from dry bodies. Thus, pure ſulphur and ſteel-filings, well ground, and mixed in equal quantities, with water enough to make them into a dry paſte, and laid an hour or two any where, even under ground, will ſmoke and emit flame, and that with the greater vehemence as it is more ſtrongly preſſed down.

The fourth is by PHOSPHORUS, which is a kind of fire-magnet prepared from the parts of animals, that imbibes and retains *fire* for many years.

But in all theſe ways it does not appear that any *fire* is excited or generated of what was not *fire* before; for if in a ſevere winter's day you rub a plate of gold briſkly againſt another, they will both grow hotter and hotter by degrees, till at length they become red-hot, and at the point of melting; and yet all this time the plates loſe nothing of their weight, but ſwell and grow bigger in all their dimenſions.

Hence it follows, that the particles of the gold are not converted by the friction into *fire*, but that the *fire* exiſted before; and all the effect of the friction, &c. is to collect or bring together a quantity thereof before diſperſed throughout the atmoſphere.

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In effect, there is no making or producing of *fire de novo*; all we can do is, of inſenſible, to render it ſenſible; i. e. to collect it out of a greater ſpace into a leſſer, and to direct and determine it to certain places. This is effected, as above mentioned by motion, attrition, &c.

The ſun alſo contributes very much to the bringing of *fire* to light, by means of his rapid motion round his axis, whereby the fiery particles every-where diffuſed are directed and determined in parallel lines towards certain places, where their effect becomes apparent.

Whence it is that we perceive the *fire* or heat when the ſun is above the horizon; but that when he diſappears, his impreſſion or preſſion being taken away, the *fire* continues diſperſed at large through the ethereal ſpace?

In effect, there is not leſs *fire* in our hemiſphere in the night-time than by day, only it wants the proper determination to make it perceived.

Another way of rendering it ſenſible, is, by collecting the parallel rays into a leſs compaſs, by means of convex glaſſes, or concave ſpecula. See BURNING-*glaſs*.

From theſe various ways of kindling *fire*, or producing heat in bodies, Dr. Franklin conjectures, that the *fire* exiſted in theſe bodies, though in a quieſcent ſtate, before it was by any of theſe means exerted, diſengaged, and brought forth to action and to view; and that it conſtitutes part, and even a principal part of the ſolid ſubſtance of bodies; ſo that kindling *fire* in a body is nothing more than developping the inflammable principle, and ſetting it at liberty to act in ſeparating the parts of that body, which then exhibits the appearances of ſcorching, melting, burning, &c. He alſo ſuppoſes, that particles of *fire* joined to thoſe of air and water aſſiſt in raiſing vapours. See EVAPORATION. Franklin's Letters and Papers on Philoſophical Subjects, p. 412, &c.

To the ſame purpoſe Boerhaave maintains, that this *elementary fire* is preſent every-where, in all bodies, in all ſpace, and at all times, and in equal quantities; for go where you will, to the top of the higheſt mountain, or deſcend into the loweſt cavern, whether the ſun ſhine or not, in the coldeſt winter, or the moſt ſcorching ſummer, by one or other, or all of the means above mentioned, may *fire* be collected. In a word, there is no aſſignable phyſical point without *fire*; no place in nature where the attrition of two ſticks will not render it ſenſible. So long as *fire* remains equably and undetermined in any place, it does not diſcover itſelf by any effect. In the ſevereſt weather we perceive no influence or effect of *fire*; when, at the ſame time, being collected and determined by attrition, it becomes manifeſt.

By changing *fire* out of its indeterminate ſtate, and impelling it in converging lines, its momentum is increaſed; witneſs the phenomena of burning-glaſſes.

But how attrition, crude vegetables, &c. contribute towards altering the direction, &c. of *fire*, does not eaſily appear.

On this *fire*, and the effects thereof above mentioned, depends all fluidity of humours, juices, &c. alſo all vegetation, putrefaction, fermentation, animal heat, and a thouſand other things.

2. But in what manner ſoever *fire* is collected in bodies, upon a ceſſation of the collecting cauſe, it ſoon diſappears again, unleſs it be ſupplied with a pabulum or fuel; and in this caſe it becomes *culinary fire*.

By pabulum or fuel of *fire*, we mean whatever receives and retains *fire*, and is conſumed, or at leaſt rendered inſenſible thereby.

The only pabulum of *fire* in all nature is the oil of ſulphur, or fat, or rather the phlogiſton of bodies; and bodies are only fuel, on account of the oil or phlogiſton they contain. For oil and ſulphur were names which the ancient chemiſts indiſcriminately gave to ſubſtances into the compoſition of which a great quantity of PHLOGISTON enters.

Hence, 1. All vegetables, not too moiſt, nor too dry, afford ſuch a pabulum, particularly thoſe which contain the greateſt quantity of oil, as balſamic and reſinous woods, &c. 2. All vegetable and animal coals are a proper pabulum for maintaining of *fire*, as being only the parts of vegetables and animals which have exhaled their water and ſalt, and retained the oil alone inhering in a black form in their earth. 3. All foſſil and bituminous earths, turfs, &c. 4. All mineral ſulphur, whether pure, or joined with earth, ſtone, or metals, as pit-coal, &c. 5. The fat and dung of animals. And 6. Several productions of chemiſtry, as oils, inflammable ſpirits, &c. afford alſo a pabulum for *fire*. See COMBUSTION.

This *fire* which burns combuſtible bodies requires air to ſuſtain it; which taken away, the *fire* is immediately diſſipated, as appears from the experiments, *in vacuo*; except in the caſe of ſubſtances into the compoſition of which nitre enters; for theſe will burn *in vacuo*, in fixed air, and under water, as is evident in ſome rockets which are made for this purpoſe.

And yet *fire* does not immediately bear or endure the air, but always repels it, and by that means forms a kind of vault or aerial furnace all round, which by its weight, and the preſſure of the incumbent air, acts on all the particles or corpuſcles that would make their way through it, and thus retains the *fire*, and applies it to the combuſtible matter.

Hence, the heavier the air, the more vehement the *fire*; and accordingly, in ſtill cold weather we obſerve the *fire* to act with more violence than in warm weather.

But whether the air retains *fire* by its weight alone (which water itſelf would do) may be queſtioned; and whether its elaſticity does not contribute ſomething thereto; as alſo, whether there be not ſome farther unknown property in the air that has a ſhare in this effect may be doubted. Something of this kind one would ſuſpect from hence, that all air is not proper to maintain flame. Probably air is capable of receiving only a certain quantity of the phlogiſton or inflammable principle from bodies in a ſtate of combuſtion; and when it is ſaturated, it can no longer ſerve the purpoſe of maintaining flame. See AIR, *phlogiſticated*, and PHLOGISTON.

This *fire*, in a burning combuſtible matter, affords a ſhining *fire* or flame, or both, according to the diverſity of fuel, and frequently alſo ſmoke, ſoot, and aſhes.

Shining or luminous *fire* ſeems to be *elementary fire*, attracted towards the part of the ſulphur or oil with ſuch force and velocity, as to move and ſhake them very violently, whirl them about, divide, and attenuate them, and thus render them volatile, and ready to be expelled; while in the mean time the air, making its vault all round, reſtrains and keeps them in, directs them to the ſulphur, and keeps them ſtill collected in their place or pabulum, while the combuſtible matter is diffuſed all round.

Flame ſeems to be nothing but a thick ſulphur, agitated, as before, by *elementary fire*; ſo that the *fire* is driven with a great motion around the revolving particles of the ſulphur. See FLAME.

Soot ſeems to be produced, when *fire* and ſulphur cannot break into a flame, being a ſort of coal conſiſting of a thick ſulphur, and an attenuated oil with earth and ſalt. See SOOT.

Smoke ſeems to be the combuſtible matter when it begins to be relinquiſhed by the *elementary fire*; for if this ſmoke be afterwards paſſed through a flame, it will itſelf become flame as before. See SMOKE.

Laſtly, aſhes are the earth and ſalt which the *fire* leaves untouched. See ASHES.

Fire may be diſtinguiſhed into *ſhining* and *not ſhining*; for that there is *fire* which does not emit light, is evident hence, that a piece of iron taken out of the *fire* before it be red-hot ſhall yet give *fire* to ſulphur.

Shining fire, again, may be ſubdivided into two kinds: that which warms, as red-hot iron; and that which does not warm, as that obſerved in putrid fiſhes, rotten wood, &c. the oil whereof, beginning to be agitated and attenuated, produces light without any heat, ſo far as the thermometer may be a rule of judging.

Among the number of theſe lambent or innocent flames, is the ſhining of meat at certain times. It has been uſually ſuppoſed that this was owing only to the putrefaction of the meat, and that it never ſhone till ſtinking, or nearly ſo, but experience proves the contrary. We have in the Philoſophical Tranſactions an account of a piece of veal which was obſerved to ſhine the night after it was killed, and yet when eaten the day afterwards was perfectly ſweet; and a part of it that was kept by way of experiment continued good many days after. This is not of the nature of common *fire* or flame, and not only differs in not burning, but in this alſo, that it is not extinguiſhable in water. A perſon ſtriking this piece of veal had the flame covering his whole hand, and that continuing even when he had put it under water; but the wiping it with a towel carried it all off and deſtroyed it. It is not uncommon to find the guts of hogs when dreſſed for the making what they call chitterlings, and put into the pickle, ſhine in this manner. Some of the pieces while under this management uſually ſwim on the water, and others ſink in it. Thoſe which ſwim are the only ones that ſhine. The light upon them is as bright as the ſtrongeſt moonſhine, and may be communicated to a perſon's hand by rubbing the pieces on it, where it will continue to be bright a long time without any ſenſible heat. The face and hands of a perſon being rubbed over with one of theſe ſhining pieces of the chitterling, not only appear bright and flaming, but are made to look conſiderably larger than they really are; and a perſon who had a mind to raiſe ſtories of ghoſts and apparitions might eaſily do it by covering the whole body of a man with this flame, and making him appear a *fiery* giant to all that ſaw him.

Mackrel in pickle will uſually become luminous in ſome degree a little before they ſtink, but it is rarely that the

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light is great; and when it has once happened ſo, it is not eaſy to hit the ſame again on a ſecond trial, though all the ingredients of the pickle are kept the ſame in the niceſt manner. Worms are often found luminous on their ſurfaces in oyſter-ſhells, yet the ſame worms are not always ſo; and what Pliny reports of the PHOLAS, and Reaumur has ſince found to be true, perhaps may not always hold ſo in future experiments. Philoſoph. Tranſ. N° 124. See DACTYLUS.

One of the moſt ſingular kinds of lambent *fire* is that diſcovered at certain times on the ſea-water, and on other water in which there are fiſh or other ſea productions kept. We have in the Philoſophical Tranſactions an account of ſome water in which mackrel were boiled, and afterwards kept, which became blackiſh and thick after two or three days, and then would ſparkle on the touch of a finger. The fiſh alſo were luminous, eſpecially about the gills; and the water, when ſtirred about with the hand, would appear ſo bright over the whole ſurface, that the appearance was like that of water in motion, on which the moon ſhines very ſtrongly.

In the ſame manner the ſea-water in many places will ſparkle and ſhine on the breaking its ſurface. Where a a ſhip makes a good way in the night, in many ſeas, the whole breaking of the water will appear behind it as if on *fire*, ſparkling and ſhining all the way that it moves from the diſturbance in the wake of the ſhip. Philoſ. Tranf. N° 37.

There does not always need the motion of a foreign body in the ſea to occaſion this ſort of phoſphorus, but the waves beating againſt one another will often occaſion it in great plenty; and ſometimes the waves waſhing againſt the rocks or againſt the ſhore, will yield a long courſe of light the whole night. This is no where ſo remarkable as at the Braſils; the ſhores there are often all on *fire* to appearance, from the vaſt effuſion of this luminous matter, as the waves waſh and break upon the ſhore.

This flaming and ſparkling of the ſurface of the ſea is wholly owing to the peculiar quality of the water; and in general, the thicker and fouler the ſea is, the more light it affords on being ſtirred in the night. A cloth dipped in the ſea-water will ſometimes be ſticky as if dipt in a ſolution of glue; in this caſe it will afford much brighter and more luminous ſparks in the drying; and this fat water will give much more *fire* from the motion of the ſhip than any other. In many places the ſurface of the ſea is found covered with fiery matter of a reddiſh or yellowiſh colour, looking like ſaw-duſt, and ſeeming to be the ordure or recrement of ſome ſea animals. This matter is always of a viſcous nature, and the ſea-water is viſcous and gluey wherever this is found, and gives more light on the moving than any other water. In the Northern ſeas there are ſometimes ſeen whole banks, as it were, of this matter, the ſurface of the ſea appearing wholly covered with it for ſeveral leagues; and this is often luminous all over in the night, though not ſtirred by any ſhip, or even by the motion of any fiſh. Many of the ſea fiſh have a viſcous matter about their gills, eſpecially when they have been ſome time dead. Theſe, when kept in ſea-water, have ſo much of this luminous property, that all that part appears as ſoon as taken up of the brightneſs of a flaming coal, and gives a light which it is eaſy to read by. A piece of ſtick rubbed on the gills of theſe fiſh will become luminous whereever it has touched them, and will continue ſo as long as it retains any of the moiſture, but as that dies the light will fade and go off; and it may be revived again, on touching the fiſh a ſecond time. Obſerv. ſur l'Aſie, p. 289. Jones's Abr. Philoſ. Tranſ. vol. v. part ii. p. 213. See a more particular account and explication of this phenomenon under the article *Luminouſneſs of the* SEA.

Of *ſhining*, and at the ſame time *warming fires*, the principal is that of the ſun, as it is called; though, whether the *fire* be really emitted from the body of the ſun, or whether it be only the common vague univerſal *fire* determined by the ſun, is not eaſy to ſay; this *fire* we more uſually conſider under the denomination of light.

This ſolar *fire*, in calcining certain bodies, makes ſome addition to the weight thereof.

Thus, antimony expoſed in the focus of a burning-glaſs will ſmoke a conſiderable time, and the greateſt part of it will ſeem to evaporate in fumes; but, if afterwards tried by the balance, it will be found to have gained in weight; and if it be again applied in the focus of a larger glaſs, it will again emit fumes, and yet ſtill be increaſed in weight.

Du-Clos found, that a pound of regulus of antimony, finely powdered, and expoſed to the focus of a burning-glaſs, acquired in the ſpace of an hour an increaſe of weight equal to a tenth part of the former weight: the ſame fact was alſo obſerved by Homberg with regard to antimony, and by Du-Hamel in ſeveral other minerals. Zumbachius found that lead liquified in the focus of a large ſpeculum, and afterwards calcined and converted into glaſs, gained an increaſe of weight, though part of it evaporated in ſmoke. Nor is this increaſe of weight peculiar to ſubſtances calcined by ſolar *fire*. It is well known that 100 lb. of lead calcined in a fierce *fire* yields 110 lb. of minium. Hellot, by reducing 4 lb. of zinc into a calx, obtained 3 lb. 14 ounces of very white and fine calx, 2 ounces and 2 drams of coarſer and whitiſh calx, and an ounce of earth, though in the mean while part of the metal had eſcaped in ſmoke. Geoffroy found that biſmuth acquires in calcination an increaſe of $\frac{1}{48}$th of its original weight. The calx of tin is alſo known to gain $\frac{1}{12}$th in weight. An ounce of filings of copper expoſed to a wheel-*fire* for the ſpace of three hours, and and afterwards left to cool, had acquired an increaſe of 49 grains. Iron, according to the experiments of Mr. Scheffer, publiſhed in the Swediſh Tranſactions for the year 1757, receives by complete calcination an augmentation of one third of its weight; and it has been lately obſerved by Profeſſor Brugmans, in his Obſervationes Academicæ de Affinitatibus Magneticis, publiſhed at Leyden in 1778, that a quantity of the filings of iron which weighed one ounce or 480 grains before it was expoſed to the *fire*, after eleven calcinations, increaſed in weight 140 grains; in the firſt calcination, which was the weakeſt, and in which all the filings were not red-hot in the crucible, the weight of the ounce increaſed 3 grains; in the ſecond, in which the phlogiſton was inflamed, and the whole maſs had a white heat, the weight of the ounce was increaſed during the ſpace of half an hour 34 grains; in the third, during a like interval, 50 grains; in the fourth, 18; in the fifth, 15; in the ſixth, 7; in the ſeventh, 6; in the eighth, 9; in the ninth, in a new crucible, 5; in the tenth and eleventh, in the ſame crucible, one each. From other experiments this learned profeſſor concludes, that the condition which is neceſſary in order to the augmentation of the weight of iron by *fire*, is, that the phlogiſton be previouſly conſumed; and he is of opinion, that the ſame rule holds with reſpect to the augmentation of weight in other metals. M. de Buffon, in the firſt volume of his Supplement to his Natural Hiſtory, 1774, recites ſome experiments which he had made on coherent maſſes of iron, and from which he inferred the ponderoſity of *fire*. In one of his trials he found a ball of iron which weighed 49 lb. 9 ounces when cold, to weigh when heated to a white heat 49 lb. 11 ounces, which gives an augmentation of $19\frac{1}{5}$ grains to the pound. Theſe concluſions of Buffon have been ſince invalidated by ſome experiments of Dr. Roebuck and Mr. Whitehurſt: the former uſed two accurate balances; one of which, with the weight of a pound, would turn with one-tenth of a grain; and the other with a weight of half an ounce in each ſcale, would turn with the one hundredth part of a grain. A piece of iron of nearly one pound weight having received a white heat, was found to have loſt ſcarce a grain when it was cold; and another piece of about five penny-weights weighed ſomewhat more when it was cold than when it was hot. By other experiments ſince made in the preſence of ſeveral members of the royal ſociety, it appeared, that a cylinder of iron brought to a white heat, and then weighing 55 pounds, on being ſuffered to cool, ſeemed gradually to acquire weight; and about twenty-two hours after it had begun to cool, was found to have increaſed in weight 6 penny-weight, 17 grains. The beam uſed on this occaſion was ſo nicely conſtructed, that, when it was loaded with the great weight above mentioned, the ſcale evidently turned with 4 grains.

The experiments of Mr. Whitehurſt were made with ſmall maſſes; but with a balance ſo nice as to be ſenſibly affected by the two thouſandth part of a grain. A penny-weight of gold made red-hot, and brought nearly to a ſtate of fuſion, became apparently lighter; but on cooling, its former weight was perfectly reſtored. The ſame quantity of iron likewiſe ſeemingly loſt weight on being equally heated; but its weight was viſibly augmented on becoming cold.

Mr. Whitehurſt accounts for the apparent fallacy in M. de Buffon's experiments, by ſuppoſing that the heat of the large maſs of iron employed by him had a greater effect on that arm of the beam from which it was ſuſpended than on the other; and that by expanding or lengthening the former in a greater degree than the latter, it produced the preponderancy on that ſide which M. de Buffon aſcribed to the particles of *fire* contained in the metal. Philoſoph. Tranſ. vol. lxvi. part. ii. art. 31. p. 509. art. 38. p. 575.

M. Marggraff, in his experiments on PLATINA, found, that after expoſing 2 ounces of crude platina in a ſcorifying diſh under a muffle to a ſtrong *fire* for two hours, and ſuffering it to become cold, it weighed 2 ounces and 10 grains, or one part in ninety-ſix more than it did at firſt;

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firſt; and an ounce of platina in a covered crucible, placed in a melting furnace, and expoſed between three and four hours to the ſtrongeſt *fire* of all the furnaces in his laboratory, weighed near 6 grains, or about one part in eighty more than at firſt. Acta Chemica, tom. ii. p. 113. M. Macquer put an ounce of platina into a German crucible, and expoſed it to a ſtrong *fire* for fifty hours; and on weighing the platina after the operation, it was found to be increaſed 14 grains, or allowing 576 grains to the French ounce, about one part in forty-one. The ſame platina, ſubmitted to another ſimilar operation, received a farther increaſe of 2 grains; the augmentation in all being 16 grains, or one part in 36. This increaſe of weight he ſuppoſes to be owing to the calcination of ſome heterogeneous ſubſtances mixed with the platina.

Dr. Lewis, having picked out from platina 360 grains of the larger and brighter particles, and the ſame quantity of the blackiſh duſt ſeparated from it by a ſieve, put the two parcels in two ſmooth ſcoriſying diſhes, and kept them under a muffle in very ſtrong heat for five hours, and when cold the picked platina weighed with great exactneſs was found to have gained 2 grains, or one part in 180, while the duſt was increaſed near 9 grains, or one part in 40. Comm. Philoſ. Techn. p. 462. The concluſion which ſome philoſophers have drawn from theſe experiments, and others of a ſimilar nature, is, that *fire*, by adhering to certain ſubſtances increaſes their weight, and is therefore ponderous like other bodies; an opinion which ſeems to have been ſuggeſted even by the ancients. See Lucretius, lib. ii. v. 185. But howſoever the queſtion concerning the nature and gravity of *fire* may be determined, the increaſe of weight acquired by calcined ſubſtances is moſt ſatisfactorily accounted for by the modern diſcoveries with regard to fixed air. See CALCINATION.

See on the ſubject of this article Boerhaave's Chemiſtry, vol. i. part 2. of *Fire*, and Muſchenbroek's Introd. ad Phil. Nat. tom. ii. cap. xviii. p. 609, &c. Ed. 1762.

Beſide the ſolar, there is likewiſe a ſubterraneous *fire*.

This appears in digging under-ground; for the firſt glebe next to the ſurface is warmed by the heat of the ſun, and as you go deeper you will find it colder; whence, even in hot countries, they have conſervatories of ice at ſome depth under-ground, till, arriving at a certain depth, viz. forty or fifty feet, it begins to grow warmer, ſo that no ice can there ſubſiſt; and at a yet greater depth, it is ſo hot as to take away reſpiration, extinguiſh candles, &c. and if the miner will venture farther, and carry a candle along with him, he frequently ſets the whole place in a flame, the ſulphureous fumes, rendered volatile by the ſubterraneous *fire*, catching flame from the candle.

Whence it is alleged by ſome that there is another ſource of *fire*, or, as it were, another ſun in the boſom of the earth which gives motion and life to every thing growing in or upon the globe, and even that the center of the earth is mere *fire*; which *fire* is likewiſe argued to be perpetual, from volcanos or burning-mountains, which have been known to caſt up *fire* from the earlieſt account of time. See HEAT and VOLCANO.

There are two great *fires*, therefore, the higher or ſolar, and the lower or ſubterraneous.

The effects of this laſt ſeem wholly the ſame with thoſe of the common culinary *fires*; for burnt coals, cinders, and melted minerals are thrown out by the burning mountains; and hot ſprings, ſteams, vapours, &c. are found in ſeveral parts of the globe, riſing nearly in the ſame manner as if they were produced by the heat of a common furnace. Whence there is little room to doubt but that the ſubterranean *fires* are not like the celeſtial or ſolar but the culinary.

Martin, in his Atlas, tells us, that there are pits of natural *fire* in China which are capable of dreſſing meat, but will not conſume wood; but we have no authentic teſtimony of any eye-witneſs to this ſtrange fact.

FIRE, in *Chemiſtry*, is the great inſtrument by which moſt of the operations of that art are performed.

The kind, degree, direction, &c. of *fire* are things the chemiſt is principally to attend to. The diverſity of *fire* makes a great difference in the reſult of the experiment; ſo that the ſame effect, e. gr. ſhall not ariſe, if an experiment be made with the *fire* of ſpirit of wine and that of pit-coal.

And to this cauſe Mr. Boyle, in his Treatiſe of the unexpected Failure of Experiments, attributes it, that a great many experiments ſucceſsfully tried by ſome have not ſucceeded with others.

The *fires* chiefly required by the chemiſts are ſuch as yield no fæces or remains, no ſalt nor ſmoke; and ſuch alone are thoſe of the ſun and of ſpirit of wine. Thoſe which come next in purity are oils diſtilled *per veſicam*, which loſe their earth and ſalt by their boiling and agitation in the water, ſo that the oftener the diſtillation is repeated, the purer they are rendered. After theſe the beſt is turf.

Indeed, the very manner wherein the *fire* is blown is found to have ſome effect. Thus, Acoſta, lib. iv. cap. 5. relates, that in Peru, when they would melt and ſeparate their ſilver from the earth, &c. if the *fire* be blown up with bellows, the fuſion will not ſucceed; nor will any other *fire* do but that blown by the wind raiſed from the fall of ſome water; ſo that they are forced to have recourſe to large tubes laid to the feet of large mountains, where there are cataracts to convey the wind generated by the fall of water to their works.

The degree of *fire*, or the collection and direction of *fire* to the degree proper for each operation, conſtitutes almoſt the whole art of chemiſtry.

Now the greater or leſs force of *fire* depends altogether on a greater or leſs quantity thereof collected into a focus; for as to its motion it does not ſeem in our power to alter it, or to make any increaſe or diminution of the force of the *fire* on that account.

The chemiſts in all ages have been accuſtomed to ſpeak of the degrees of *fire*, which they uſually divide into four; but very little accuracy was found on this head till the method was diſcovered of applying the thermometer of Fahrenheit to the meaſurement of the progreſs of heat by certain and invariable rules. On this baſis Boerhaave has eſtabliſhed the chemical doctrine of the power of *fire*, and divided it into ſix degrees; and theſe are the degrees of *fire* which our chemiſts allude to, when they now mention the force of *fire* in their operations.

The firſt degree is that by which nature performs the office of vegetation in plants, and by which chemiſtry imitates and does the like. This commences from the higheſt degree of cold, which in Fahrenheit's thermometer is marked at 1° and ends at 80°, ſince in this whole interval vegetables of one kind or other give indications of life and growth; ſo that if all the plants with which we are at preſent acquainted be examined by the degrees of heat contained within theſe limits, we ſhall find ſome plant or other that comes to its maturity in almoſt every one of theſe intermediate degrees.

Hence it appears probable, that a chemiſt, by duly conducting this degree of heat in an artificial ſtove might contrive to cheriſh and forward the vegetation of various plants; and in the offices of chemiſtry a furnace might be made for raiſing any degree of heat within theſe limits, on which a veſſel of water might be ſet, and a thermometer applied to it, the riſe or fall of which indicate the degree of heat required. Glaſs veſſels placed in the water thus tempered might be uſed for containing thoſe ſubſtances which are to undergo this degree of *fire*. Thus, the fragrant ſcent of roſes may be communicated to oil, by putting the inodorous and inſipid oil of olives in a tall clean chemical glaſs, and digeſting it in a heat of 56 degrees with the moſt fragrant roſes gathered juſt as they are opening in the morning: the application of a ſimilar degree of heat would impregnate alcohol with the pureſt ſpirit of ſaffron.

The ſecond degree of *fire* may be commodiouſly meaſured by the heat that is at ſome time or other obſerved in healthy bodies, and may be ſuppoſed to commence at the 40th degree of the thermometer, and to end about the 94th. Animals may ſubſiſt if their humours have any degree of heat in them between theſe limits. The eggs of inſects ſubſiſt unhurt during hard winters, and hatch in the ſucceeding ſpring. Fiſhes, both of the ſea and of rivers, live in water which is only 34 degrees warm; and fiſhes that have lungs, and all reſpiring animals in a ſtate of health, communicate to their humours a warmth of 92 degrees; and therefore, the limits of this degree are fixed at 33 and 94. Within the compaſs of this heat are included the vital actions of animals, the fermentation of vegetables, and the putrefaction both of vegetables and animals; and likewiſe the generation, breeding, hatching, birth, and nutrition of animals. Some determine the ſtandard of this heat by applying a thermometer to a hen brooding on her eggs, and by keeping a *fire* continually to this degree, chickens have been hatched. This degree of heat is employed by chemiſts to prepare their elixirs, volatile alkaline ſalts, and their tinctures. However, it appears from later obſervations, that the limits of *animal* HEAT are conſiderably greater than thoſe which the celebrated profeſſor has above ſtated.

The third degree of heat extends from the 94th degree of the thermometer to the 212th, at which water generally begins to boil. Through this ſpace the water and native ſpirits are ſeparated from all vegetables and animals, and the reſiduum becomes dry and durable. The eſſential oils of plants become volatile; the ſalts and oils in the freſh juices of animals are ſcarcely raiſed, but the juices

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juices dry into a thick, hard, brittle, inſipid, inodorous ſubſtance, which will keep for years without any conſiderable alteration. This degree of heat is for the diſtillation of oils and medicinal waters of vegetables. The ſanguineous ſerous juices of animals coagulate in boiling water into maſſes that may be cut aſunder; all their ſolids are converted into a thick tenaceous liquid, and it is conſequently deſtructive to all animals. See *Animal* HEAT.

The fourth degree of heat may be reckoned from the degree 212 to 600; within which limits all oils, ſaline lixivia, mercury, and oil of vitriol are diſtilled; lead and tin will alſo melt and mix together. The oils, ſalts, and ſaponaceous juices of animals and vegetables are rendered volatile and acrid, and become more or leſs alcaleſcent: their ſolid parts are calcined, and loſe their diſtinguiſhing qualities and proper virtues; and with this degree of *fire* foſſil ſulphur and ſal armoniac are ſublimed.

The fifth degree of *fire* is that which fumes the other metals, beginning at the degree 600, and terminating at the degree of heat capable of melting iron. Glaſs, gold, ſilver, copper, and iron remain long unchanged; all other fixed bodies become white with this heat, the fixed ſalts of vegetables and foſſils melt, loſe moſt of their oils, acquire an increaſing alcaline acrimony, and with ſand or flint are converted into glaſs. Lime-ſtones are calcined, and all other bodies either vitrify or become volatile, and are diſſipated into the air.

The ſixth and higheſt degree of *fire* is that produced either by a lens or a burning ſpeculum, which hardly any ſubſtance is able to reſiſt; and even the gold and diamond, and platina are conſiderably altered by it.

The utmoſt effect of *fire* is the vitrification of fixed bodies; and this, ſays Boerhaave, the ancient magi of the Eaſt ſeems to have been appriſed of, as they predict the deſtruction of the world by *fire*, and its mutation into tranſparent glaſs. Boerhaave by Dallow, ubi ſupra, p. 241, &c.

This laſt degree was firſt diſcovered in the year 1690 by Mr. Tſchirnhauſen, whoſe burning-glaſs rendered every thing, even gold itſelf volatile.

Beſides theſe ſix degrees, the chemiſts have ſeveral intermediate ones; all which, however, may be eaſily reduced to the former.

As the *digeſting fire*, or *venter equi*, which is the heat of a dunghill.

The *balneum Mariæ*, *arenoſum*, &c. explained under the article BALNEUM.

The *naked* or *immediate fire*, which is the common *fire* applied under a veſſel.

The *fire* of a lamp, which is moderate and equal, and may be increaſed by the addition of more wick, uſed by enamellers, &c.

The *wheel fire*, which is lighted all round a crucible or other veſſel to heat it all alike.

That called *by ſuppreſſion*, which is when the veſſel is not only encompaſſed round, but covered over with *fire*.

The *reverberatory fire*, when it is in a furnace cloſe a-top, by which the *fire* is reflected back, and all round upon the veſſel.

The *melting* or *fuſing fire*, for the ſolution and calcination of metals and minerals.

The *glaſs-houſe fire*, for the vitrifying of the aſhes of vegetables.

And the *olympic fire*, which is that of the ſun collected in the focus of a burning mirrour, &c.

Hell-fire is a term denoting the greateſt degree of heat employed by the manufacturers of ſal ammoniac in Egypt.

To the ſeveral degrees of *fire* required, ſeveral forms of furnaces are accommodated; which ſee under the article FURNACE.

There are five principal ways of altering the degree of *fire*.

For *fire* differs 1. According to the weight of the pabulum or fuel, it being a rule, that the heavier the fuel or combuſtible matter is, the more vehement, *cæteris paribus*, is the *fire*. Thus, ſpirit of wine affords a weaker and leſs deſtructive *fire* than oil; and this than pitch, and ſo on; the heaver and groſſer, ſtill the fiercer.

2. According to the quantity of the pabulum or fuel.

3. According to the diſtance of the *fire* from the object; it being a rule, that the heat of the *fire* at different diſtances is reciprocally as the ſquares of thoſe diſtances.

4. By the introducing or blowing of air into the *fire*, it being a rule that the ſtronger the current of air or wind is, provided it be not ſo ſtrong as to break the aereal fornix or vault incumbent on the *fire*, the more is the *fire* increaſed. For a briſk blowing puts the minute parts of the pabulum into a greater motion; whence the greater attrition ariſes, and of conſequence more *fire* is collected.

5. According to the ſolidity or reſiſtance of the medium between the *fire* and the object; for the more ſolid the medium, the greater quantity of heat, *cæteris paribus*, does it receive from the *fire* and communicate to the object.

Thus, a vapour-bath communicates much leſs heat to the bodies diſtilled by it than a water-bath, and this again leſs than a bath of ſteel-filings; for all bodies expoſed to the *fire* grow hot in proportion to their ſpecific gravities. Thus, if a piece of metal be put in water, and both ſet over the *fire*, while the water only grows lukewarm the metal ſhall be ſo hot as to be paſt touching; and thus, a key in a perſon's pocket ſitting near the *fire* ſhall frequently be very hot, while his clothes themſelves have not any ſenſible warmth. Indeed, this rule admits of ſome exceptions; for we have oils lighter than water, which yet admit of triple its degree of heat before they boil.

It is a great controverſy in chemiſtry, whether *fire* when applied to bodies only ſeparates and diſſolves them, or whether it does not alſo really and abſolutely change them.

Mr. Boyle, in his Sceptical Chemiſt, we think, has abundantly proved, that *fire* really alters bodies, and that the parts or elements procured from bodies by *fire* did not exiſt as ſuch in the bodies themſelves.

Add, that *fire* does not only ſeparate and decompound, but it alſo compounds and mixes different bodies ſo intimately together, that the new formed ſubſtance appears perfectly ſimple, and is not liable to any alteration from its power afterwards. Boerhaave.

FIRE, in *Medicine* and *Surgery*, is uſed in the ſame ſenſe with cautery. See CAUTERY and CAUSTIC.

Fire alſo gives the denomination to divers diſeaſes, as

FIRE, *St. Anthony's*, by phyſicians more uſually called *erysipelas*. See ERYSIPELAS and ANTHONY.

FIRE, *walking*, called alſo *Will-with-a-wiſp*, *Jack-in-a-lantern*, *ignis fatuus*, &c. See IGNIS *fatuus*.

FIRE, in *Theology*, is frequently underſtood of the puniſhment of the wicked after death. See HELL.

It is ſuppoſed the world will periſh at laſt by *fire*. See CONFLAGRATION.

God has made ſeveral revelations of himſelf under the appearance of *fire*; he appeared to Moſes under the form of a *fire* burning in a buſh; the Holy Ghoſt deſcended on the apoſtles in tongues of *fire*; and the camp of the Iſraelites was guided and conducted in the night-time by a pillar of *fire*.

The Perſians adored God under the image or repreſentation of *fire*, becauſe it is *fire* that gives motion to every thing in nature. They are ſaid to have in that empire *fires* ſtill ſubſiſting, which have burnt many thouſand years. See FIRE *everlaſting*, GABRES, and MAGI.

The Hebrews kept up the *holy fire* in the temple. This *holy fire* deſcended from heaven, firſt upon the altar in the tabernacle at the conſecration of Aaron and his ſons to the prieſthood, Lev. ix. 24. and afterwards it deſcended anew on the altar in the temple of Solomon, at the conſecration of that temple. 2 Chron. vii. 1. And there it was conſtantly maintained by the prieſts day and night, without ſuffering it ever to go out; and with this all the ſacrifices were offered that required *fire*. This *fire*, according to ſome of the Jewiſh writers, was extinguiſhed in the days of Manaſſeh; but the more general opinion among them, is, that it continued till the deſtruction of the temple by the Chaldeans: after that it was never more reſtored; but inſtead of it they had only common *fire* in the ſecond temple.

The VESTALS were appointed expreſsly to keep up the ſacred *fire* of the Romans.

Vulcan was worſhipped among the ancients, and particularly the Egyptians, as the inventor of *fire*; and Boerhaave has made it highly probable, that the Vulcan of the heathens was the Tubal-Cain of the Hebrews, the firſt who appears to have known the uſe of *fire*, and to have applied it in the fuſion of metals, and other preparations of chemiſtry.

FIRE, in the *Manege*. To give the *fire* to a horſe is to apply the firing-iron red-hot to ſome preternatural ſwelling in order to diſcuſs it, which is oftentimes done by clapping the firing-iron upon the ſkin without piercing through. We give the *fire* to FARCY knots, by running a pointed burning-iron into the ulcers. We likewiſe give the *fire* for wrenches of the paſterns. See FIRING-*iron*.

FIRE, in the *Military Language*, is ſometimes applied to the *fires* lighted in an army in the night-time.

But the term *fire* or *firing* is more frequently uſed for the diſcharge of the *fire*-arms, or the ſhot made on the enemy from the artillery, &c. And accordingly it is uſed as a word of command to foldiers of all denominations to diſcharge their *fire*-arms, grenades, cannon, &c. The *fire*

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fire of the infantry is by a regular diſcharge of their *fire*-locks, by platoons, diviſions, &c. that of the cavalry with their fuſees and piſtols; and that of the place beſieged from their artillery. See EXERCISE and FIRING.

In fortification, the *fire of the place* denotes the flank, or that part of the curtain where the line of defence terminates, from whence they *fire* to defend the oppoſite face of the baſtion.

FIRE-*arrow* is a ſmall iron dart furniſhed with ſprings and bars, together with a match impregnated with powder and ſulphur, which is wound about its ſhaft. It is uſed by privateers and pirates to *fire* the ſails of the enemy, and for this purpoſe is diſcharged from a muſket or a ſwivel-gun. The match being kindled by the exploſion, communicates the flame to the ſail, againſt which it is directed where the arrow is faſtened by means of its bars and ſprings. As this is peculiar to hot climates, particularly the Weſt Indies, the ſails being extremely dry are inſtantly ſet on *fire*, and the *fire* is conveyed to the maſts, rigging, and finally to the veſſel itſelf.

FIRE-*arms*. See ARMS.

FIRE-*ball*, a compoſition of meal-powder, ſulphur, ſaltpetre, roſin, pitch, &c. about the bigneſs of a hand-granade, made of an iron ſheet, filled and covered over with ſeveral coats of the above mixture, the laſt coat being of grained powder. Thick brown paper made into the form of a ſhell adapted to the ſize of the mortar, and filled with an equal quantity of ſulphur, pitch, roſin, and meal powder well mixed and put in warm, will anſwer the purpoſe as well as any thing elſe. This is to be thrown into the enemies works in the night-time to diſcover where they are; or to *fire* houſes, galleries, or blinds of the beſiegers. The balls uſed for this intention are prepared with mealed powder, ſaltpetre, ſulphur, roſin, ſteel or iron filings, fir-tree ſaw-duſt boiled in ſaltpetre ley, and birch wood charcoal, well rammed into a ſhell, having various holes filled with ſmall barrels, loaded with muſket-balls, and immerſed in melted pitch, roſin, and turpentine oil. They are ſometimes armed with ſpikes or hooks of iron, that they may not roll off, but ſtick or hang where they are deſired to have any effect. See BALLS.

FIRE-*bare*, in our *Old Writers*, is uſed for a beacon. *Quod ſine dilatione levari & reparari fac. ſigna &* fire-bares, *ſuper montes altiores in quolibet hundredo, ita quod tota patria, per illa ſigna, quotieſcunque neceſſe fuerit, præmunire poteſt.* Ordin. Obſervand. Temp. Edw. II.

FIRE-*barrels*. See BARRELS. Thoſe uſed in FIRE-*ſhips* ought to be of a cylindric form, as moſt ſuitable to contain the REEDS with which they are filled, and more convenient for ſtowing them between the troughs in the *fire*-room. Their inſide diameters ſhould not be leſs than 21 inches, and 30 inches are ſufficient for their length. The bottom parts are firſt well ſtored with ſhort double-dipped reeds placed upright; and the remaining vacancy is filled with *fire-barrel* compoſition, being a maſs of corned powder, pitch, and tallow, well mixed and melted, and poured over them. The proportion and quantity of ingredients for one barrel are 120 lb. corned powder, 60 lb. of pitch, and 10 lb. of tallow; and the priming compoſition for one barrel is 100 lb. of corn powder, 50 lb. of ſaltpetre, 40 lb. of ſulphur, 6 lb. of roſin, and three pints of oil. There are five holes of three-fourths of an inch in diameter, and 3 inches deep, formed in the top of the compoſition while it is warm; one being in the center, and the other four at equal diſtances round the ſides of the barrel. When the compoſition is cold and hard, the barrel is primed by filling thoſe holes with fuſe-compoſition, which is firmly driven into them, ſo as to leave a little vacancy at the top to admit a ſtrand of quick match twice doubled. The center hole contains two ſtrands at their whole length, and every ſtrand muſt be driven home with mealed powder. The looſe ends of the quick-match being then laid within the barrel, the whole is covered with a dipped CURTAIN, faſtened on with a hoop that ſlips over the head of the barrel, to which it is nailed. Theſe barrels ſhould be made very ſtrong, not only to ſupport the weight of the compoſition before firing, when they are moved from place to place, but to keep them together whilſt burning; for if the ſtaves are too light and thin, ſo as to burn very ſoon, the remaining compoſition will tumble out and be diſſipated, and the intention of the barrels, which is to carry the flame aloft, will be fruſtrated. Falconer's Mar. Dict. and Muller, vol. .v p. 301.

FIRE-*blaſts*, in *Agriculture* and *Gardening*. See BLAST, and Hales's Statics, vol. i. p. 36.

FIRE, *bon*. M. Mahudel has a diſſertation on the origin of *bon-fires*, wherein he endeavours to make it appear that they were unknown to the ancients, and conſequently muſt be a modern invention.

He does not deny that the ancients had rejoicings on occaſion of the concluſion of a peace or alliance, or the news of a victory's being obtained againſt their enemies, on the birth-day, proclamation, or marriage of their prince; as alſo when they recovered from a dangerous ſickneſs; but, according to him, the *fire* on all theſe occaſions ſerved only to burn the victims or the incenſe; and as theſe ſacrifices were moſtly offered in the night-time, the illuminations were only intended to give light to perform the ceremonies. Hiſt. Acad. Inſcript. tom. ii. p. 430. ſeqq.

FIRE-*bote*, fuel for neceſſary firing, which, by the common law, tenants may take out of the lands granted to them.

FIRE-*cocks*. Church-wardens in London, and within the bills of mortality, are to fix *fire-cocks* at proper diſtances in ſtreets, and written marks near them, and to keep in every houſe thus marked an inſtrument or key for opening the plug, and a large engine and hand-engine for extinguiſhing *fire*, under the penalty of 10 *l*. The turn-cock whoſe water ſhall come firſt into a main-pipe at a *fire* ſhall have 10 *s*. the firſt engine that is brought ſhall entitle to 30 *s*. the ſecond to 20 *s*. and the third to 10 *s*. 6 Ann. cap. 31. 12 Geo. III. cap. 73. To prevent *fires*, it is required that workmen in the city of London, &c. build all front and rear walls of brick or ſtone; and that the front walls be 18 inches above the gutter, and coped with ſtone, tile, or brick; and party walls between houſe and houſe, thoſe belonging to houſes the expence of building which is more than 120 *l*. to be of the thickneſs of 1 foot 9 inches, or 2½ bricks in the loweſt ſtory; and of 2 bricks, or 1 foot 5½ inches from thence to the garret floor; and from the garret upwards 1½ brick, or 13 inches, and to be carried up to the full height of 18 inches above the adjoining gutters; and it is alſo required, that no timbers, except the girders, binding and trimming joints, and the templets under theſame, ſhall be laid into ſuch party-walls; and that there ſhall be 5 inches of ſolid brick work left at or between the ends of all lentils, wall-plates, and bond timbers. See BUILDING, and Stat. 7 Anne, cap. 17. 11 Geo. I. cap. 28. 33 Geo. II. cap. 30. and 4 Geo. III. cap. 14. And on the breaking out of any *fire*, all the conſtables and beadles ſhall repair to the place with their ſtaves, and be aſſiſting in putting out the ſame, and cauſing people to work, &c. No action ſhall be had againſt any perſon in whoſe houſe or chamber a *fire* ſhall begin. 6 Anne, 10 Anne, cap. 14. But if ſuch *fire* happens through negligence of any ſervant, ſuch ſervant ſhall forfeit 100 *l*. to be diſtributed among the ſufferers; or, in default of payment, ſhall be committed to ſome work-houſe, and there kept to hard labour for eighteen months. See ARSON.

All the laws relating to the prevention, &c. of *fire*, are reduced into one ſtatute, and former ſtatutes repealed by 12 Geo. III. cap. 73.

FIRE-*damp*, in *Natural Hiſtory*. See DAMP.

FIRE-*eater*. We have a great number of mountebanks who have procured the attention and wonder of the public by eating of *fire*, walking on *fire*, waſhing their hands in melted lead, and the like tricks.

The moſt celebrated of theſe was our countryman Richardſon, much talked of abroad. His ſecret, as related in the Journals des Sçavans, of the year 1680, conſiſted in a pure ſpirit of ſulphur, wherewith he rubbed his hands and the parts that were to touch the *fire*, which, burning and cauteriſing the epidermis, hardened and enabled the ſkin to reſiſt the *fire*.

Indeed, this is no new thing; Amb. Paré aſſures us he had tried on himſelf, that after waſhing the hands in urine, and with unguentum aureum, one may ſafely waſh them in melted lead.

He adds alſo, that by waſhing his hands in the juice of onions he could bear a hot ſhovel on them while it melted lard.

FIRE, *electrical*. See ELECTRICITY.

FIRE-*engine* is a machine for extinguiſhing accidental *fires* by means of a ſtream or jet of water. The common ſquirting *fire-engine* conſiſts of a lifting pump placed in a circular or cylindric veſſel of water, and wrought by two leavers that act always together. During the ſtroke, the quantity of water raiſed by the piſton of the pump ſpouts with force through a pipe joined to the pump-barrel, and made capable of any degree of elevation by means of a yielding leather pipe, or by a ball and ſocket turning every way, ſcrewed on the top of the pump. The veſſel containing the water is covered with a ſtrainer, which prevents the dirt and filth poured into it with the water from choaking the pump-work. Between the ſtrokes of this engine the ſtream is diſcontinued

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for want of an air-veſſel. However, in ſome caſes, engines of this conſtruction have their uſe, becauſe the ſtream, though interrupted, is much ſmarter than when the engine is made to throw water in a continued ſtream. The beſt engine of this latter kind is that of Mr. Newſham, formerly an engine-maker in London. A perſpective view of the whole engine ready for working is repreſented in *Tab. Hydraulics*, &c. *fig.* 3. This engine conſiſts of a ciſtern A B about three times as long as it is broad, made of thick oaken planks, the joints of which are lined with ſheet-copper, and eaſily moveable by means of a pole and croſs bar C in the fore-part of the engine, which is ſo contrived as to ſlide back under the cover of the ciſtern, and of four ſolid wheels, two of which are ſeen at D and E. The hind axle-tree, to which the wheel E and its oppoſite are fixed, is faſtened acroſs under the bottom of the ciſtern; but the fore axle-tree, bearing the wheel D, &c. is put on a ſtrong pin or bolt ſtrongly faſtened in an horizontal ſituation in the middle of the front of the bottom of the ciſtern, by which contrivace the two fore-wheels and their axle-tree have a circular motion round the bolt, ſo that the engine may ſtand as firm on rough or ſloping ground as if it was level. Upon the ground next to the hind part of the engine may be ſeen a leathern pipe F, one end of which may be ſcrewed on and off upon occaſion to a braſs cock at the lower end of the ciſtern: the other end is immerſed in the water, ſupplied by a pond, *fire*-plug, &c. and the pipe becomes a ſucking pipe for furniſhing the pumps of the engine by its working, without pouring water into the ciſtern. To the hind part of the ciſtern is faſtened a wooden trough G, with a copper grate for keeping out ſtones, ſand, and dirt, through which the ciſtern is ſupplied with water when the ſucking pipe cannot be uſed. The fore part of the ciſtern is alſo ſeparated from the reſt of its cavity by another copper grate, through which water may be poured into the ciſtern. Thoſe that work the pumps of this engine move the handles viſible at the long ſides up and down, and are aſſiſted by others who ſtand on two ſuſpended treddles, throwing their weight alternately on each of them, and keeping themſelves ſteady by taking hold of two round horizontal rails, H, I, framed into four vertical ſtands, which reach to the bottom of the ciſtern, and are well ſecured to its ſides. Over the hind trough there is an iron handle or key K, ſerving to open and ſhut a cock placed under it on the bottom of the ciſtern, the uſe of which we ſhall explain in the ſequel of this article. L is an inverted pyramidal box or caſe which preſerves the pumps and air veſſel from damage, and alſo ſupports a wooden frame M, on which ſtands a man, who, by raiſing or depreſſing, and turning about the ſpout N, directs the ſtream of water as occaſion requires. This ſpout is made of two pieces of braſs pipe, each of which has an elbow; the lower is ſcrewed over the upper end T (ſee *fig.* 5.) of the pipe that goes through the air-veſſel, and the upper part ſcrews on to the lower by a ſcrew of ſeveral threads, ſo truly turned as to be water-tight in every ſituation. The conic form of the ſpouting-pipe ſerves for wire-drawing the water in its paſſage through it, which occaſions a friction that produces ſuch a velocity of the jet as to render it capable of breaking windows, &c. whilſt the valves and leathern pipes of the engine have ſufficient water-way to ſupply the jet in its greateſt velocity. Leather pipes of conſiderable length may be ſcrewed at one end to the noſel of the engine, and furniſhed at the other end with a wooden or braſs pipe for guiding the water into the inner apartments of houſes, &c. Between the pyramidal box L and the fore-end of the engine, there is a ſtrong iron bar O, lying in an horizontal poſition over the middle of the ciſtern, and playing in braſſes ſupported by two wooden ſtands; one of which, P, is placed between the two fore-ſtands of the upper rails, and the other is hid in the incloſure over the hind part. Upon proper ſquares of this bar are fitted, one near each end, two ſtrong croſs bars, which take hold of the long wooden cylindrical handles, by means of which the engine is worked; and the treddles by which they are aſſiſted are ſuſpended at each end by chains in the form of a watch chain, and receive their motion jointly with the handles that are on the ſame ſide, by means of two circular ſectors of iron faſtened together, and fixed upon proper ſquares of the middle horizontal bar; the two fore ones may be ſeen at Q; the two hind ones, repreſented on a large ſcale in *fig.* 4. differ from the former only in thickneſs; for the fore-ſectors are made to carry only one chain each, faſtened by one end to their upper part, and by the lower end to the treddles; whereas the ſole of the two hind ſectors is wide enough to carry two chains each; one ſet faſtened like thoſe of the fore ones for the motion of the treddles; and the other two chains are faſtened by their lower ends to the lower part of theſe ſectors, and by their upper ends to the top of the piſton bars, in order to give them motion. See *fig.* 4. in which the hind ſectors and their apparatus are repreſented, as they would appear to a perſon, ſtanding between the two fore wheels, and looking at the hind part of the engine. The ſquare over the letter A is the ſection of the middle bar, on which, right over the two barrels, are placed the two ſectors B C A and D E A forged together. E G H K and *f g h k* are the two piſton rods; and the openings between the letters G, H, and *g*, *h*, are the ſpaces through which the hind parts of the two treddles paſs. L and M repreſent two ſtrong ſtuds rivetted on the other ſide of the bars on which they are placed; and to each of theſe is faſtened a chain like a watch chain, fixed by their upper ends to the upper extremities D and B of the iron ſectors, by which they are drawn up and down alternately. Theſe ſectors give alſo an alternate motion up and down to the piſton-rods, by means of two other chains left white in the figure, in order to diſtinguiſh them from the others; theſe are faſtened by their lower ends to the lower extremities of the ſectors E and C, and their upper ends terminating in a male ſcrew, are made tight to the piſton-rods at F and *f* by two nuts. The ſhape of the piſton-rods, and the ſize and ſituation of the chains that give them motion, are ſo contrived, that the vertical axis of the piſtons is exactly in the middle of the breadth of the perpendicular part of the chains, and of the upper part of the piſton-rods taken together. P Q repreſents one of the two croſs bars through the ends of which paſs the long handles, to which the men apply their hands when they work the engine; theſe croſs bars are fitted on the middle bar at ſome diſtance from the ſectors.

The other parts of this uſeful engine may be underſtood by the help of *fig.* 5. which repreſents a vertical ſection taken through the middle line of the hind part of the engine, as alſo the ſection of the air-veſſel, and that of one of the barrels, and likewiſe the profiles of the hind ſectors, and of ſeveral other parts. A B is the ſection of the bottom of the ciſtern, and C that of the hindmoſt axle-tree. D E is the vertical ſection of a ſtrong piece of caſt braſs or hard metal, ſo worked as to have a hollow in it, repreſented by the white part, and fixed to the bottom of the ciſtern: this reaches from the opening D through the cock W, and afterwards divides itſelf into two branches, ſo as to open under the two barrels; one of theſe branches is exhibited in the figure, and the other is exactly behind this. Through this channel, which may be called the ſucking-piece, water is conveyed to the pumps by the preſſure of the atmoſphere, either from the ciſtern itſelf, or from any place at a diſtance, by means of a leathern pipe F, *fig.* 1. which ſcrews on to the ſucking-piece at D, *fig.* 5. under the hind trough Z, the grate of which is repreſented by the horizontal ſtrokes. F G repreſents the vertical ſection of another piece of caſt braſs or hard metal that may be called the communication-piece, having two hollows for conveying the water from under the two piſtons to the two openings of the flanch of the air-veſſel: one of theſe hollows appears in the figure; the other lies exactly behind this, though not in a parallel direction. Between the ſection of the ſucking-piece D E and that of the communication-piece F G may be obſerved the ſection of one of the plates of leather, which makes all tight, and forms one of the two ſucking valves, of which there is another juſt behind this under the other barrel. R S T is the ſection of the copper air-veſſel, and T V that of the conduit-pipe; this veſſel is ſcrewed on to the hind part of the communication-piece, and at top is faſtened by a collar of iron to a croſs piece of timber. Between the flanch of the air-veſſel and the communication-pipe may be obſerved the ſection of one of the plates of leather, making all tight, and ſcrewing one of the two forcing valves, of which there is another juſt behind this, exactly over the other opening of the communication from the air-veſſel. Theſe valves are loaded with a lump of caſt iron or lead, having a tail or teat let through the flap of the valve and croſs-pinned under it; and it is to be obſerved, that, though both the valves are repreſented open in the figure, they are never both open at the ſame time; for when the engine is not at work they are cloſed down by the weights on their upper ſurfaces; and when the engine works, two are ſhut, and the other two are open alternately, by the motion of the piſtons and the action of the atmoſphere, together with the re-action of the air contained in the air-veſſel. H I is the ſection of one of the barrels of the two pumps which are both ſucking and forcing, as is evident from the poſition of the valves and the ſtructure of the piſtons, each of which is compoſed of two iron plates, of two wooden trenchers, and of two flat pieces of leather turning one up and the other down. L K repreſents one of the piſton rods edge-wiſe, behind which is one of the chains,

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chains, the top ſcrew of which, K, can only be ſeen. M is the end of the middle bar, and N a ſection of the hindmoſt of the two middle ſtands which ſupport the middle bar. O repreſents the end of the profile of one of the treddles, paſſing through the rectangular holes of the piſton-rods as in *fig.* 2. The weight on theſe treddles brings them and the piſton-rods down alternately, and they are raiſed up again by help of the other ſet of chains, one of which may be ſeen edge-wiſe in this figure, placed on the ſole of one of the ſectors, &c. See *fig.* 4.

PQ is part of the croſs bars which carry the handles, ſeen edge-wiſe; and XY repreſents an iron handle, by the help of which the cock W may be placed in the ſeveral ſituations requiſite for the uſe of the engine. The mechaniſm of the cock W may be underſtood by *fig.* 6, 7, and 8. which repreſent the horizontal ſection of it in three different ſituations. It has three holes that are left white in theſe figures. In *fig.* 6. the poſition of the cock is repreſented when the handle XY or K is in a direction parallel to DE or to the middle bar, as in *fig.* 5. and *fig.* 3. In this poſition the water ſupplied by the ſucking-pipe enters at D, and proceeds directly through the cock W to the valve under the two piſtons; and there is now no communication from the barrels with the cavity of the ciſtern. In *fig.* 7. we have the poſition of the cock when the handle XY is turned one quarter of a revolution towards the eye from the laſt mentioned ſituation, in which caſe there is no communication from the barrels with the outer extremity of the ſucking-piece, but the water poured into the fore and hind trough, and paſſing from thence into the cavity of the ciſtern, enters the cock ſide-wiſe at W, and turning at right angles through the cock towards E, proceeds to the barrels of the pumps. *Fig.* 8. repreſents the cock W when the handle is placed diametrically oppoſite to its laſt ſituation; in which caſe there is no communication from the under-ſide of the barrels with the cavity of the ciſtern or the outward end of the ſucking-piece; but this ſituation affords a communication from the cavity of the ciſtern with the outſide of the engine, and the water left in the cavity of the ciſtern may by this means be employed when the engine has done working. Theſe engines are made of five or ſix different ſizes. See Deſaguliers's Courſe of Exper. Philoſ. vol. ii. p. 505—518.

The principles on which this engine acts, ſo as to produce a continued ſtream are obvious: the water, being driven into the air-veſſel, as in the operation of common ſucking and forcing pumps, will compreſs the air contained in it, and proportionably increaſe its ſpring, ſince the force of the air's ſpring will always be inverſely as the ſpace which it poſſeſſes: therefore, when the air-veſſel is half filled with water, the ſpring of the included air, which in its original ſtate counterbalanced the preſſure of the atmoſphere, being now compreſſed into half the ſpace, will be equal to twice the preſſure of the atmoſphere; and by its action on the ſubjacent water will cauſe it to riſe through the conduit pipe, and to play a jet of 32 or 33 feet high, abating the effect of friction. When the air-veſſel is two-thirds full of water, the ſpace which the air occupies is only one-third of its firſt ſpace; therefore, its ſpring being three times as great as that of the common air, will project the water with twice the force of the atmoſphere, or to the height of 64 or 66 feet. In the ſame manner, when the air-veſſel is three-fourths full of water, the air will be compreſſed into one-fourth of its original ſpace, and cauſe the water to aſcend in air with the force of three atmoſpheres, or to the height of 96 or 99 feet, &c. as in the following table:

Height of the water	Height of the compreſſed air	Proportion of the air's ſpring	Height to which the water will riſe
1/2	1/2	2	33 feet
2/3	1/3	3	66
3/4	1/4	4	99
4/5	1/5	5	132
5/6	1/6	6	165
6/7	1/7	7	198
7/8	1/8	8	231
8/9	1/9	9	264
9/10	1/10	10	297

See Martin's Philoſ. Brit. vol. ii. p. 69, &c.

FIRE-*engine* is alſo a name frequently given to a machine for raiſing water by ſteam, more properly called STEAM-*engine*.

FIRE, *everlaſting*, in *Pagan Theology*, is a kind of reputed ſacred *fire* worſhipped by the Gavers or GABRES in Perſia. Dr. Mounſey, formerly phyſician to the Czarina's army, has given the following account of it: this perpetual *fire* riſes out of the ground in the peninſula of Abſcheron, about twenty miles from Baku, and three miles from the Caſpian ſhore. The ground is rocky, over which is a ſhallow covering of earth. If a little of the ſurface be ſcraped off, and *fire* be applied to the hollow, it catches flame immediately, and burns without intermiſſion, and almoſt without conſumption; nor is it ever extinguiſhed unleſs ſome cold earth be thrown over it, by which it is eaſily put out. There is a ſpot of ground, about two Engliſh miles in extent, which has this property, where the earth continually burns; but the moſt remarkable part of it is a hole about four feet deep and fourteen in diameter. This *fire* is worſhipped, and is ſaid to have burnt many thouſand years. The cracks in the walls of the caravanſera inhabited by the religious are covered with flame if a candle be held to them; and when there is occaſion for a ſmall light, no more is neceſſary than to ſtick one end of a piece of reed in the ground, and apply a lighted candle to the other; a flame will kindle at the top of the reed, and burn till it is extinguiſhed by covering it. They burn ſtones into lime by filling a hole in the ground with a heap of them, and bringing a lighted candle to the hole, upon which the *fire* kindles, and in about three days burns the ſtones ſufficiently. The flame yielded by this *fire* has neither ſmoke nor ſmell. This ſacred and adored phenomenon is nothing more than an inflammable vapour, which iſſues in great quantity out of the ground in this place, and is ſupplied by the naphtha with which the adjacent country abounds. Philoſ. Tranſ. vol. xlv. for 1748, p 296.

FIRE, *extinguiſhing of*. The world has long been in an opinion, that a more ready way than that in general uſe might be found for *extinguiſhing* fires in buildings; and it has been generally attempted upon the doctrine of exploſion. Zachary Greyl was the firſt perſon who put this plan into execution with any tolerable degree of ſucceſs. He contrived certain engines eaſily manageable, which he proved before ſome perſons of the firſt rank to be of ſufficient efficacy, and offered to diſcover the ſecret by which they were contrived for a large premium given either from the crown or raiſed by a ſubſcription of private perſons. But this ſcheme meeting with no better ſucceſs than things of this nature uſually do, he died without making this diſcovery. Two years after this, the people who had his papers found the method; and it was ſhewn before the king of Poland and a great concourſe of nobility at Dreſden, and the ſecret purchaſed at a very conſiderable price. After this the ſame perſon carried the invention to Paris and many other places, and practiſed it every where with ſucceſs. The ſecret was this: a wooden veſſel was provided holding a very conſiderable quantity of water; in the center of this there was fixt a caſe made of iron plates, and filled with gunpowder; from this veſſel to the head of the larger veſſel containing the water, there proceeded a tube or pipe which might convey the *fire* very readily through the water to the gunpowder contained in the inner veſſel. This tube was filled with a preparation eaſily taking *fire* and quickly burning away; and the manner of uſing the engine was to convey it into the room or building where the *fire* was, with the powder in the tube lighted. The conſequence of this was, that the powder in the inner caſe ſoon took *fire*, and with a great exploſion burſt the veſſel to pieces and diſperſed the water every way; thus was the *fire* put out in an inſtant, though the room was flaming before in all parts at once. The advantage of this invention was, that at a ſmall expence, and with the help of a few people, a *fire* in its beginning might be extinguiſhed; but the thing was not ſo general as it was at firſt expected that it would prove; for though of certain efficacy in a chamber or cloſe building where a *fire* had but newly begun; yet when the miſchief had increaſed ſo far that the houſe was fallen in, or the top open, the machine had no effect. This was the contrivance firſt diſcovered by Greyl, and from which our chemiſt Godfrey took the hint of the machine, which he called the WATER-*bomb*, and would fain have brought into uſe in England. Act. Eruditor. ann. 1721. p. 183. Dr. Hales propoſes to check the progreſs of *fires* by covering the floors of the adjoining houſes with earth. The propoſal is founded on an experiment which he made with a fir-board half an inch thick, part of which he covered with an inch depth of damp garden mould, and then lighted a *fire* on the ſurface of the mould; though the *fire* was kept up by blowing, it was two hours before the board was burnt through, and the earth prevented it from flaming. The thicker the earth is laid on the floors, the better; however, Dr. Hales apprehends, that the depth of an inch will generally be ſufficient; and he recommends to lay a deeper covering on the ſtairs, becauſe the *fire* commonly aſcends by them with the greateſt velocity. Philoſ. Tranſ. vol. xlv. for 1748, p. 277.

Mr. Hartley made ſeveral trials in the years 1775 and 1776, in order to evince the efficacy of a method which he had invented for reſtraining the ſpread of *fire* in buildings.

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ings. For this purpoſe thin iron plates are well nailed to the tops of the joiſts, &c. the edges of the ſides and ends being lapped over, folded together, and hammered cloſe. Partitions, ſtairs, and floors, may be defended in the ſame manner; and plates applied to one ſide have been found ſufficient. The plates are ſo thin as not to prevent the floor from being nailed in the joiſts in the ſame manner as if this preventative were not uſed: they are kept from ruſt by being painted or varniſhed with oil and turpentine. The expence of this addition, when extended through a whole building, is eſtimated at about five *per cent.* Mr. Hartley has a patent for this invention, and parliament has voted a ſum of money towards defraying the expence of his numerous experiments. 14 Geo. III. cap. 85. The ſame preſervative may alſo be applied to ſhips, furniture, &c.

Lord Mahon has alſo diſcovered and publiſhed a very ſimple and effectual method of ſecuring every kind of building againſt all danger of *fire*. This method he has divided into three parts, viz. under-flooring, extra-lathing, and inter-ſecuring. The method of under-flooring is either ſingle or double: in ſingle under-flooring, a common ſtrong lath of oak or fir, about one-fourth of an inch thick, ſhould be nailed againſt each ſide of every joiſt, and of every main timber, ſupporting the floor which is to be ſecured. Other ſimilar laths are then to be nailed along the whole length of the joiſts, with their ends butting againſt each other. The top of each of theſe laths or fillets ought to be at 1½ inch below the top of the joiſts or timbers againſt which they are nailed; and they will thus form a ſort of ſmall ledge on each ſide of all the joiſts. Theſe fillets are to be well bedded in a rough plaſter hereafter mentioned when they are nailed on, ſo that there may be no interval between them and the joiſts; and the ſame plaſter ought to be ſpread with a trowel upon the tops of all the fillets, and along the ſides of that part of the joiſts which is between the top of the fillets and the upper edge of the joiſts. In order to fill up the intervals between the joiſts that ſupport the floor, ſhort pieces of common laths, whoſe length is equal to the width of theſe intervals, ſhould be laid in the contrary direction to the joiſts, and cloſe together in a row, ſo as to touch one another: their ends muſt reſt upon the fillets, and they ought to be well bedded in the rough plaſter, but are not to be faſtened with nails. They muſt then be covered with one thick coat of the rough plaſter, which is to be ſpread over them to the level of the tops of the joiſts; and in a day or two this plaſter ſhould be trowelled over cloſe to the ſides of the joiſts, without covering the tops of the joiſts with it.

In the method of double-flooring, the fillets and ſhort pieces of laths are applied in the manner already deſcribed; but the coat of rough plaſter ought to be little more than half as thick as that in the former method. Whilſt this rough plaſter is laid on, ſome more of the ſhort pieces of laths above mentioned muſt be laid in the intervals between the joiſts upon the firſt coat, and be dipped deep in it. They ſhould be laid as cloſe as poſſible to each other, and in the ſame direction with the firſt layer of ſhort laths. Over this ſecond layer of ſhort laths there muſt be ſpread another coat of rough plaſter, which ſhould be trowelled level with the tops of the joiſts without riſing above them. The rough plaſter may be made of coarſe lime and hair; or inſtead of hair, hay chopped to about three inches in length may be ſubſtituted with advantage. One meaſure of common rough ſand, two meaſures of ſlacked lime, and three meaſures of chopped hay, will form in general a very good proportion, when ſufficiently beat up together in the manner of common mortar. The hay ſhould be put in after the two other ingredients are well beat up together with water. This plaſter ſhould be made ſtiff; and when the flooring boards are required to be laid down very ſoon, a fourth or fifth part of quick-lime in powder, formed by dropping a ſmall quantity of water on the lime-ſtone a little while before it is uſed, and well mixed with this rough plaſter, will cauſe it to dry very faſt. If any cracks appear in the rough plaſter work near the joiſts when it is thoroughly dry, they ought to be cloſed by waſhing them over with a bruſh wet with mortar waſh: this waſh may be prepared by putting two meaſures of quick-lime and one of common ſand in a pail, and ſtirring the mixture with water till the water becomes of the conſiſtence of a thin jelly.

Before the flooring boards are laid, a ſmall quantity of very dry common ſand ſhould be ſtrewed over the plaſter-work, and ſtruck ſmooth with an hollow rule, moved in the direction of the joiſts, ſo that it may lie rounding between each pair of joiſts. The plaſter-work and ſand ſhould be perfectly dry before the boards are laid for fear of the dry rot. The method of under-flooring may be ſucceſsfully applied to a wooden ſtair-caſe; but no ſand is to be laid upon the rough plaſter-work. The method of extra-lathing may be applied to cieling joiſts, to ſloping roofs, and to wooden partitions.

The third method, which is that of inter-ſecuring, is very ſimilar to that of under-flooring; but no ſand is afterwards to be laid upon it. Inter-ſecuring is applicable to the ſame parts of a building as the method of extra-lathing, but it is ſeldom neceſſary.

Lord Mahon has made ſeveral experiments in order to demonſtrate the efficacy of theſe methods. In moſt houſes it is only neceſſary to ſecure the floors; and the extra-expence of under-flooring, including all materials, is only about nine pence per ſquare yard; and with the uſe of quick-lime a little more. The extra expence of the method of extra-lathing is no more than ſix pence per ſquare yard for the timber ſide-walls and partitions; but for the cieling about nine pence per ſquare yard. But in moſt houſes no extra-lathing is neceſſary. Philoſ. Tranſ. vol. lxviii. for 1778, part ii. art. 40. p. 884, &c.

FIRE-*flaire*, in *Ichthyology*. See PASTINACHA *marina*.

FIRE-*flies*, in the *Hiſtory of Inſects*. Among the flies of Guiana there are two ſpecies of *fire-flies*. The largeſt is more than an inch in length, having a very large head connected with the body by a joint of a particular ſtructure, with which at ſome times it makes a loud knock, eſpecially when laid on its back. This fly has two feelers or horns, two wings, and ſix legs. Under its belly is a circular patch, which, in the dark, ſhines like a candle; and on each ſide of the head, near the eyes, is a prominent, globular, luminous body, in ſize about one-third larger than a muſtard ſeed. Each of theſe bodies is like a riſing ſtar, emitting a bright, and not ſmall light; ſince two or three of theſe animals put into a glaſs veſſel afford light ſufficient to read without difficulty, when placed cloſe to a book. When the fly is dead theſe bodies will ſtill afford conſiderable light, though leſs vivid than before; and if bruiſed and rubbed over the hands and face, they become luminous in the dark, like a board ſmeared with phoſphorus. They have a reddiſh brown colour, and live in rotten trees in the day, but are always abroad in the night. The other kind are not more than half as large as the former, and their light proceeds from under their wings, and is ſeen only when they are elevated, like ſparks of *fire*, appearing and diſappearing every ſecond. Of theſe the air is full in the night, though they are never ſeen in the day. They are common not only in the ſouthern but northern parts of America during the ſummer.

FIRE-*lock*, or FUSIL, a ſmall gun which fires with a flint and ſteel. It is diſtinguiſhed from an old muſket or match-lock which was fired with a match. The *fire-lock* is now in common uſe with the European armies, and carried by the foot-ſoldiers. It is three feet eight inches in the barrel; and, including the ſtock, four feet eight inches, and carries a leaden bullet, of which twenty-nine make 2 lb. Its diameter is the fifty-five hundredths of an inch, and that of the barrel one and a fiftieth part of the ſhot. *Fire-locks* were made uſe of in 1690, when match-locks were diſuſed; but the time of their invention is uncertain.

For the uſe of the *fire-lock*, ſee EXERCISE.

FIRE-*maſter*, in our *Train of Artillery*, is an officer who gives the directions, and the proportions of the ingredients for all the compoſitions of *fire*-works, whether for ſervice in war, or for rejoicings and recreations. He has a mate to aſſiſt him.

His orders are given to the *fire*-workers and bombardeers, who are obliged to execute them.

FIRE-*office*, an office of inſurance from *fire*. See INSURANCE.

FIRE-*ordeal*. See ORDEAL.

FIRE-*philoſophers*, or *Philoſophi per ignem*, a fanatical ſect of philoſophers who appeared towards the cloſe of the ſixteenth century, and made a figure in almoſt all the countries of Europe. The diſtinguiſhing tenet from which they derived this appellation was, that the intimate eſſences of natural things were only to be known by the trying efforts of *fire*, directed in a chemical proceſs. They were alſo called *Theoſophiſts*, from their declaring againſt human reaſon as a dangerous and deceitful guide, and repreſenting a divine and ſupernatural illumination as the only means of arriving at truth: they were likewiſe denominated *Paracelſiſts*, from the name of Paracelſus, the eminent phyſician and chemiſt, who was the chief ornament and leader of this extraordinary ſect. It was patronized in England by M. Robert Flood or Fludd, who endeavoured to illuſtrate the philoſophy of Paracelſus in a great number of treatiſes; in France, it was zealouſly propagated by Rivier; in Denmark, by Severinus; in Germany, by Kunrath, an eminent phyſician of Dreſden; and in other countries by warm and ſucceſsful votaries, who aſſumed a ſtriking air of piety and devotion,

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devotion, and propoſed to themſelves no other end than the advancement of the Divine glory, and the reſtoration of peace and concord in a divided church; accordingly they were joined by ſeveral perſons eminent for their piety, and diſtinguiſhed by their zeal for the advancement of true religion. One of the moſt celebrated of theſe was Daniel Hoffman, profeſſor of divinity in the univerſity of Helmſtadt, who, availing himſelf of ſome unguarded paſſages in the writings of Luther, extravagantly maintained, that philoſophy was the mortal enemy of religion; that truth was diviſible into two branches, the philoſophical and theological; and that what was true in philoſophy was falſe in theology. Hoffman was afterwards obliged, by the interpoſition of Henry Julius, duke of Brunſwick, to retract his invectives againſt philoſophy, and to acknowledge in the moſt open manner the harmony and union of ſound philoſophy with true and genuine theology. Moſheim's Eccl. Hiſt. by Maclean, vol. iv. p. 17, 18. 8vo. edit. 1768.

FIRE-*places* are contrivances for communicating heat to rooms, and alſo for anſwering various purpoſes of art and manufacture.

For the latter kind, ſee FURNACE and STOVE. The principal objects with regard to the former are leſſening the charge of fuel and augmenting the benefit of *fire*. The general properties of air and *fire*, on which their conſtruction chiefly depends, are the following, viz. that air is rarefied by heat, and condenſed by cold; i. e. the ſame quantity of air takes up more ſpace when warm than when cold: air rarefied and expanded by heat is ſpecifically lighter than it was before, and will riſe in other air of greater denſity; ſo that a *fire* being made in any CHIMNEY, the air over the *fire* is rarefied by the heat, becomes lighter, and immediately riſes in the funnel, and goes out; the other air in the room, flowing towards the chimney, ſupplies its place, is rarefied in its turn, and riſes likewiſe; and the place of the air thus carried out of the room, is ſupplied by freſh air coming in through doors and windows, or, if they be ſhut, through every crevice with violence; or if the avenues to the room be ſo cloſed up, that no freſh ſupply of air can be obtained, the current up the funnel muſt flag; and the ſmoke, no longer driven up, float about in the room. Common *fire* throws out light, heat, and ſmoke; the light and heat move in right lines with great ſwiftneſs, but the ſmoke is but juſt ſeparated from the fuel, and moves only as it is carried off by the ſtream of rarefied air; and without a continual acceſſion of air, will remain crowded about the *fire*, and ſtifle it. Heat may be ſeparated from the ſmoke and light by means of a plate of iron; and the greateſt ſenſible heat is directly over the *fire*, where, beſides the rays of heat ſhot upwards, there is a continual riſing ſtream of hot air, heated by thoſe rays that are ſhot round on every ſide.

The *fire-places* moſt in uſe are, 1. The large open *fire-places*, that were commonly uſed in former times, and are ſtill continued in the country, and in kitchens. Theſe require a large funnel, conſume a great quantity of fuel, generally ſmoke, if the door be not left open, and contribute little to warm a room. Their ſpaciouſneſs is their greateſt convenience.

2. Inſtead of theſe old-faſhioned chimnies, the modern *fire-places*, eſpecially in towns, have been conſtructed with low breaſts and hearths, narrowed by jambs. *Fire-places* of this contracted form will keep rooms generally free from ſmoke; but the funnel requires a conſiderable quantity of air, which ruſhes in at every crevice, ſo as to render the ſituation of perſons continually expoſed to it uncomfortable and dangerous. Many of the diſeaſes proceeding from colds may be aſcribed to ſtrong drawing chimnies, whereby, in ſevere weather, perſons are ſcorched before while they are froze behind. Theſe *fire-places* are of little uſe in warming a room; becauſe the air round them, which is warmed by the direct rays of the *fire*, does not continue in the room, but is continually collected into the chimney by the current of cold air coming behind it, and is preſently carried off. Beſides, the greateſt part of the *fire* is loſt, being abſorbed by the back jambs and hearth, which are ſo dark and porous as to reflect very little, and the upright heat flies directly up the chimney. To remedy this inconvenience the Sieur Gauger, in his book entitled La Mechanique de Feu, publiſhed in 1709, and ſince tranſlated by Dr. Deſaguliers, (ſee CHIMNEY) propoſed ſeven different conſtructions of, 3. A third ſort of chimnies, in which there are hollow cavities made by iron plates in the back, jambs, and hearth, through which plates the heat paſſing, warms the air in thoſe cavities, which is continually coming into the room freſh and warm. This conſtruction had many obvious advantages; but the expence and difficulty attending it diſcouraged the propagation of the invention. However, the upright heat was almoſt wholly loſt in theſe as in the common chimnies

4. Another kind of *fire-place* is the Holland iron ſtove, with a flue proceeding from the top, and a ſmall iron door opening into the room. Theſe ſerve to warm a room, ſave fuel, and produce a conſtant change of air. But the *fire* is not ſeen, and little uſe can be made of it beſides that of warming the room. It is therefore rarely uſed in England, except in ſome work-ſhops.

5. The German ſtove is compoſed of five iron plates ſcrewed together, and fixed ſo as that the fuel may be put into it from another room, or from the outſide of the houſe. It is a kind of oven reverſed, its mouth being without, and body within the room that is to be warmed by it. This ſtove warms a room with little fuel, and is attended with no danger from the irruption of cold air; but the *fire* is not ſeen, and there is no change of air in the room heated by it: For an account of the Chineſe ſtove, ſee KANG.

6. Another kind of convenience for warming rooms is a charcoal *fire* kindled in pots and chaffing diſhes. This is chiefly uſed in the ſhops of handicraftmen. But the ſulphureous fumes ariſing from the coals render this mode of giving heat diſagreeable and dangerous; and in a cloſe room ſometimes fatal.

The ingenious Dr. Franklin, whoſe name we have had frequent occaſion of recording in this work, having recounted the inconveniencies and advantages of *fire-places* in common uſe, propoſes a new contrivance for this purpoſe, called the Penſylvania *fire-place*. 1. This machine conſiſts of a bottom-plate or hearth-piece (ſee *Tab. Miſcellany*, *fig.* 6.) with a riſing moulding before for a fender, two perforated ears F, G, for receiving two ſcrew-rods; a long air-hole *a a*, through which the outward air paſſes into an air-box; and three ſmoke-holes repreſented by dark ſquares in BC, through which the ſmoke deſcends and paſſes away; beſides double ledges for receiving between them the lower edges of the other plates. 2. A back plate without holes, and furniſhed with a pair of ledges to receive, 3. The two ſide-plates, each of which has a pair of ledges to receive the ſide-edges of the front plate, with a ſhoulder on which it reſts; two pair of ledges to receive the ſide-edges of the two middle plates which form the air-box, and an oblong air-hole near the top, through which the air warmed in the box is diſcharged into the room, and a wing or bracket, as H, and a ſmall hole, as R, for the axis of the regiſter to turn in. See *fig.* 7. which repreſents one of theſe plates. 4. An air-box, compoſed of the two middle plates DE and FG, *fig.* 8. and 9. The firſt has five thin ledges or partitions caſt on it, the edges of which are received into ſo many pair of ledges caſt in the other: the tops of all the cavities formed by theſe thin deep ledges are alſo covered by a ledge of the ſame form and depth caſt with them; ſo that when the plates are put together, and the joints luted, there is no communication between the air-box and the ſmoke. In the winding paſſages of this box, freſh air is warmed as it paſſes into the room. 5. A front plate, which is arched on the under ſide, and ornamented with foliages, &c. 6. A top plate, with a pair of ears M, N, (*fig.* 10.) anſwerable to thoſe in the bottom plate, and perforated for the ſame purpoſe. It has alſo a pair of ledges running round the under ſide to receive the top edges of the front, back and ſide plates. The air-box does not reach up to the top-plate by $2\frac{1}{2}$ inches.

All theſe plates are of caſt iron; and when they are all in their proper places, they are bound firmly together by a pair of ſlender rods of wrought iron with ſcrews, and the machine appears as in *fig.* 10. There are alſo two thin plates of wrought iron, viz. 7. The ſhutter, which is of ſuch a length and breadth as to cloſe well the opening of the *fire-place*, and ſerving to blow up the *fire*, and to ſecure it in the night. It is raiſed or depreſſed by means of two braſs knobs, and ſlides in a groove left between the foremoſt ledge of the ſide plates and the face of the front plate. 8. The regiſter, which is placed between the back plate and air-box, and furniſhed with a key; ſo that it may be turned on its axis and made to lie in any poſition between level and upright. The operation of this machine, and the method of fixing it may be underſtood by obſerving the profile of the chimney and *fire-places* in *fig.* 11. M. is the mantle-piece or breaſt of the chimney; C the funnel; B the falſe back, made of brick-work in the chimney, four inches or more from the true back, from the top of which a cloſing is to be made over to the breaſt of the chimney, that no air may paſs into the chimney except that which goes under the falſe back, and up behind it; E the true back of the chimney; T the top of the *fire-place*; F the front of it; A the place where the *fire* is made; D the air-box; K the hole in the ſide plate, through which the warmed air is diſcharged out of the air-

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box into the room; H the hollow, formed by removing ſome bricks from the hearth under the bottom plate filled with freſh air, entering at the paſſage I, and aſcending into the air-box through the air-hole in the bottom plate near G, the partition in the hollow, deſigned to keep the air and ſmoke apart; P the paſſage under the falſe back, and part of the hearth for the ſmoke; and the arrows in the figure ſhew the courſe of the ſmoke. The *fire* being made at A, the flame and ſmoke will aſcend, ſtrike the top T, and give it a conſiderable heat; the ſmoke will turn over the air-box, and deſcend between it and the back plate to the holes near G in the bottom plate, heating in its paſſage all the plates of the machine; it will then proceed under and behind the falſe back, and riſe into the chimney. The air of the room contiguous to the ſeveral plates, and warmed by them, becomes ſpecifically lighter than the other air in the room, and is obliged to riſe; but, being prevented by the cloſure over the *fire-place* from going up the chimney, is forced out into the room, and riſing by the mantle-piece to the cieling, is again driven down gradually by the ſteam of newly-warmed air that follows; and thus the whole room becomes in a little time equally warmed. The air, alſo, warmed under the bottom plate and in the air-box, riſes and comes out of the holes in the ſide plates, and thus warming and continually changing the air of the room. In the cloſing of the chimney a ſquare opening for a trap-door ſhould be left open for the ſweeper to go up: the door may be made of ſlate or tin, and ſo placed, that by turning up againſt the back of the chimney when open, it cloſes the vacancy behind the falſe back, and ſhoots the ſoot that falls in ſweeping out upon the hearth. It will alſo be convenient to have a ſmall hole about five or ſix inches ſquare, cut near the cieling through into the funnel, and provided with a ſhutter, by occaſionally opening which, the heated air of the room and ſmoke of tobacco, &c. may be carried off without incommoding the company. For a farther account of the manner of uſing this *fire-place*, the advantages attending it, anſwers to objections and directions to the brick-layer in fixing it, the curious reader may conſult Franklin's Letters and Papers on Philoſophical Subjects, p. 284—318. edit. 1769.

FIRE-*pots*, in the *Military Art*, are ſmall earthen pots into which is put a grenade, filled with fine powder till the grenade be covered; and then the pot is covered with a piece of parchment, and two pieces of match laid acroſs and lighted. This pot being thrown where it is deſigned to do execution, breaks and *fires* the powder, and thereby *fires* the powder in the grenade, which ought to have no fuze, that its operation may be the quicker.

FIRE, *razant* or *raſant*, is a *fire* from the artillery and ſmall arms directed in a line parallel to the horizon, or to thoſe parts of the works of a place that are defended.

FIRE, *running*, is when a rank or ranks of men drawn up *fire* one after another; or when the lines of an army are drawn out to *fire* on account of a victory; in which caſe each ſquadron or battalion takes it from that on its right, from the right of the firſt line to the left, and from the left to the right of the ſecond line, &c.

FIRE-*ſhips*, in the *Navy*, veſſels charged with combuſtible materials or artificial *fire*-works; which having the wind of an enemy's ſhip, grapple her, and ſet her on *fire*.

It is obſerved by Anderſon, in his Hiſtory of Commerce, vol. I. p. 432. that ſome Engliſh veſſels, filled with combuſtible matter, and ſent among the Spaniſh ſhips compoſing the Invincible Armada in 1588, are ſaid to have given riſe to the terrible invention of *fire-ſhips*. However, Livy informs us, that the Rhodians had invented a kind of *fire*-ſhips which were uſed in junction with the Roman fleet in their engagement with the Syrians in the year before Chriſt 190: cauldrons of combuſtible and burning materials were hung out at their prows, ſo that none of the enemies ſhips durſt approach them: theſe fell on the enemies gallies, ſtruck their beaks into them, and at the ſame time ſet them on *fire*. Liv. lib. xxxvii. cap. 30. tom. iii. p. 322. Ed. Crevier.

There is nothing peculiar in the conſtruction of a modern *fire-ſhip*, except the apparatus by which the *fire* is inſtantly conveyed from one part to another, and from thence to the enemy: for this purpoſe the *fire* room, in which the combuſtibles are incloſed, is built between decks, and extends from the bulk-head at the forecaſtle to a bulk-head raiſed behind the main maſt. The train incloſed in this apartment is contained in a number of wooden troughs which interſect each other in different parts of the ſhip's length, being ſupported at proper diſtances by croſs-pieces and ſtanchions. On each ſide of the ſhip are cut out ſix or ſeven port-holes, in ſize about fifteen by eighteen inches, with their lids opening downward, and cloſe caulked up. Againſt each port is fixed an *iron*-CHAMBER, which, when the ſhip is fired, blows out the port-lid and lets out the flame. Under the main and fore ſhrouds is fixed a wooden funnel, one end of which communicates with a FIRE-*barrel*, and deſigned to convey the flames to the ſhrouds. Between the funnels, called alſo *fire*-trunks, are two ſcuttles or ſmall holes in the upper deck, ſerving alſo to let out the flames. Both funnels and ſcuttles muſt be ſtopped with plugs, and have ſail-cloth or canvas nailed over them, to prevent any accident happening from above to the combuſtibles below. The port-holes, funnels, and ſcuttles, ſerve not only to communicate the flames to the outſide and upper works of the ſhip and her rigging, but likewiſe to open a paſſage for the inward air confined in the *fire*-room, ſo that it may expand itſelf without blowing up the decks. On each ſide of the bulk-head behind is cut a hole big enough to receive a trough of the ſame ſize as the others; leading troughs whoſe foremoſt ends communicate with other troughs within the *fire*-room, extend obliquely from theſe openings to ſally-ports cut through the ſhip's ſide: the decks and troughs are well covered with melted roſin. When either of the leading-troughs is fired, the flame is immediately conveyed to the oppoſite ſide of the ſhip, and both ſides burn together.

The cabbins of the lieutenant and maſter are behind the *fire*-room, one on the ſtarboard and the other on the larboard ſide. The captain's cabin is ſeparated from theſe by a bulk-head.

The ſtores for a *fire-ſhip* of 150 tuns are 8 FIRE-*barrels*, 12 *iron*-CHAMBERS, 3½ priming compoſition barrels, 1 QUICK-*match* barrel, 30 dipped CURTAINS, 150 long REEDS ſingle dipped, 75 ſhort reeds ſingle dipped, 75 ſhort reeds double dipped, 209 bavins ſingle dipped, and 24 PORT-*fires*.

The quantity of compoſition for preparing the ſtores of a *fire-ſhip* is exhibited in the following table:

	petre lb.	ſulph. lb.	corn pow. lb.	pitch. lb.	roſin. lb.	tallow. lb.	tar. lb.	oil. pts.
For 8 barrels,	0	0	960	480	0	80	0	0
For 3½ ditto priming compoſition,	175	140	350	0	21	0	0	12
For the curtains, bavins, and reeds for the ſhip, and ſulphur for ſalting them,	0	200	0	350	175	50	25	0
Total,	175	340	1310	830	196	130	25	12

For reeds for the barrels, 160lb. being one-fifth of the whole of the laſt article.

When all the ſtores are provided, they are diſpoſed of in the following manner: four of the eight *fire*-barrels are placed under the four *fire*-trunks, and the other four between them, two on each ſide the *fire*-ſcuttles, where they are ſecurely cleated to the deck. The longeſt reeds are put into the fore and aft troughs, and tied down; the ſhorteſt reeds are laid in the troughs athwart, and tied down alſo: the bavins, dipped at one end, are tied faſt to the troughs over the reeds, and the curtains are nailed up to the beams in equal quantities on each ſide of the *fire*-room. The remainder of the reeds is placed in a poſition nearly upright at all the angles of every ſquare in the *fire*-room, and there tied down; and ſome of them are put round the *fire*-barrels and tied faſt. The priming compoſition is ſtrowed along all the troughs, and over the reeds and bavins; then lay the quick-match two or three ſtrands thick on the reeds, and about the *fire*-barrels and chambers, in order to communicate a general *fire* at once: let the plugs be taken out of the funnels and ſcuttles, the curtains covering the *fire*-barrels be cut and rolled back; and let the leading troughs be laid with four or five ſtrands of quick-match, and alſo the communication-trough, ſo that the *fire* may be communicated to the whole at once. Port-*fires*, which burn about twelve minutes, are frequently uſed for firing the ſhip in preference to matches. When two fleets commence an engagement, thoſe who have the care of the *fire-ſhips* prime and prepare their *fire*-works; and when they are ready for grappling, inform the admiral of it by a particular ſignal. Muller's Syſtem of Math. &c. vol. v. p. 299, &c. and Falconer's Mar. Dict.

FIRE-*ſtone* is a coarſe, harſh, duſty FREE-*ſtone*, of a moderately compact texture, of a pale greyiſh colour, nearly white, with a very ſlight greeniſh tinge. This ſtone is moderately hard and heavy, and ſlightly colours the hands: it is compoſed of a fine ſmall angular grit, cemented by an earthy ſparry matter, intermixed with numerous ſmall ſpangles of a ſilvery mica: it will not ſtrike *fire* with ſteel, and in the fire changes to a ſlight reddiſh hue. It is called alſo *Rygate-ſtone*, from the place whence it is chiefly brought; it bears the *fire*, and is much uſed for chimneys, hearths, ovens, ſtoves, &c.

It does not bear the weather, and is therefore unfit for building.

FIRE-*water*, a name given to alkaheſt. See IGNIS *aqua*.

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FIRE, *wild*, is a kind of artificial or factitious *fire*, which burns even under water, and that with greater violence than out of it.

It is compoſed of ſulphur, naphtha, pitch, gum, and bitumen; and it is only extinguiſhable by vinegar, mixed with ſand and urine, or by covering it with raw hides.

Its motion or tendency is ſaid to be contrary to that of natural *fire*, and always following the direction in which it is thrown, whether it be downwards, ſidewiſe, or otherwiſe.

The French call it *Greek fire*, or *feu Gregeois*, becauſe firſt uſed by the Greeks about the year 660, as is obſerved by the Jeſuit Petavius, on the authority of Nicetas, Theophanes, Cedrenus, &c.

The inventor, according to the ſame Jeſuit, was an engineer of Heliopolis, in Syria, named Callinicus, who firſt applied it in the ſea-fight commanded by Conſtantine Pogonates againſt the Saracens, near Cyzicus, in the Helleſpont; and with ſuch effect, that he burnt the whole fleet therewith, wherein there were thirty thouſand men.

But others will have it of a much older date; and hold Marcus Gracchus the inventor; which opinion is ſupported by ſeveral paſſages, both in the Greek and Roman writers, which ſhew it to have been anciently uſed by both theſe nations in the wars. See Scaliger againſt Cardan.

Conſtantine's ſucceſſors uſed it on divers occaſions, with equal advantage, as himſelf; and what is remarkable enough is, that they were ſo happy as to keep the ſecret of the compoſition to themſelves; ſo that no other nation knew it in the year 960.

Hugh, king of Burgundy, demanding ſhips of the emperor Leo for the ſiege of Freſne, deſired likewiſe the Greek *fire*. Chorier, Hiſt. De Dauph.

F. Daniel gives us a good deſcription of the Greek *fire*, in his account of the ſiege of Damietta, under St. Louis. Every body, ſays that author, was aſtoniſhed with the Greek *fire* which the Turks then prepared; and the ſecret whereof is now loſt. They threw it out of a kind of mortar; and ſometimes ſhot it with an odd ſort of croſs bow, which was ſtrongly bent by means of a handle, or winch, of much greater force than the bare arm. That thrown with the mortar ſometimes appeared in the air of the ſize of a tun, with a long tail, and a noiſe like that of thunder. The French, by degrees, got the ſecret of extinguiſhing it; in which they ſucceeded ſeveral times.

FIRE-*works*, or *artificial* FIRES, are preparations made of gunpowder, ſulphur, and other inflammable and combuſtible ingredients, uſed on occaſion of public rejoicings, and other ſolemnities.

The principal of theſe are rockets, ſerpents, ſtars, hail, mines, bombs, garlands, letters, and other devices. See ROCKET, STAR, BOMB, &c.

The invention of *fire-works* is by M. Mahudel attributed to the Florentines and people of Sienna; who found out likewiſe the method of adding decorations to them of ſtatues, with *fire* iſſuing from their eyes and mouths.

The art of preparing and managing *fire-works* is called PYROTECHNY.

The making or ſelling of *fire-works*, or ſquibs, or throwing them about in any ſtreet, is, on account of the danger that may enſue to any thatched or timber buildings, declared to be a common nuſance, by 9 and 10 W. III. cap. 7. and puniſhed by a fine of 20*s*.

FIRE-*workers*, are ſubordinate officers to the *fire-maſters*, who command the bombardeers, and are ſecond lieutenants to the royal regiment of artillery.

Theſe receive the orders from the *fire-maſters*, and ſee that the bombardeers execute them.

FIRING, in the *Military Art*, denotes the diſcharge of the fire-arms; and its object is to do the utmoſt execution to the enemy.

The preſent method of *firing* by platoons is ſaid to have been invented by Guſtavus Adolphus, and firſt uſed about the year 1618; the reaſon commonly given for this method is, that a conſtant fire may be always kept up. There are three different ways of platoon *firing*; viz. ſtanding, advancing, and retreating. But previous to every kind of *firing*, each regiment or battalion muſt be told off in grand diviſions, ſubdiviſions, and platoons, excluſively of the grenadiers, which form two ſubdiviſions, or four platoons of themſelves. In *firing* ſtanding, either by diviſions or platoons, the firſt fire is from the diviſion or platoon on the right; the ſecond fire, from the left; the third, from the right again; and ſo on alternately, till the *firing* comes to the center platoon, which is generally called the colour platoon, and does not fire, remaining as a reſerve for the colours. *Firing* advancing is performed in the ſame manner, with this addition, that before either diviſion or platoon fires, it advances three paces forward. *Firing* retreating varies from either of the former methods; for, before either diviſion or platoon fires, if they are marching from the enemy, it muſt go to the right about, and after *firing*, to the left about again, and continue the retreat as ſlow and orderly as poſſible.

In hedge-*firing* the men are drawn up two deep, and in that order both ranks are to fire ſtanding. Oblique *firing* is either to the right and left, or from the right and left to the center, according to the ſituation of the object. The Pruſſians have a particular contrivance for this purpoſe; if they are to level to the right, the rear ranks of every platoon make two quick but ſmall paces to the left, and the body of each ſoldier turns one-eighth of a circle, and *vice verſâ*. Parapet *firing* depends on the nature of the parapet over which the men are to fire, and alſo upon that of the attack made to poſſeſs it. This method of *firing* is ſometimes performed by ſingle ranks ſtepping on the banquette and *firing*; each man inſtantly handing his arms to the center rank of the ſame file, and taking his back in the room of it; and the center rank giving it to the rear to load, and forwarding the arms of the rear to the front rank; by which means the front rank men can fire ſix or ſeven rounds in a minute with exactneſs. Parapet *firing* may alſo be executed two deep, when the banquette is three feet broad, or in field works, where no banquettes are made. Square *firing* is performed by a regiment or body of men drawn up in a hollow ſquare, in which caſe each front is generally divided into four diviſions or *firings*, and the flanks of the ſquare, being the weakeſt part, are covered by four platoons of grenadiers. The firſt fire is from the right diviſion of each face; the ſecond from the left diviſion of each face, &c. and the grenadiers make the laſt fire. Street *firing* is practiſed in two ways; either by making the diviſion or platoon that has fired to wheel by half-rank to the right and left outwards from the center, and to march in that order by half diviſions down the flanks on each ſide of the column, and to draw up in the rear, and go on with their priming and loading; or, to make the diviſion or platoon, after *firing*, to face to the right and left outwards from the center, and one half rank to follow the other; and in that order to march in one center file down on each ſide of the column into the rear, and there draw up as before.

FIRING-*iron*, in the *Manege*, is a piece of copper or iron, about a foot long, one end of which is made flat, and forged like a knife; the back of it being half an inch thick, and the fore edge about the fifth or ſixth part of this. When the farrier has made his *firing-iron* red hot in his forge, he applies the thinneſt part to the horſes ſkin, and ſo gives the *fire* to the hams, or ſuch places as ſtand in need of it.

FIRKIN, an Engliſh meaſure of capacity, for things liquid; containing the fourth part of the barrel.

The *firkin of ale* contains eight gallons; and that of *beer*, nine; two *firkins* of beer make the kilderkin; two kilderkins the barrel; and two barrels the hogſhead.

The *firkins* of *ſoap* and *butter* are on the footing of the *firkin* of ale; viz. a gallon per *firkin* leſs than that of beer.

FIRLOT, a dry meaſure uſed in Scotland. The oat *firlot*, which contains $21\frac{1}{4}$ pints of that country, is $19\frac{1}{2}$ inches in diameter both at top and bottom, being of a perfectly cylindrical form, and in depth $7\frac{1}{3}$ inches. The wheat *firlot* contains about 2211 cubical inches, and the barley *firlot* 31 ſtandard pints; whereby it appears that the Scotch wheat *firlot* exceeds the Engliſh buſhel by 33 cubical inches.

FIRMAMENT, in the *Ancient Aſtronomy*, the eighth heaven, or ſphere; being that wherein the fixed ſtars were ſuppoſed to be placed.

It is called the *eighth*, with reſpect to the ſeven heavens or ſpheres of the planets, which it ſurrounds.

It is ſuppoſed to have two motions; a diurnal motion, given it by the primum mobile, from eaſt to weſt, about the poles of the ecliptic; and another oppoſite motion from weſt to eaſt; which laſt it finiſhes, according to Tycho, in 25412 years; according to Ptolemy, in 36000; and according to Copernicus, in 258000; in which time the fixed ſtars return to the ſame preciſe points wherein they were at the beginning. This period is commonly called Plato's year, or the great year. See PRÆCESSION *of the equinox*.

In divers places of Scripture the word *firmament* is uſed for the middle region of the air. Many of the ancients allowed, with the moderns, that the *firmament* is a fluid matter; though they, who gave it the denomination of *firmament*, muſt have taken it for a ſolid one.

FIRMAN, in the Eaſt Indies, and particularly in the territories of the Great Mogul, is the paſſport, or permit, granted to foreign veſſels, to trade within their juriſdiction.

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FIRMNESS, FIRMITAS, in *Philoſophy*, denotes the conſiſtence of a body; or that ſtate, wherein its ſenſible parts cohere, or are united together, ſo that the motion of one part induces a motion of the reſt. In which ſenſe, *firmneſs* ſtands oppoſed to fluidity.

Some authors confound *firmneſs* with denſity; as thinking the ſame ſtate or property of body implied by both; or at leaſt, that *firmneſs* follows denſity; but this is a miſtake. For mercury, the denſeſt body in nature excepting gold, is yet one of the moſt fluid; and even gold itſelf, with all its denſity, when fuſed, wants *firmneſs*, or coheſion.

Many of the Carteſians, and others, hold *firmneſs* to conſiſt in the mere quiet of the particles of the body, and their mutual immediate contact; urging, that a ſeparation of parts can only ariſe from ſome matter interpoſed between them, which is excluded by the notion of contiguity.

But the inſufficiency of this hypotheſis is evident: for mere ſimple reſt has no force, either to act or reſiſt; and conſequently two particles only joined by reſt and contiguity, would never cohere ſo as that a motion of the one ſhould induce a motion of the other. This is obvious in the caſe of two grains of ſand, which, however contiguous, and at reſt, will never conſtitute a *firm* coherent body.

The *firmneſs* of bodies, then, depends on the connexion or coheſion of their particles. Now, the cauſe of coheſion, Sir I. Newton, and his followers, hold to be an attractive force, inherent in bodies, which binds the ſmall particles thereof together; exerting itſelf only at, or extremely near, the points of contact, and vaniſhing at greater diſtances.

The *firmneſs* of bodies, therefore, follows the laws of the COHESION of bodies.

Hence, *firmneſs* in all bodies muſt be as the ſurfaces and contacts of the component parts: thus a body, whoſe parts are by their peculiar ſhapes capable of the greateſt contacts, is moſt *firm*; and that, whoſe parts are capable of the leaſt contact, will be moſt ſoft.

In the former, the greateſt requiſite is to be as near to cubes as poſſible, and in the latter to ſpheres. And in the ſame manner are to be accounted for, not only all the intermediate degrees between the moſt *firm*, and the moſt ſoft bodies, but thoſe different conſiſtencies, which are diſtinguiſhed by other names, as friable, tenacious, glutinous, and the like; for the greater are the ſolidities of the component parts of any body, in proportion to their ſurfaces, though that body, by the aptitude of the contacts, may be what we call *very hard*; yet it will be moſt friable or brittle. And where the ſurfaces of the component particles are much extended upon a ſmall quantity of matter, the bodies they compoſe, though they may be light and ſoft, yet they will be tenacious or glutinous; for although the flexibility of their compounding parts admits of their eaſy changing of figure by any external force, yet by their touching one another in ſo many points, they are very difficultly ſeparated.

The former is the caſe in cryſtallized ſalts, reſins, and the like; the latter in turpentines, gums, and all of that ſort.

FIRM-ORE, a kind of LEAD-*ore*.

FIRST *mover*, in the *Ancient Aſtronomy*. See PRIMUM *Mobile*.

FIRST-*fruits*, *Annates* or *Primitiæ*, the profits of a benefice for the firſt year after avoidance. See ANNATES and PRIMITIÆ.

The *firſt fruits* were formerly eſtimated according to a rate or *valor* made under the direction of pope Innocent IV. by Walter biſhop of Norwich, in 38 Hen. III. and afterwards advanced in value by commiſſion from pope Nicholas III. A. D. 1292, 20 Edw. I. which valuation of pope Nicholas is ſtill preſerved in the exchequer; and the tenths or *decimæ* were the tenth part of the annual profit of each living by the ſame valuation; claimed by the holy ſee on the authority of the precept recorded in Numb. xviii. 26. Theſe papal uſurpations were firſt introduced into this kingdom by Pandulph the pope's legate, during the reigns of king John and Henry III. in the ſee of Norwich, and afterwards attempted to be made univerſal by the popes Clement V. and John XXII. about the beginning of the fourteenth century. Theſe claims were often oppoſed by the Engliſh parliament; but they continued till the reformation in the reign of Henry VIII. at which period it was computed, that in the compaſs of 50 years 800,000 ducats had been ſent to Rome for *firſt fruits* only. This revenue was annexed to the crown by 26 Hen. VIII. cap. 3. confirmed by 1 Eliz. cap. 4. and a new *valor beneficiorum* was then made, by which the clergy are at preſent rated. By theſe ſtatutes all vicarages under ten pounds a year, and all rectories under ten marks, are diſcharged from the payment of *firſt fruits*; and if the incumbent lives but half a year, he ſhall pay only one quarter of his *firſt fruits*; if one whole year, half of them; if a year and a half, three quarters; and if two years, the whole. By ſtat. 27 Hen. VIII. cap. 8. no tenths are due to be paid for the firſt year; and by other ſtatutes of queen Anne, in the fifth and ſixth years of her reign, if a benefice be under fifty pounds per annum, clear yearly value, it ſhall be diſcharged of the payment of *firſt fruits* and tenths. Queen Anne granted her royal charter, confirmed by ſtat. 2 Ann. cap. 11. whereby the whole revenue of *firſt fruits* and tenths is veſted in truſtees for ever, to form a perpetual fund for the AUGMENTATION of poor livings, uſually called queen Anne's bounty. Blackſt. Comm. vol. i. p. 284, &c.

FIRST *fruits, office of*, is kept in the Temple, under the direction of a remembrancer, receiver, and comptroller, and their deputies and clerks.

FIRUZINUS *color*, a term that frequently occurs in ſome of the old writers on gems, and has been miſtaken by many to mean a ruſty brown; and by others, black; but theſe are not colours to be ſought after among the gems, and yet it is to thoſe that this epithet is uſually applied. We find it uſed for a blue kind of jaſper by ſome authors, the ſame with the jaſpis boreas of Pliny and Dioſcorides, and by others for the ſapphire, which ſome of the ancients, particularly Theophraſtus, having called μελανας, that is, black in its deepeſt colour, authors have been led to ſuppoſe that this word ſtood for black; but as there are not, nor ever were any black ſapphires, it is certain from this, as well as many other inſtances, that the ancients uſed this word, μελας, for a deep blue, and in that ſenſe *firuzinus color* does ſignify the ſame thing; it being the aerinus color of the ancients, or what we call ſky-colour, or a fine blue; ſuch as the colour of the fineſt ſapphires.

FISANELLE, in *Ornithology*, a name given by the Venetians to a water-fowl of the colymbus kind, called by authors the colymbus major, or great diver. Its general weight is about a pound, its beak is two fingers breadth long, and all its feathers are downy, ſoft, and very thick ſet together; its head and neck are brown, and its back is blackiſh; its ſides and belly brown, and its breaſt of a ſilver white; it has no tail, and its wing-feathers are black and white; its feet are not webbed, but the toes are all widened by membranes. It is very common in the markets of Italy. Ray's Ornith. p. 256.

FISC, FISCUS, in the *Civil Law*, the treaſury of a prince, or ſtate; or that to which all things due to the public do fall.

The word is derived from the Greek φισκος, *a great baſket*, uſed when they went to market.

By the civil law, none but a ſovereign prince has a right to have a *fiſc*, or public treaſury. See ÆRARIUM.

FISCAL, ſomething relating to the pecuniary intereſt of the king, the public, or a private perſon.

The emperor Adrian erected the office of *fiſcal* advocate in the Roman empire.

FISCHERLIN, in *Ornithology*, a name given by many of the northern nations to a ſmall ſpecies of the LARUS or GULL, called by Mr. Ray *larus piſcator*, by Linnæus *larus minuta*, and in Engliſh, the leſſer ſea-ſwallow. It is ſmaller than the common black-bird. Its bill is yellow, tipt with black, its forehead and cheeks white; from the eyes to the bill is a black line. Its wings are long and grey, its feet ſhort and yellow, its breaſt and belly are white, and of an exquiſite gloſs, the crown of its head black, and its back grey. They are very common on our coaſts, and feed on ſmall fiſh; but as they are delicate birds, and incapable of bearing the inclemency of the weather on our ſhores during winter, they quit their breeding places at its approach, and do not return till ſpring. Ray's Ornithology, p. 269.

FISGUM, a name uſed by ſome for the fiſh commonly called *miſgum*.

FISH, in *Natural Hiſtory*, the fourth claſs of animals, including four orders, viz. *apodes*, *jugulares*, *thoracica*, and *abdominales*, which comprehend forty-ſeven genera, and four hundred ſpecies, in the Linnæan ſyſtem; the characters of which are, that they have either a naked or ſcaly body, that they have no feet, and always have fins. According to the new Artedian ſyſtem, *fiſh* in general are divided into five diſtinct orders. The generality of *fiſh* have the tail placed perpendicularly, but a few of them have it horizontally. Of thoſe which have the tail perpendicular, ſome have the rays of the fins bony; and theſe either have the gills covered with a membrane, containing ſeveral bones, or they have no ſuch membrane: of thoſe which have this membrane, with the bones over the gills, ſome have the rays, though bony, yet not pungent; theſe are called the MALACOPTERYGII, or the ſoft-finned *fiſh*. Others have them with the

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FISHES.

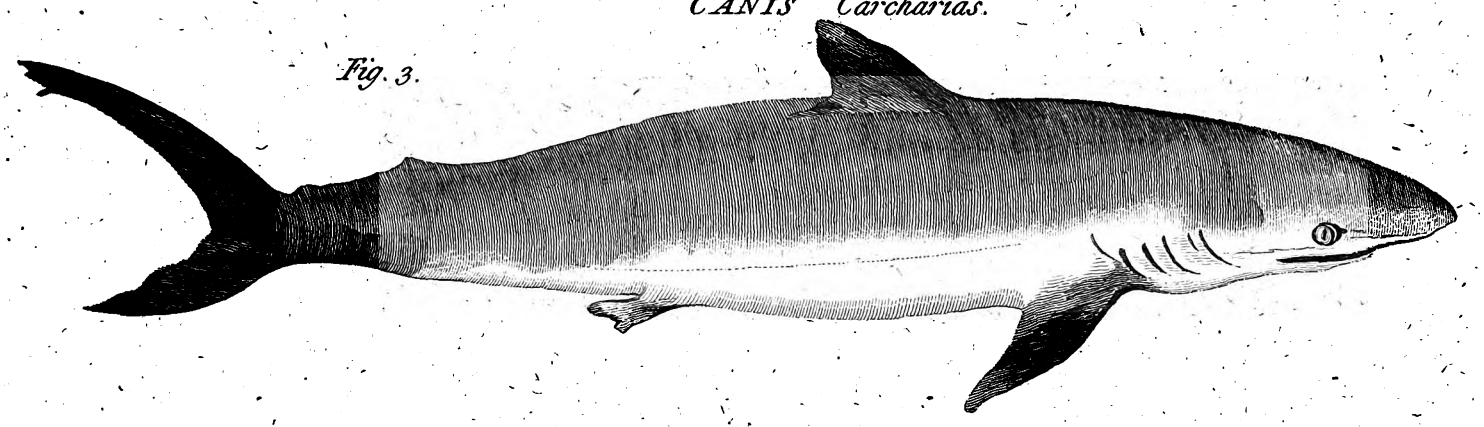
Fig. 1. Sea EAGLE

GUAMAJACU Atinga.

Fig. 2.

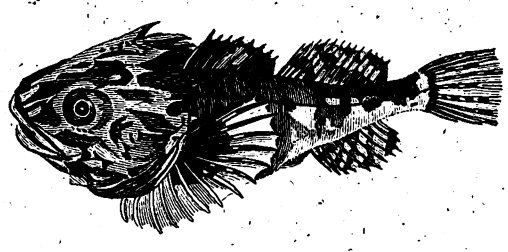
CANIS Carcharias.

Fig. 3.



FATHER Lasher.

Fig. 4.



GOAT Fish

Fig. 5.

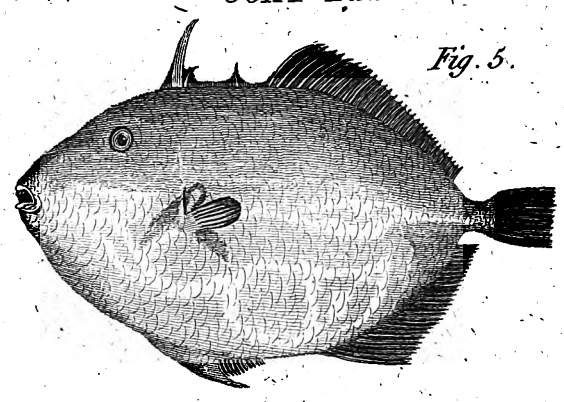
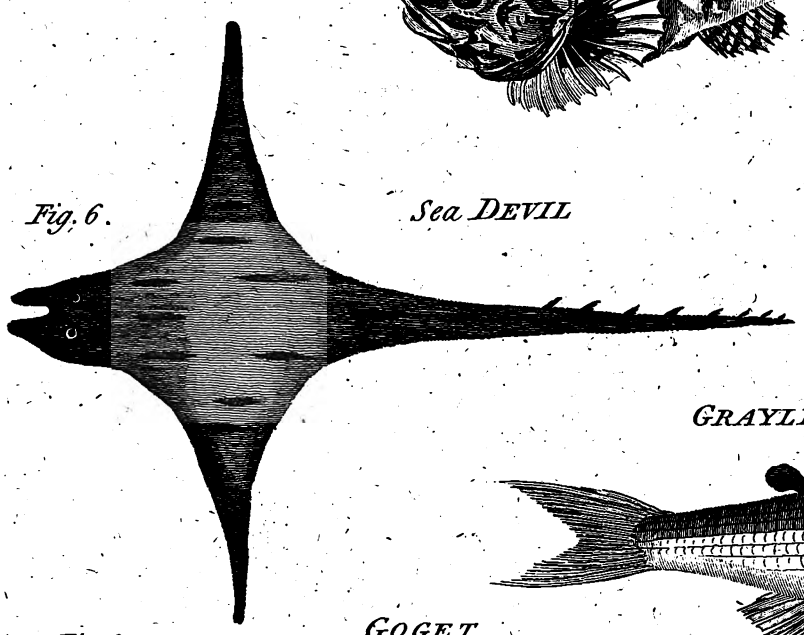


Fig. 6. Sea DEVIL



GRAYLING

Fig. 7.

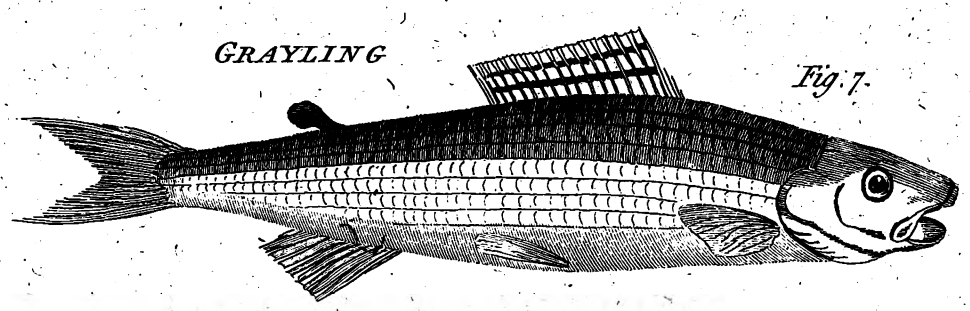
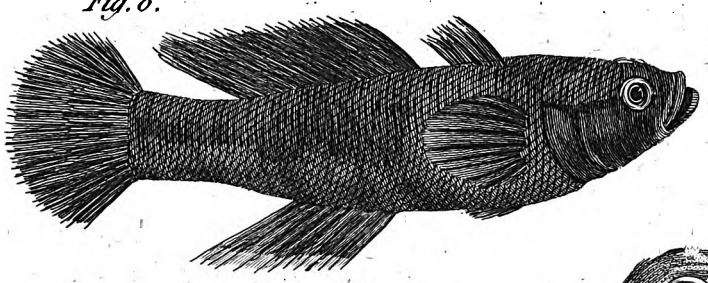


Fig. 8. GOGET



GURNARD

Fig. 9.

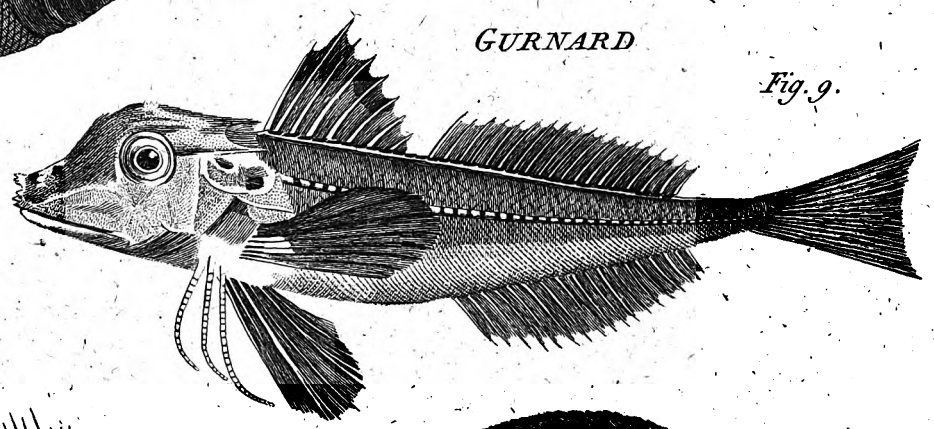


Fig. 10. DRACUNCULUS

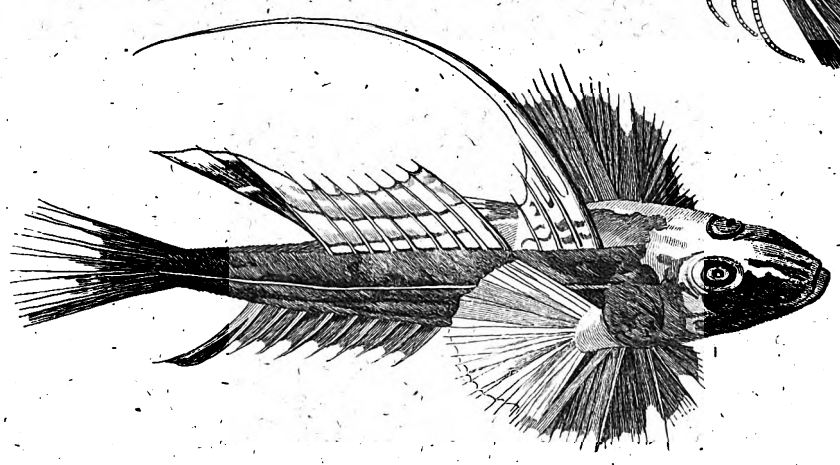
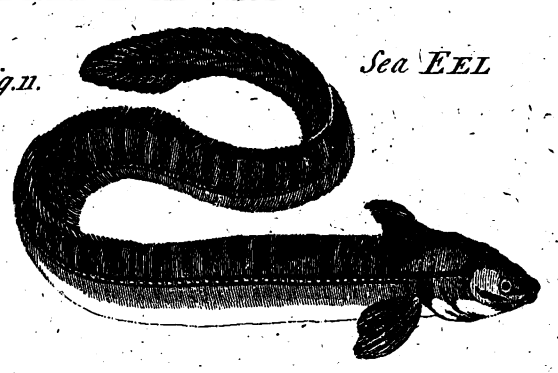


Fig. 11. Sea EEL



J. Taylor sculp.

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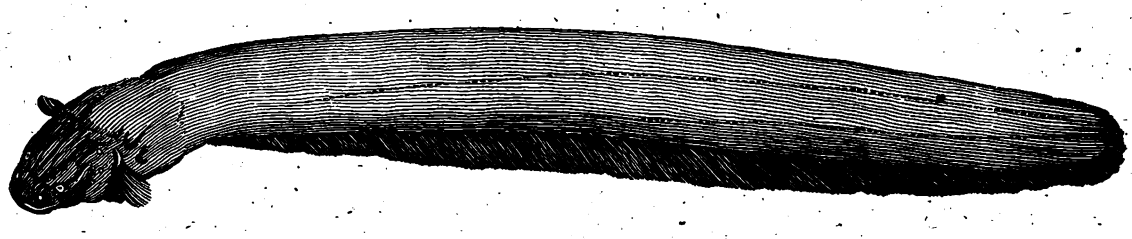
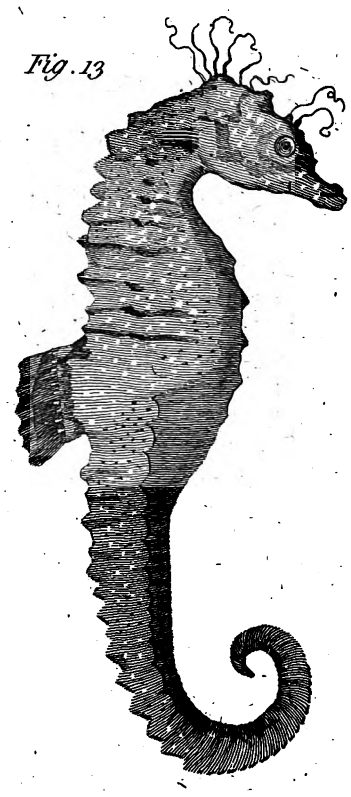
F I S H E S *Tab. II.*

GYMNOTUS Electricus *Fig. 12*

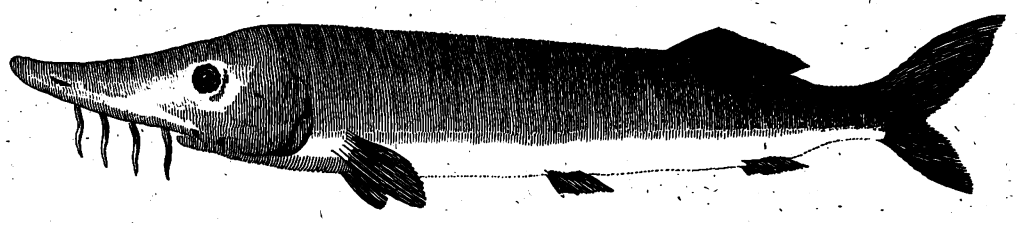


HIPPOCAMPUS

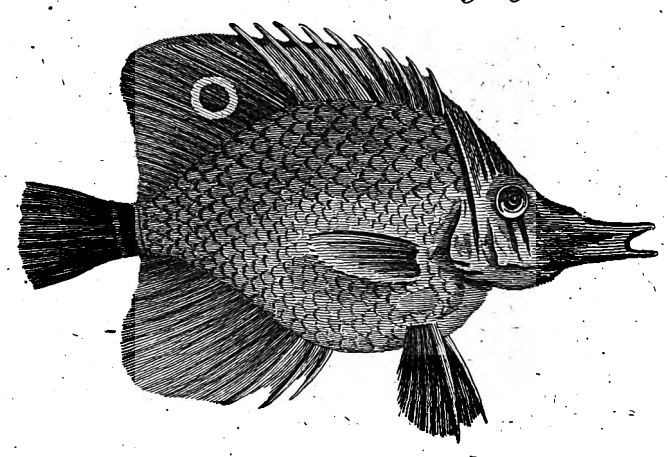
Fig. 13



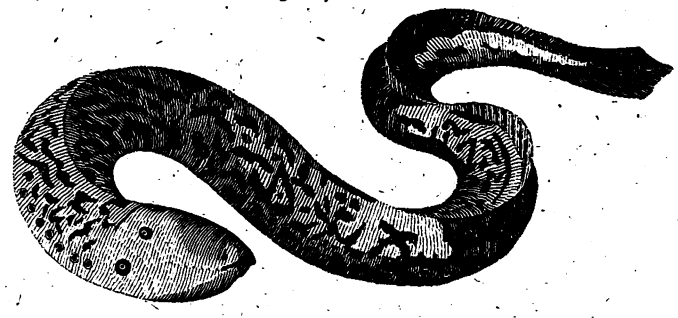
HUSO Germanorum *Fig. 14.*



JACULATOR *Fig. 15*

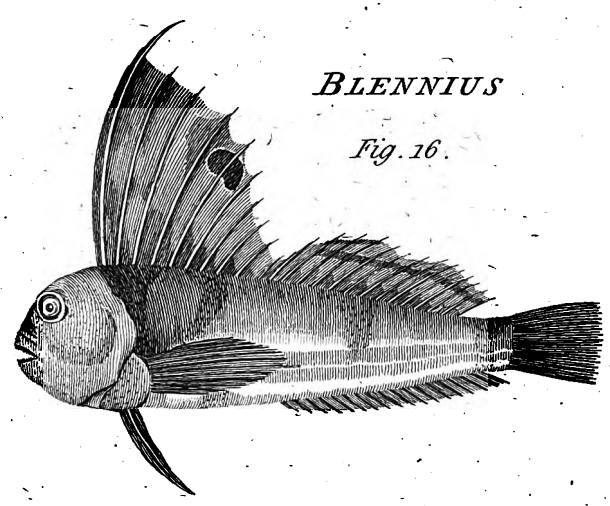


LAMPREY *Fig. 17*

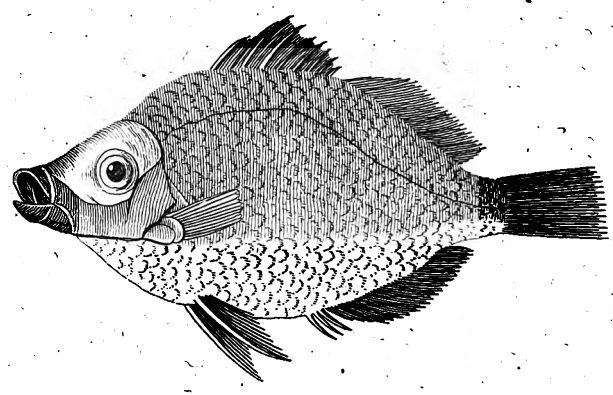


BLENNIUS

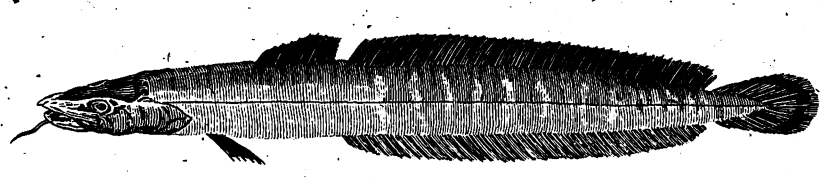
Fig. 16.



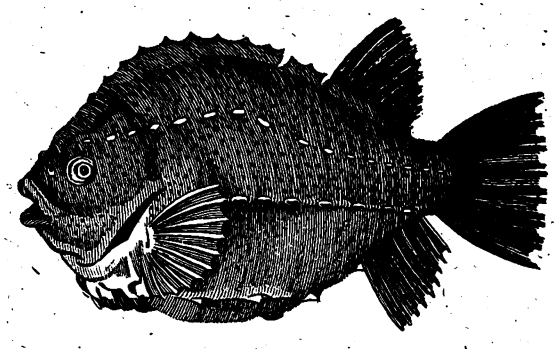
A P E R *Fig. 19*



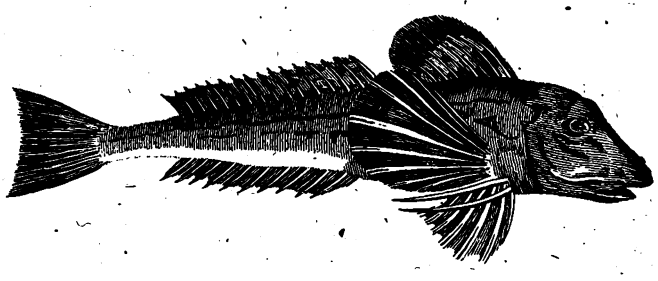
L I N G *Fig. 18*



LUMP Fish *Fig. 21.*



LUCERNA *Fig. 20*



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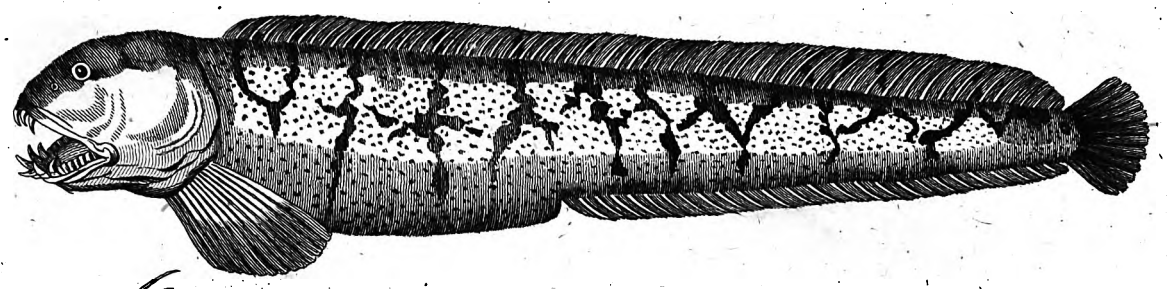
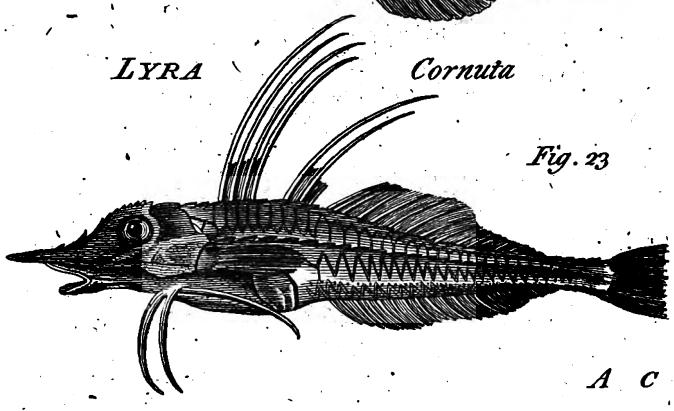
FISHES *Tab.III.*

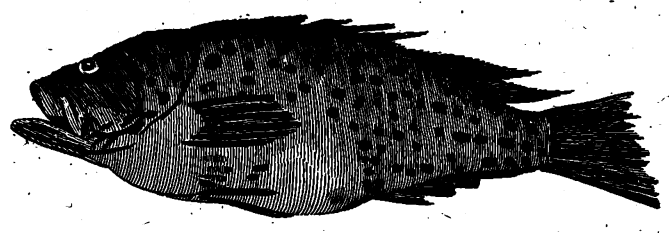
LUPUS Martinus *Fig.22*



LYRA Cornuta *Fig.23*

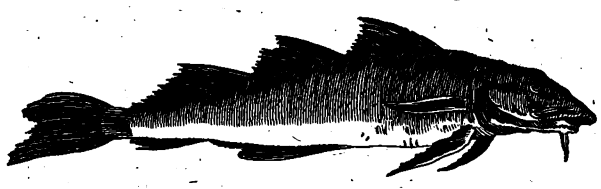


MEROS *Fig.24*



ACUS *Fig.25*

MERLUCIUS *Fig.26*



MONK Fish *Fig.27*

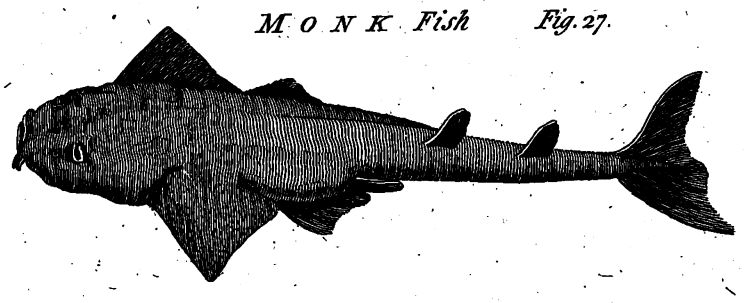
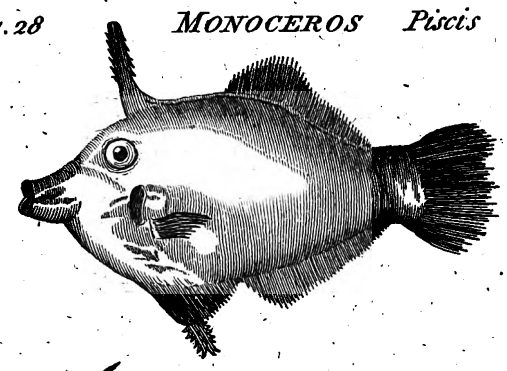
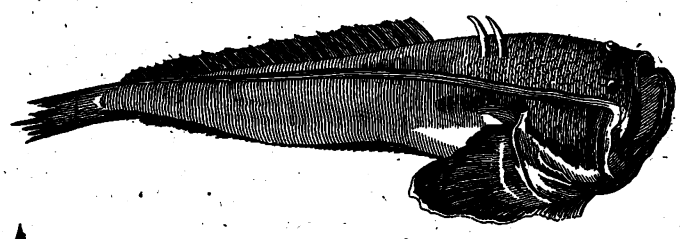


Fig.28 *MONOCEROS Piscis*



NIQUI or PIETERMAN *Fig. 29*



ORBIS

Fig.30 *OPAH*

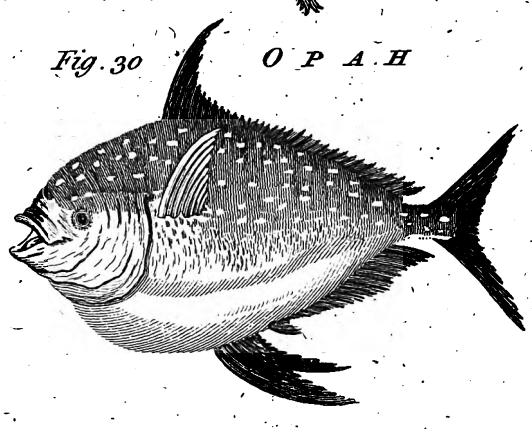
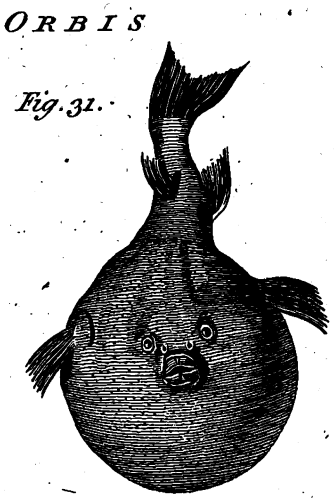
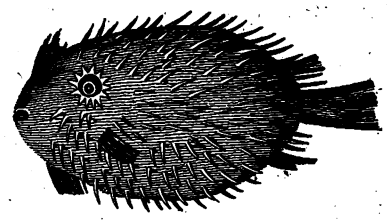


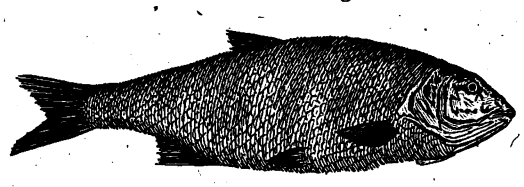
Fig.31.



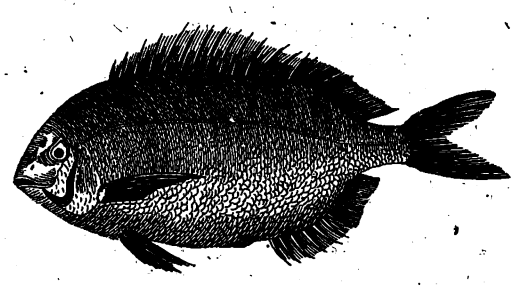
ORBIS Muricatus *Fig.32*



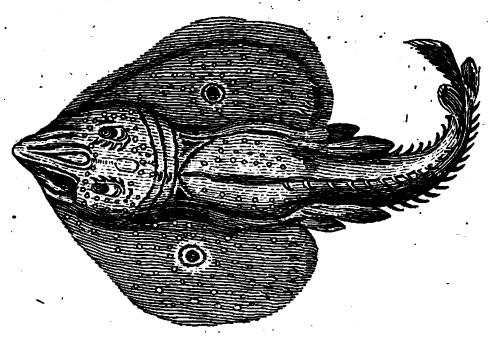
ORFUS *Fig.33.*



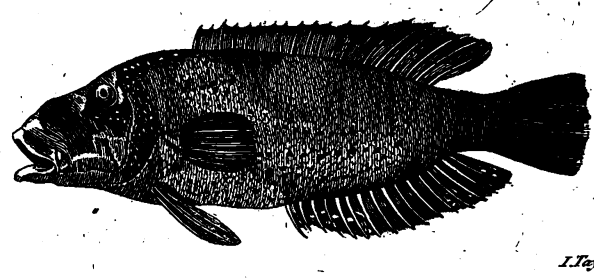
PAGRUS *Fig.34.*



PASTINACA Marina *Fig.35*



PEACOCK Fish *Fig.36.*



I.Taylor sculp.

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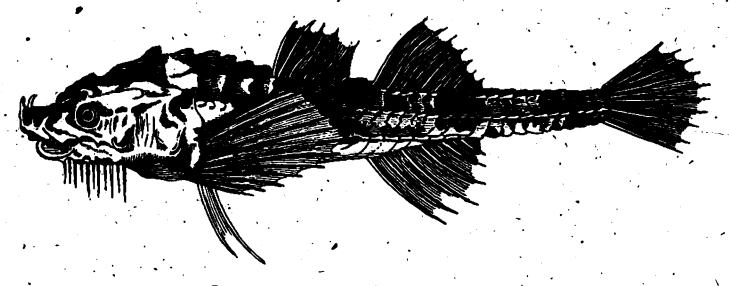
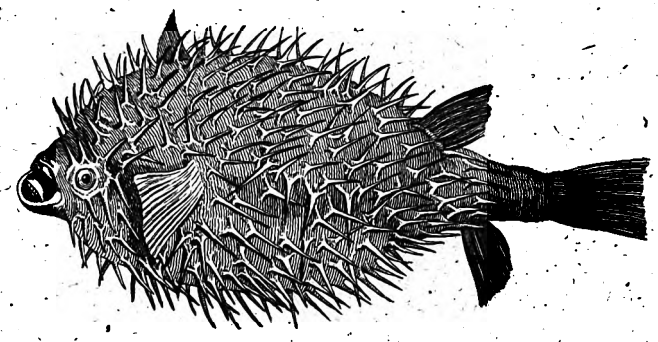
FISHES *Tab. IV.*

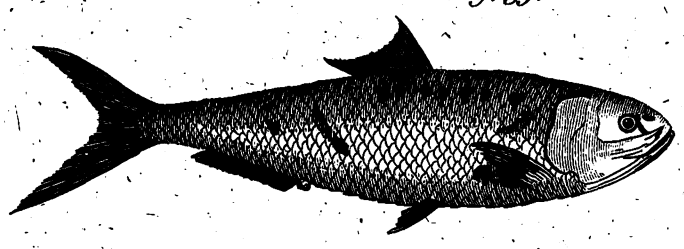
POGGÉ Fig. 37.



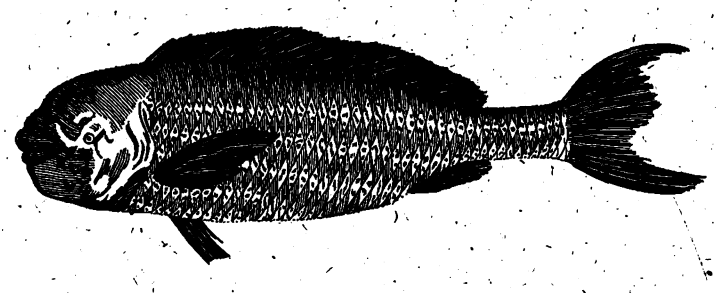
PORCUPINE Fish Fig. 38.



CLUPEA Fig. 39.



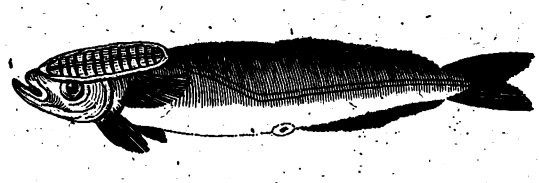
PUDIANO Verde. Fig. 40.



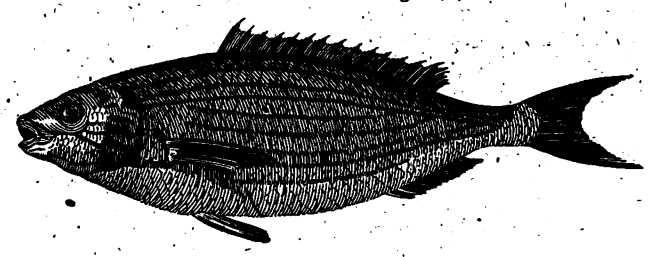
EXOCŒTUS or FLYING Fish.

Fig. 41.

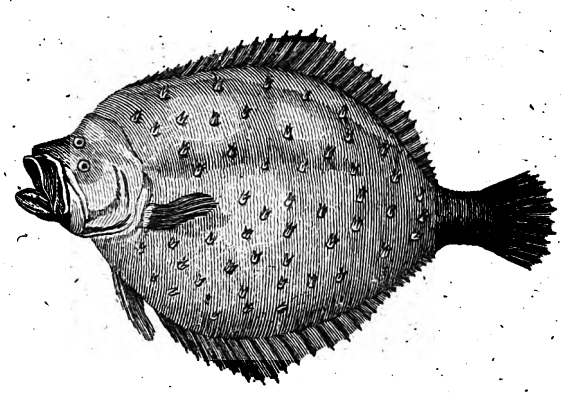
REMORA Fig. 42.



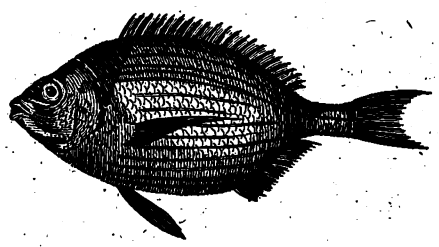
SALPA Fig. 44.



RHOMBUS Aculeatus. Fig. 43.

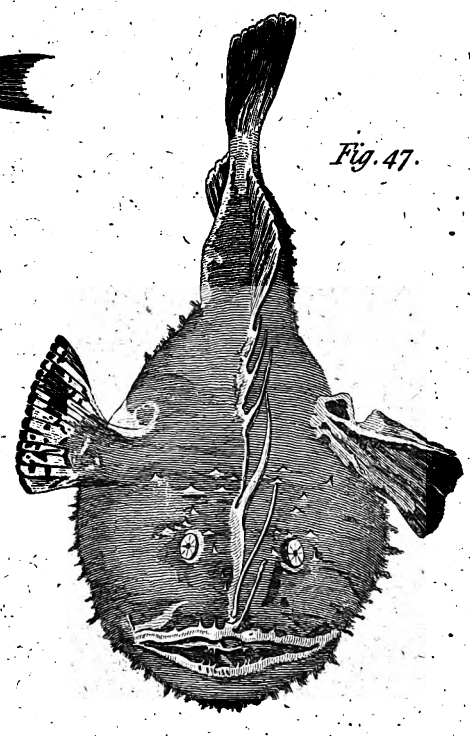


SARGUS Fig. 45.

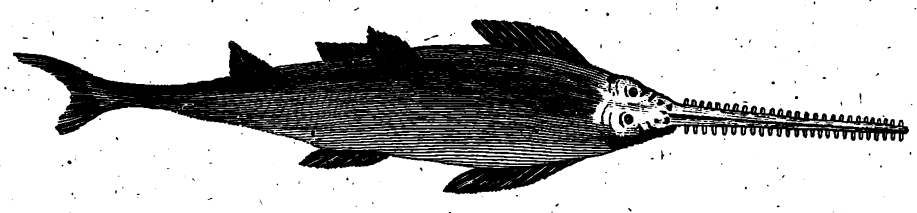


SEA Devil or TOAD Fish.

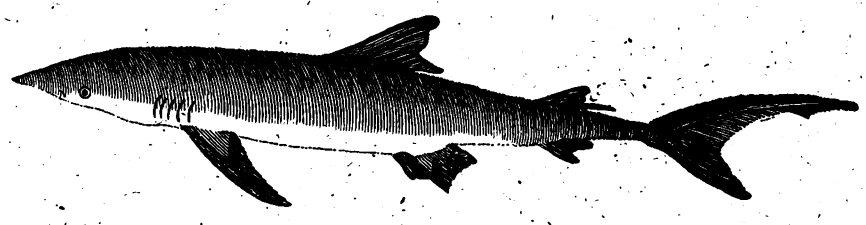
Fig. 47.



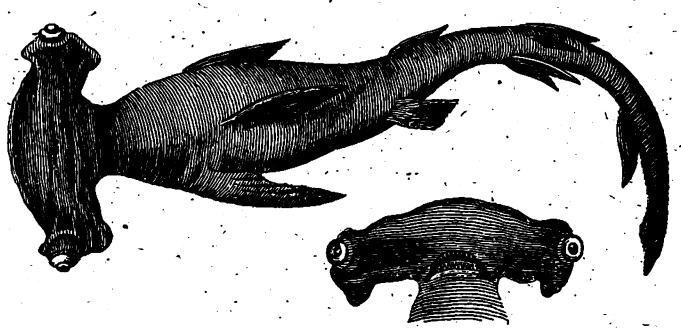
SAW Fish. Fig. 46.



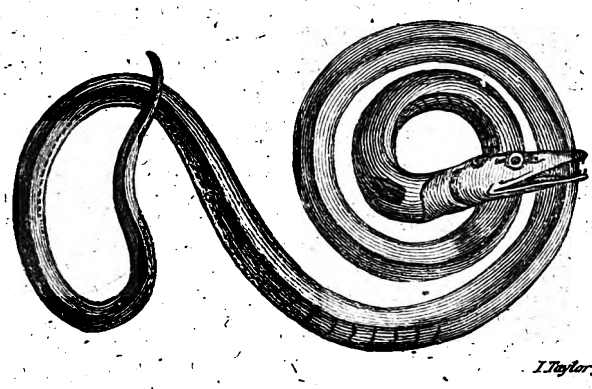
Blue SHARK. Fig. 48.



Hammer-headed SHARK. Fig. 49.



Sea SNAKE. Fig. 50.



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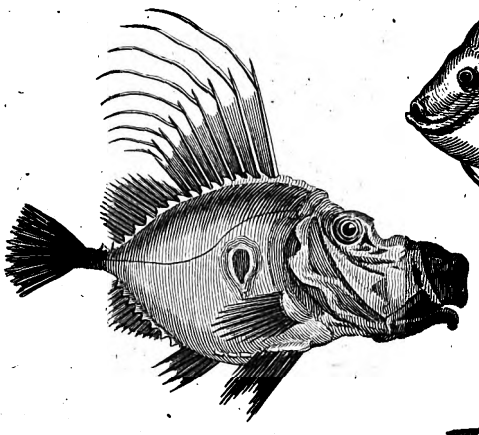
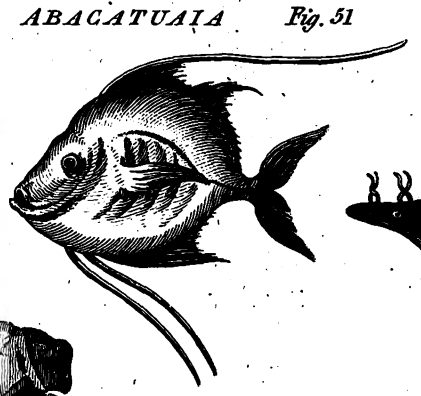
FISHES *Tab.V.*

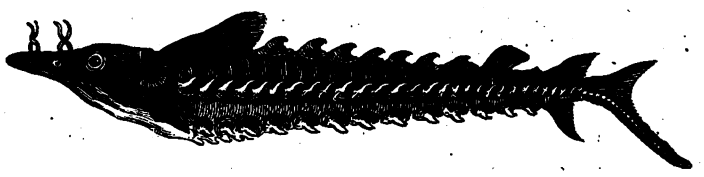
DOREE *Fig.50 Fig.2*



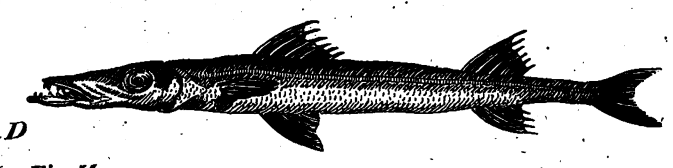
ABACATUAIA *Fig. 51*



STURGEON *Fig. 52*

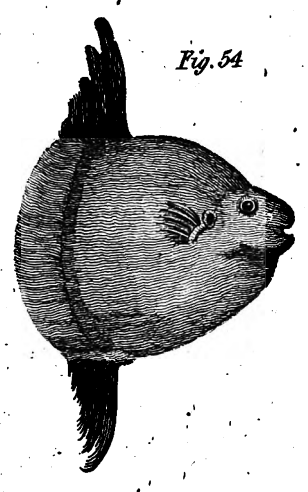


SUDIS *Fig. 53*



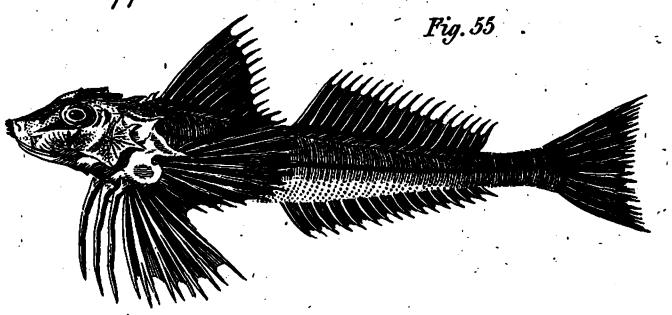
SUN fish

Fig. 54



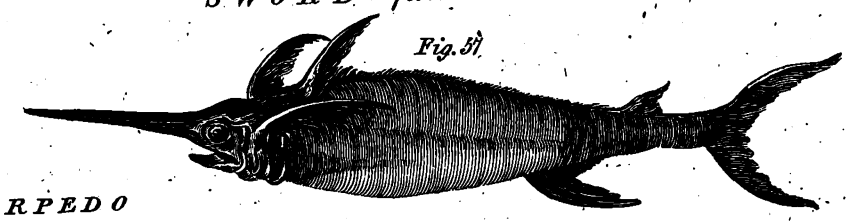
SWALLOW fish
or Sapphirine GURNARD

Fig. 55

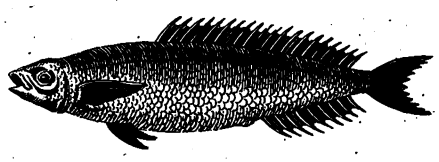


SWORD fish

Fig. 57

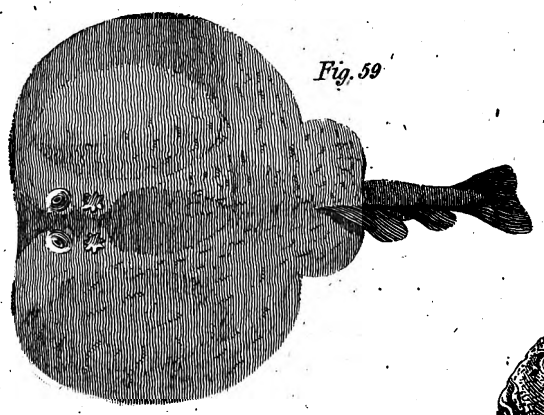


BOOPS *Fig. 56*

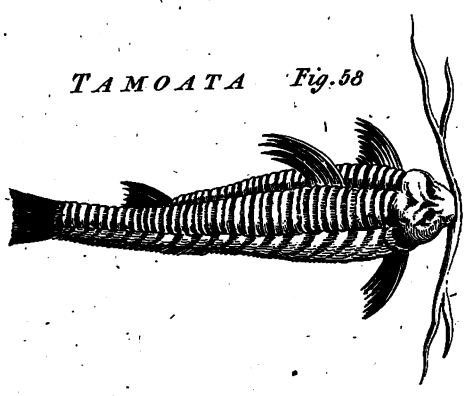


TORPEDO

Fig. 59

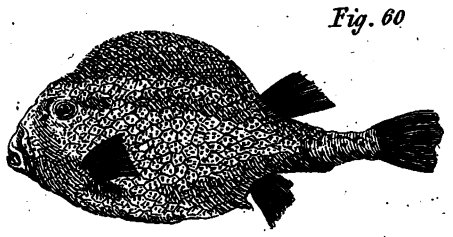


TAMOATA *Fig. 58*

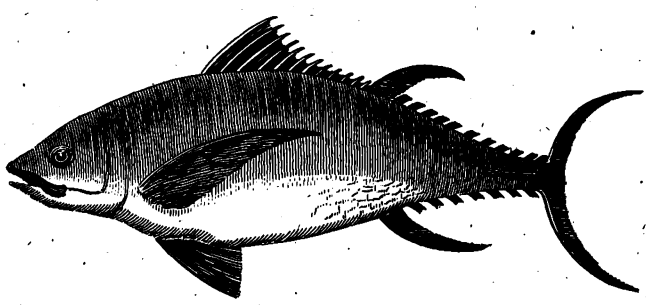


TRIANGULARIS piscis

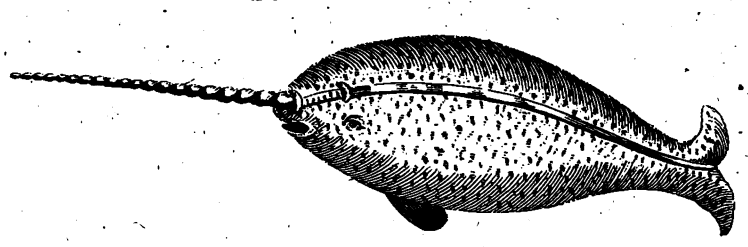
Fig. 60



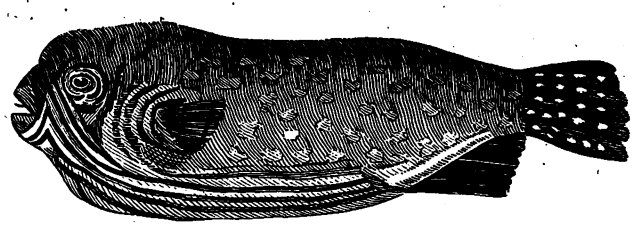
TUNNY *Fig. 61*



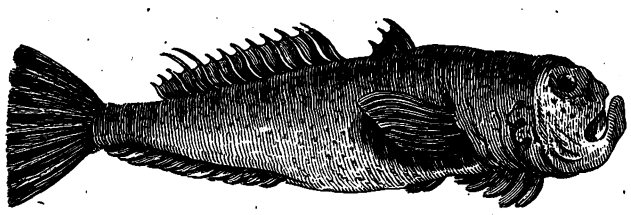
Sea UNICORN *Fig. 62*



BONT-VISCH *Fig. 64*

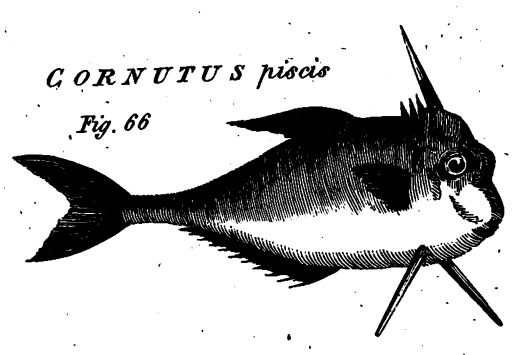


URANOSCOPUS *Fig. 63*

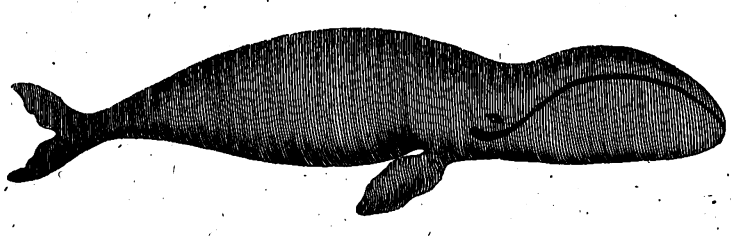


CORNUTUS piscis

Fig. 66



WHALE *Fig. 65*



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rays prickly; these are the ACANTHOPTERYGII, or prickly-finned *fish*. Those which have no bones in the membrane over the gills, make only one genus, and are called the BRANCHIOSTEGI. The other kind, which have not bony, but cartilaginous rays in the fins, are called CHONDROPTERYGII. And finally, those *fish* which have the tail placed not perpendicularly, but horizontally, are called PLAGIURI.

Naturalists observe much wisdom and design in the structure of *fishes*, and their conformation to the element in which they are to reside.

Their bodies are clothed and guarded in the best manner with scales, &c. suitable to their respective circumstances, the dangers they are exposed to, and the motion and business they are to perform.

The center of gravity is placed in the fittest part of the body for swimming; and their shape is the most commodious for making way through the water, and most agreeable to geometrical rules.

They have several parts peculiar to themselves; as fins, to balance and keep them upright. See FIN.

And an air-bladder, or swim, to enable them to rise and sink to any height and depth of water, at pleasure.

They have also gills or bronchiæ, whereby they respire; as land-animals do by the lungs.

The tail is the instrument of progressive motion, and serves to row them forward.

Their eyes are peculiarly formed to enable them to correspond to all the convergencies and divergencies of rays, which the variations of the watry medium, and the refractions thereof, may occasion; in which respect they bear a near resemblance to those of birds.

Fish are distinguished into *sea*, or *salt-water fish*, *pisces marini*, as the whale, herring, mackrel, &c. *river*, or *fresh-water fish*, *pisces fluviales*, as the pike, trout, &c. and *pond*, or *lake-fish*, as the carp, tench, &c. to which may be added others which abide indifferently in fresh water or salt, as salmons, shad-fish, &c.

Aristotle, and after him Mr. Willughby, more accurately distinguish *fish* into *cetaceous*, *cartilaginous*, and *spinous*.

The cetaceous *fish* are those whose tail is so placed, that when the *fish* is in its natural posture, it stands parallel to the horizon. By this situation of the tail, they are enabled to force themselves suddenly to the surface of the water to breathe, which they are frequently obliged to do. This species, like land-animals, breathe by means of lungs, being destitute of gills; for this purpose they have an orifice on the top of the head, through which also they eject water. They copulate also like quadrupeds, and conceive and bring forth their young, which they suckle with their milk. Many of these circumstances induced Linnæus to place this tribe among his MAMMALIA. The cartilaginous *fish* are those whose fins serving for swimming, are sustained by cartilages in the place of the bony rays which support them in the other, and which have also cartilages in the whole body, instead of bones. They breathe through certain apertures, generally placed on each side of the neck, but in some instances beneath, and in some above, and from one to seven in number on each part. Many of the cartilaginous *fish* are viviparous, being excluded from an egg, which is hatched within them; but some, as the sturgeon and others, are oviparous. This division comprehends the same genera to which Linnæus has given the name of AMPHIBIA *nantes*. These are the characters of the two first classes; and all those *fish* which have their fins supported by bony rays, which have their tails placed perpendicularly, not horizontally, and which have bones, not cartilages in their bodies, are called the spinose *fish*.

The true characters of these two great classes of *fish*, the cetaceous and cartilaginous, are easily found; but the characters of the spinose kinds are to be sought for deeper, and do not offer themselves so readily. The multitude of these, and the great likeness between several of the different genera, render it no easy task to distinguish them one from another. Though it be a general rule that the generical characters of *fish* are to be taken from their external parts; yet in cases where these external parts differ among themselves in number, figure, and proportion, it is necessary that the primary character of the genus should be taken from those parts which are the least variable of all others; and which are the most peculiar to the *fish* under consideration, and the least common to other genera. The utmost care and skill of the *ichthyologist* is necessary to the distinguishing these characters; and on a strict enquiry he will find, that those parts which seem at first most proper to found distinctions on, are in reality least of all so. The figure of the fins and tail in *fish* might seem one of the most essential characters for a generical distinction; yet a farther search into their nature will shew that they can be of no use at all in this sense. Almost all the species of the cyprini, a genus constituted on essential and invariable characters, and a truly natural one, have fins acute at the end, and have forked tails; yet had these been made characters of the genus, they would have excluded *fish* that are properly of it. Thus the tench and the carassius have both obtuse fins, and tails straight or plain, not forked at the end. There are indeed many natural genera of *fish*, in which the fins and tail are alike in all, as the pearch, the mackrel, the conger. These allow the fins and tail as very good collateral circumstances of the distinction; but even these could not well be distinguished by such marks alone, as they are common to many other genera besides.

The figure of the breast, the belly, and the back, and the whole figure of the body in regard to length and breadth, are all very obvious characters; but they are not essential enough to be of any use in the distinctions of the genera. The back in some of the cyprini is subacute, as in the common bream; whereas in almost all the others it is only moderately convex. This sets aside the use of the figure of the back as a generical character, since the bream, notwithstanding this difference from the rest of the cyprini, is truly of that genus. The belly, in the far greater number of the cyprini, also is plane in the anterior part, and between the pinnæ ventrales and the anus is raised into a ridge; but in the tench, the whole belly from the head to the tail is flat. And to this it may be added, that the general figure of the body, as to length or breadth, is extremely different in the cyprini of various species, as witness the bream, the alburnus, the rutilus, &c. some of which are properly flat, and others almost round.

The figure of the HEAD, the MOUTH, the EYES, the NOSTRILS, and other parts belonging to the head, are very different from these variable parts; they are in general fixed and permanent, and are of the utmost consequence in the distinctions; but as this figure is too common, and belongs to too many species equally, they are rather of use in distinguishing the orders, classes, and families of *fish*, than their genera. Thus the clupeæ, the cotti, the coregones, and scorpænæ of authors, have a plain general resemblance in the form of their heads, and yet they are of very different genera.

The figure of the scales is generally always the same in the same genus, and therefore may be made a good collateral circumstance in the distinctions; but as the same form is common to the scales of many genera, it is impossible to bring them to any great use in constituting the characters of the genera. As to the situation of the external parts, as that of the eyes, nostrils, mouth, and anus, they are generally regular, and alike in all the species of the same genus, regard being had to the proportion; but as their situation, though alike in these genera, is not peculiar to each, the marks are too common to be used as distinctive characters for genera. The situation of the fins also is usually very regularly the same in all the species of the same genus; but the same objection lies against this as against the others, in regard to making generical characters from it. The number of TEETH can be of no use in making characters of genera; for this very often varies in the same species in different individuals, as in the pike, salmon, &c.

In regard to the other external parts of *fish*, there are none which are found in all the spinose *fish*, and differ in all the several genera, except those little bones which are found on each side in the membrane of the head, which covers the gills. These bones are found in almost all the *fish* that have any bones, though in some kinds the thickness of this membrane makes them less conspicuous than in others. The number of these bones is much more regularly and constantly the same in the same genera, than that of the fins, as we may find by many observations. The four genera of the *scombri*, *gadi*, *perca*, and *syngnathi*, have the number of the fins very various in the several species of each genus; but in all these genera the number of the bones in the membrane that covers the gills, is regularly the same in every species. All the *gadi* have regularly seven bones on each side, and so on of the rest. All the *cyprini* have three of these bones on each side; all the *cotti* have six on each side; all the *clariæ* seven; all the *clupeæ* eight; all the *esoces* fourteen; and so of the rest. There are only two known genera of *fish*, that do not agree in all the species in the number of these bones; these are the salmon and the coregoni. In the first of these the number of the bones is in the several species ten, eleven, or twelve; and in the several species of the other, there are eight, nine, or ten, and sometimes but seven. It is an observation, however, worthy the naturalist's consideration, that nature has given this difference in the number of these bones in the several species only to those genera in which all the species

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cies have ſuch a ſtrong external reſemblance in all parts, that ſcarce any thing more than the facies externa was neceſſary for knowing that they belonged to one another; for beſide that all the ſalmon and coregoni have a membranous appendage reſembling a fin on the hinder part of the back, the ſeveral ſpecies of each genus are ſo very remarkably like one another, that it is not eaſy to diſtinguiſh them in many caſes.

As to the number of the fins on *fiſh*, there are a vaſt number of genera which have all the ſame general number, as the *cyprini*, *clupeæ*, *coregoni*, *oſmeri*, *ſalmon*, *cobitides*, *eſoces*, *pleuronecti*, *ſpari*, *labri*, *gobii*, and *gaſteroſtei*; all have ſeven fins radiated with bony ribs. The ſame number of ſeven fins, and thoſe of the ſame kind, is common alſo to the ſeveral other genera; but on the contrary, though all the ſpecies of the ſame genus have conſtantly the ſame number of bones in the membrane that covers the gills, yet it is very rare that the different genera have the ſame number. The pearch, the *gadi*, the *ammodytes*, and the *ſcombri*, have indeed all ſeven on each ſide. The *cyprini* and the *gaſteroſtei* have each of them three on each ſide. The *cotti*, the *pleuronecti*, and the *mugil*, have ſix each: theſe, however, are genera ſo very different in their other characters, and in their *facies externa*, that there is not the leaſt danger of their being confounded one with another.

From this it appears very evidently, that the number of theſe bones in the *membrana branchioſtega*, affords the firſt and moſt eſſential of all characters for the diſtinction of the genera of the catheturous and oſteopterygious, or bony-finned *fiſh*. This however is not ſufficient alone, though it is a great aſſiſtant in determining the genera; but in order to bring *fiſh* to their proper genera, it is neceſſary firſt, that all of the ſame genus ſhould have the ſame number of bones in the gills; then, that they ſhould have in the genera the ſame external form and figure; after this, that they muſt have the ſame ſituation of the fins, provided that the number does not differ, which ſometimes has been found to vary in ſpecies truly of the ſame genus; but in general it is, and ought to be, the ſame in all.

The ſituation of the teeth alſo ſhould be the ſame, and this generally holds right in the different genera of *fiſh*, all the ſpecies having in each natural genus the ſame orders of teeth. After this, the ſcales are to be examined, and theſe ought to be of the ſame ſort, and to have the ſame ſituation. Theſe are the circumſtances neceſſary to be enquired into, in regard to the eſtabliſhing juſt and natural genera. If all theſe agree in all the ſpecies, and, beſide this agreement, there be an analogy in the ſituation and form of the other internal and external parts, particularly in the ſtomach, and its appendices, in the inteſtines, and in the air-bladder, there will remain no doubt of the genus eſtabliſhed on ſuch foundations being perfectly juſt and natural.

It is not to be expected, however, that every one of theſe characters ſhould be found regularly in every ſpecies of the ſame genus in the ſame perfection; ſome will ſhew them more, others leſs, and others will want ſomething of them. But the three grand things that are eſſential to the ſameneſs of the genus, are the ſame number of bones in the branchioſtege membrane, and the ſame general external face or figure, and the ſame ſituation of the fins. The other circumſtances are additional and confirmative.

Upon the whole it appears, that the number of certain parts is the firſt great foundation of generical diſtinctions in *fiſh*; and that no one note or generical character can be ſo extenſive as to take in the whole at once, but that other characters leſs eſſential but more numerous muſt be in ſome caſes taken in for eſtabliſhing the whole ſeries of *ichthyological* diſtinctions. Artedi, Ichthyolog.

Willughby thinks it would be yet more proper to divide *fiſh* into ſuch as *breathe with lungs*, and ſuch as *breathe with gills*; and then to ſubdivide thoſe that breathe with gills, not into cartilaginous and ſpinous, but into *viviparous* and *oviparous*.

The *viviparous* kind that *breathe with gills*, he ſubdivides into *long*; ſuch as the *galei* and *canes*, or ſharks and dog-*fiſh*; and broad, ſuch as the paſtinaca, raja, &c. the ſubdiviſions of each whereof, he gives in his chapter of cartilaginous *fiſh* in general.

The *oviparous* kind that *breathe with gills* are the moſt numerous; and theſe he ſubdivides into ſuch as are what we uſually call *flat-fiſh*; and ſuch as ſwim with their back upright, or at right angles to the horizon.

The *plain* or *flat-fiſh* kind, called uſually *plani ſpinoſi*, are either *quadrati*, as the rhombi and paſſeres; or *longiuſculi*, as the ſoleæ.

Such as ſwim *with their backs erect*, are either long and ſmooth, and without viſible ſcales, as the eel-kind; or ſhorter and leſs ſmooth; and theſe have either but one pair of fins at their gills, or elſe another pair of fins alſo on their bellies; which latter kind he ſubdivides into two kinds. 1. Such as have *no prickly fins on their backs*, but ſoft and flexible ones. 2. Such as have *prickly fins* upon their backs.

Thoſe *fiſh* which have only ſoft and flexible fins on their backs, may be divided into ſuch as have *three*, *two*, or but *one* ſingle fin there.

No *fiſh* but the aſelli have *three* FINS on their backs.

Fiſh with *two fins* on their backs are either the truttaceous, trout kind; or the gobionites, loch, or gudgeon kind.

Fiſh with but *one ſoft back-fin* are of three ſorts. The firſt kind have one long continued fin, from head to tail, as the hipparus of Rondeletius, &c.

The ſecond have their fins but ſhort, and placed juſt in the middle of their back; and theſe are either *marine*, as the herring-kind; or *fluviatile*, as thoſe which we call *leather-mouthed fiſh*; ſuch as carp, tench, &c.

Fiſh which have *prickly fins on their backs* are of two kinds. 1. Such as have *two prickly fins on their backs*; and in theſe the anterior radii of their fins are always prickly. 2. Such as have but *one prickly fin* there.

The northern countries abound in large and delicate *fiſh* even to the extremeſt degrees of cold. Scheffer, in his Hiſtory of Lapland, gives us a wonderful account of the abundance, and large ſize of the *fiſh* there.

The ſalmon grow to a larger ſize than we ever ſee them, and are caught in ſuch abundance, that the natives who pickle them, ſometimes export not leſs than thirteen thouſand tuns in a year; pike are very common, and grow to the length of ſix or ſeven foot, and a proportionable thickneſs.

The carp grow to an ell long, and often conſiderably more; and trout, barble, gudgeons, and pearch, grow to a proportionable ſize and fatneſs. The laſt of theſe *fiſh* have one thing very peculiar among them: they ſoak the ſkins in water, and then ſtripping off the ſcales, they add freſh water, and boil the ſkins down till wholly diſſolved; of this they make a very pure and beautiful ſort of glue, which is not inferior in ſtrength to our coarſe and ſtinking kind.

The coming of certain kinds of *fiſh* in ſhoals and infinite multitudes, to certain coaſts at certain times of the year, is a thing of great advantage to mankind, as it gives opportunities of taking them with great eaſe, and in vaſt quantities; but the reaſon of theſe periodical returns of the ſeveral kinds does not ſeem much underſtood, though a little obſervation would probably clear it up. There is a ſmall inſect common in many ſeas, but peculiarly plentiful on the coaſts of Normandy in the months of June, July, and Auguſt. This is well deſcribed by Rondeletius, under the name of the ſea-caterpillar; and at this time of the year it is ſo frequent in the place before mentioned, that the whole ſurface of the water is covered with it as with a ſcum. This is the ſeaſon of the year when the herrings come alſo in ſuch prodigious ſhoals to theſe coaſts. The fiſhermen complain much of theſe naſty vermin, which diſturb their fiſheries; but they do not conſider that it is to theſe alone that their fiſheries are owing; for it is evident, that the herrings feed on theſe creatures greedily, by the vaſt quantity found in all their ſtomachs; and it is highly probable, nay ſcarce to be doubted, that the reaſon of thoſe *fiſh* coming up in ſuch numbers is to feed on them; probably if obſervation was made, the ſame would be found to be the caſe in all the other places where the herrings come in the ſame ſort of plenty. The mackrel come down in the ſame numbers regularly at certain times of the year, and for the ſame ſort of reaſon. This *fiſh* is an herb-eater, and is particularly fond of that ſea-plant called by naturaliſts the narrow-leaved purple palmated ſea-wrack; this grows in great abundance on the coaſts of England, and many other places, and is in its greateſt perfection in the beginning of the ſummer, though ſometimes later than others, according to the ſeverity or mildneſs of the winter.

The whole occaſion of theſe *fiſh* coming in ſuch quantities is to feed on this plant; and thoſe who would attend to its growing up, would know when to expect the mackrel berter than thoſe who liſten for thunder for the ſignal of them. The tunnies come at certain ſeaſons to the coaſts of Provence and Languedoc, in the ſame ſhoals that herrings and mackrel do to other places. This ſeems to be on another occaſion: the *fiſh* called by the French the emperor, and by the ſame confounded with the ſword-fiſh, is the great enemy of theſe *fiſh*, and in ſummer is ſo plentiful in thoſe ſeas, that they find no way of ſaving themſelves, but by flying to the ſhallow waters, where the other cannot eaſily follow them; hence they frequent the ſhores. The pilchards caught upon the coaſts of Brittany, and making a conſiderable article of commerce for that province, are yet a ſtronger

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proof of the natural means that bring *fiſh* in ſhoals to certain places, than any other. Theſe *fiſh* evidently come for food, and that not natural to the place, but prepared for them by the inhabitants.

The people of Brittany purchaſe from Norway the offal and entrails of all the large *fiſh* caught in the northern ſeas; this is of late years become a regular and conſiderable article of trade; they cut theſe to pieces, and ſtrew them in vaſt quantities over the whole ſurface of the ſea along their coaſts, at times when the winds do not ſit ſo as to blow it off.

This always brings together the pilchards in as vaſt ſhoals, as the herrings or mackrel come in other places; and the fiſhermen catch them in ſuch quantities, as to be able to ſupply all the maritime places in the neighbourhood with them at a ſmall price. The ſalmon, a *fiſh* bred in rivers, yet going at certain times to the ſea, is another of thoſe *fiſh* which come up at times in vaſt ſhoals. See SALMON.

Small *fiſh* may very well be kept in glaſs-jars with freſh water; and thoſe of prey are very fit to be tamed by this means.

Some of theſe creatures often have no other ſuſtenance than the animalcula of the water they are put in. Phil. Tranſ. N° 478. p. 26. See DACE and RUFF.

Mr. Boyle ſpeaks of a kind of *fiſh* on the coaſt of Ireland, the hearts of which are found inverted. Works abridg. vol. i. p. 27.

In the Philoſophical Tranſactions, N° 463. ſect. 1. we have a method of preparing ſpecimens of *fiſh*, by drying their ſkins, as practiſed by Dr. Gronovius.

FISH, *black, of Aleppo*, is deſcribed by Dr. Ruſſel as reſembling, in its ſhape, the SILURUS *Rondeletii*, and like it having no ſcales. The head and back are black; the lateral line runs quite from the head to the tail, on the middle of the ſide; below which to the belly, the colour generally changes to a dark purple. The under part of the head is alſo of the ſame colour. The head is flat, and about five inches long; the body is round, and near the tail becomes flat. The mouth is not ſo large in proportion as that of the ſilurus; it has no tongue, and the ſtructure of the mouth and palate agree exactly with the deſcription of that *fiſh*. A ſmall cirrus ariſes on each ſide from the edge of the noſtril, and two others twice as long, and much ſtronger, from the angles of the mouth. There are alſo four on the lower lip; the eyes are ſituated near the corner of the mouth; the branchiæ are four on each ſide, with a double row of ſharp points. Near the bronchiæ there are two fins, compoſed of ſeven radii; to the anterior part of which joins a pretty ſtrong prickly bone. Above the anus are two ſmaller fins; a long fin extends from under the anus to the tail, and another from the neck along the back; neither of which join with the tail. This *fiſh* is found in the river Orontes, and in ſtagnant waters near it. The markets of Aleppo are plentifully ſupplied with it from November to March. The fleſh is red like beef, and of a rank taſte, and eſteemed unwholeſome, though for want of better much uſed. Hiſt. Aleppo, p. 73.

FISH, with regard to commerce, is diſtinguiſhed into *dry, pickled, green*, and *red*.

FISH, *dry* or *ſalt*, is that which is ſalted and dried either by the heat of the ſun, or by fire. Such principally are the cod, ſtock-fiſh, herring, and pilchard. See *Cod* FISHERY.

FISH, *green*, is that lately ſalted, and which yet remains moiſt; as green cod, &c.

FISH, *pickled*, is that boiled and ſteeped in a pickle made of ſalt, vinegar, &c. as ſalmon, cod, herring, mackrel, pilchard, anchovy, and oyſters.

FISH, *red*, is ſome freſh *fiſh* broiled on the gridiron, then fried in oil of olives, and barrelled up with a proper liquor, as new olive-oil, vinegar, ſalt, pepper, cloves, and laurel-leaves, or other herbs. The beſt *fiſh* thus prepared are ſturgeon and tunny.

FISH, conſidered as a food, makes a conſiderable article in the furniture of the table; and the breeding, feeding, catching, &c. thereof, make a peculiar art of no ſmall moment in the œconomy of a gentleman's houſe and garden.

To this relate the ponds, ſtews, &c. deſcribed in their proper places. See FISH-*pond*, STEW, &c.

FISH, *blowing of*, is a practice ſimilar to that of blowing fleſh, poultry, and pigs, and adopted for the ſame deceitful purpoſes. The method of blowing *fiſh*, eſpecially cod and whitings, is by placing the end of a quill or tobacco-pipe at the vent, and pricking a hole with a pin under the fin which is next the gill; thereby making the *fiſh* appear to the eye large and full, which when dreſſed will be flabby, and little elſe than ſkin and bones. But this impoſition may be diſcovered by placing the finger and thumb on each ſide of the vent, and ſqueezing it hard; the wind may be perceived to go out, the ſkin will fall in, and the *fiſh* appear lank, and of little value.

FISH, *breeding of*. See FISH-*pond*.

FISH, *caſtration of*, is a method firſt practiſed by Mr. Tull, in order to prevent the exceſſive increaſe of *fiſh* in ſome of his ponds, where the numbers did not permit any of them to grow to an advantageous ſize. But he afterwards found, that the caſtrated *fiſh* grew much larger than their uſual ſize, were more fat, and always in ſeaſon. This operation may be performed both on male and female *fiſh*; and the moſt eligible time for it is when the ovaries of the female have their *ova* in them, and when the veſſels of the male, analogous to theſe, have their ſeminal matter in them; becauſe, at this time, theſe veſſels are more eaſily diſtinguiſhed from the ureters, which convey the urine from the kidneys into the bladder, and are ſituated near the ſeminal veſſels on each ſide of the ſpine; which, without ſufficient attention, may be miſtaken for the ovaries, eſpecially when theſe laſt are empty. The time leaſt proper for this operation, is juſt after they have ſpawned, becauſe the *fiſh* are then too weak and languid to bear, with ſucceſs, ſo ſevere an operation; however, with ſkill and care, it may be performed almoſt at any time. When a *fiſh* is to be caſtrated, it muſt be held in a wet cloth, with its belly upwards; then with a ſharp pen-knife, having its point bent backwards, the operator cuts through the integuments of the rim of the belly, taking care not to wound any of the inteſtines. As ſoon as a ſmall aperture is made, he carefully inſerts a hooked pen-knife, and with this dilates this aperture from between the two fore-fins almoſt to the anus. He then, with two ſmall blunt ſilver-hooks, five or ſix inches long, and of this form ∩, by the help of an aſſiſtant, holds open the belly of the *fiſh*; and, with a ſpoon or ſpatula, removes carefully the inteſtines from one ſide. When theſe are removed, you ſee the ureter, a ſmall veſſel, nearly in the direction of the ſpine, and alſo the ovary, a larger veſſel, lying before it, nearer the integuments of the belly. This laſt veſſel is taken up with a hook of the ſame kind with thoſe before mentioned, and, after detaching it from the ſide far enough for the purpoſe, divided tranſverſely with a pair of ſharp ſciſſars, care being taken, that the inteſtines are not wounded or injured. After one of the ovaries has been divided, the operator proceeds to divide the other in the ſame manner; and then the divided integuments of the belly are ſewed with ſilk, the ſtitches being inſerted at a ſmall diſtance from one another. Mr. Tull obſerves farther, that the ſpawning time is very various; that trouts are full about Chriſtmas; perch in February; pikes in March, and carp and tench in May; and that allowance muſt be made for climate and ſituation, with regard to the ſpawning of *fiſh*. When the *fiſh* are caſtrated, they are put into the water where they are intended to continue; and they take their chance in common with other *fiſh*, as though they were not caſtrated. With tolerable care, few die of the operation. Phil. Tranſ. vol. xlviii. part 2. art. 106.

FISH, *eyes of*. See EYES.

FISH, *fecundity of*, has been taken notice of by various writers, who have furniſhed inſtances of it in ſome particular ſpecies that have been thought ſurpriſing. M. Petit is ſaid to have found in the carp 342,144 eggs; and Lewenhoeck in a cod of middling ſize 9,384,000. But Mr. Harmer has lately purſued the inveſtigation of this curious ſubject with peculiar attention and accuracy, and extended his inquiries to a greater variety of ſpecies than any other perſon. The method which he adopted was that of weighing the whole ſpawn very exactly; he then took a piece weighing a certain number of grains, and carefully counted the eggs contained in it; and by dividing the number of eggs by the number of grains, he found, nearly, how many eggs there were in each grain. His computation of the number of eggs extended no farther than to thoſe which he could diſtinguiſh with his naked eye; though by this limitation, he omitted many eggs, diſcoverable by a microſcope, that might juſtly have been counted. The weights he uſed were avoirdupois, and he reckoned 437½ grains to an ounce.

The following table exhibits the general reſult of his enquiries: the firſt column contains the names of the *fiſh* which he examined; the ſecond, their weight; the third, the weight of their ſpawn; and the fourth, their fecundity; and the fifth, the time of the year, when each ſpecies of *fiſh* was examined. He has alſo added other columns, exhibiting the portion of ſpawn weighed, and the number of eggs found in a grain, and the reſult of examining ſeveral varieties of the ſame ſpecies of *fiſh* of different weights, which the curious reader may conſult. See Phil. Tranſ. vol. lvii. for 1767. art. 30. p. 280.

Abſtract

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Abſtract of the Table.

Fiſh.	Weight. oz.	dr.	Weight of ſpawn. Grains.	Fecundity. Eggs.	Time.
Carp	25	8	2571	203109	April 4.
Cod-fiſh	——	——	12540	3686760	Dec. 23.
Flounder	24	4	2200	1357400	Mar. 14.
Herring	5	10	480	36960	Oct. 25.
Lobſter	36	0	1671	21699	Aug. 11.
Mackrel	18	0	1223½	546681	June 18.
Perch	8	9	765½	28323	April 5.
Pike	56	4	5100½	49304	April 25.
Prawn	(127 grains)		——	3806	May 12.
Roach	10	6½	361	81586	May 2.
Shrimp	(39 grains)		7	6807	May 3.
Smelt	2	0	149½	38278	Feb. 21.
Soal	14	8	542½	100362	June 13.
Tench	40	0	——	383252*	May 28.

* N. B. Part of the ſpawn of this *fiſh* was accidentally loſt, and therefore this number is conſiderably too ſmall.

FISH, *feeding of.* 1. In a ſtew, thirty or forty carps may be kept from October to March, without feeding; and, by fiſhing with trammels, or flews, in March or April, you may take from your great waters, to recruit the ſtews; but you muſt not fail to feed all ſummer, from March to October again, as conſtantly as cooped chickens are fed; and it will turn to as good an account.

2. The conſtancy and regularity of ſerving the *fiſh* conduces very much to their well eating, and thriving.

The care of doing this, is beſt committed to the gardener, who is always at hand, and on the ſpot.

3. Any ſort of grain boiled is good to feed with, eſpecially peas and malt, coarſe ground; the grains after brewing, while freſh and ſweet, are alſo very proper; but one buſhel of malt, not brewed, will go as far as two of grains; chippings of bread, and orts of a table, ſteeped in tap-droppings of ſtrong beer, or ale, are excellent food for carps. Of theſe the quantity of two quarts to thirty carps, every day, is ſufficient; and to be ſo fed morning and evening, is better than once a day.

There is a ſort of food for *fiſh*, that may be called accidental, and is no leſs improving than the beſt that can be provided; and this is, when the pools happen to receive the waſh of commons, where many ſheep have paſture, the water is thus enriched by the ſoil, and will feed a much greater number of carps than otherwiſe it would do; and farther, the dung that falls from cattle ſtanding in water in hot weather, is alſo a very great nouriſhment to *fiſh*. See farther on the method of feeding carp, and the advantages reſulting from it, under the article CARP.

The beſt food, to raiſe pikes to an extraordinary fatneſs, is eels; and without them it is not to be done, but in a long time. Setting theſe aſide, ſmall perches are the beſt meat. Breams put into a pike pond breed exceedingly, and are fit to maintain pikes; which will take care they do not increaſe overmuch; the numerous fry of roaches and rudds, which come from the greater pools into the pike quarters, will likewiſe be good diet for them.

Pike in all ſtreams, and carp in hungry-ſpringing waters, being fed at certain times, will come up, and take their meat almoſt from your hand.

The beſt feeding-place is toward the mouth of the pond, at the depth of about half a yard; for by that means the deep will be kept clean and neat; the meat thrown into the water, without other trouble, will be picked up by the *fiſh*, and nothing will be loſt; yet there are ſeveral devices for giving them food, eſpecially peas; as a ſquare board like a trencher, ſupported by four ſtrings, one at each corner, with leads at the bottom for ſinking it, on which the food may be let down into the water.

When *fiſh* are fed in the larger pools or ponds, where their numbers are great, malt boiled, or freſh grains, is the beſt food. Thus carps may be fed and raiſed like capons, and tench will feed as well; but perch are not for a ſtew in feeding-time.

FISH, *generation of.* The general opinion of the world as to the generation of *fiſh*, is, that the female depoſits her ſpawn or eggs, and that the male after this ejects the ſperm or male ſemen upon it in the water, by which it is fecundated. The want of the organs of generation in *fiſh*, gives an apparent probability to this; but Linnæus is greatly againſt it. He affirms, that there can be no poſſibility of the impregnation of the eggs of any animal out of its body.

To confirm this, the general courſe of nature not only in birds, quadrupeds, and inſects, but even the vegetable world, has been called in to his aſſiſtance, as proving, that all impregnation is performed, whilſt the ova are in the body of the parent; and he ſupplies the want of the organs of generation by a very ſtrange proceſs, affirming that the males eject their ſemen always ſome days before the females depoſit their ova or ſpawn, and that the females ſwallow this, and have their eggs by that means impregnated by it.

He ſays, that he has often ſeen three or four females at this time frequently gathered about the male, and greedily ſnatching up into their mouths the ſemen he ejects: he mentions ſome of the eſoces, ſome pearch, and ſome of the cyprini, in which he had ſeen this proceſs. Mr. Tull aſſerts, that he has frequently ſeen *fiſh* in actual copulation; and that this is generally done before the ova arrive at maturity. Phil. Tranſ. vol. xlviii. part ii. art. 106. p. 873.

FISH, *generical names of.* See GENERICAL *name.*

FISH, *gilding of.* See GILDING.

FISH, *hearing of.* When the lapilli or bones in the heads of *fiſh*, which are truly their organs of hearing, are examined in the heads of the ſeveral kinds, it appears, that they differ from one another both in their ſtructure and ſubſtance. For in the cetaceous *fiſh*, whoſe ſkeletons are truly bony, and which in certain reſpects may be compared to truly ligneous trees, both the os petroſum, and the auditory organs, are in theſe as in other animals, perfectly oſſeous or bony; whereas the cartilaginous *fiſh*, whoſe ſkeletons are elaſtic, and are cartilagineous rather than bony, may be compared to the keratophyta, or tough horny ſea-plants; and theſe *fiſh*, inſtead of an os petroſum, have ſomething analogous; but it is cartilaginous not bony, and the auditory bones are of a tartareous kind of ſubſtance, being friable, and eaſily crumbled to pieces. See EAR.

It has been a diſputed point among the naturaliſts of many ages, whether *fiſh* hear or not; it is plain that the cetaceous *fiſh* have all of them auditory paſſages or ear-holes, but it has not been found, that any other *fiſh* have any appearance of them. Many authors have been fond of believing that all *fiſh* have hearing; but their arguments in general are inconcluſive.

Among the ancients, many authors appear to have been poſitive in the opinion, that *fiſh* had hearing, though they were by no means ſatisfied about the ways or paſſages by which they heard. Placentini afterwards diſcovered ſome bones in the head of the pike, which had very much the appearance of being organs of hearing, but he could never diſcover any external paſſages to them. Klein ſeems to be the only author who has improved upon this hint to any purpoſe; and he affirms and proves from experiments and obſervations, that all *fiſh* have the organs of hearing, and have alſo paſſages from without to thoſe organs, though in many ſpecies they are difficult to be be ſeen, and that even the moſt minute and obſcure of theſe are capable of communicating a tremulous motion to thoſe organs from ſounds iſſuing from without; nor does the water appear, on ſerious conſideration, to be any impediment, but rather a proper medium for the conveying the ſounds to ſuch organs; and it appears no way more ſtrange, that they ſhould hear through the water, than that a man ſhould hear in one room the words pronounced in another, though there is a partition between them.

The organs of hearing in *fiſh* are indiſputably the little bones commonly called lapilli, and found in the heads of all *fiſh*; theſe are conſtituent and eſſential parts in the head of *fiſh*, and are generated with the brain itſelf; not an accidental thing as ſome have believed them to be. They are always found to differ in magnitude, according to the ſize of the *fiſh* they belong to; and they are more eaſily diſtinguiſhed in the heads of the ſpinoſe *fiſh*, than in any other kind. There are in all kinds of *fiſh* three pair of them; the firſt are the two largeſt bones, and are eaſily enough found; but the greateſt difficulty lies in diſcovering the other two pair, which are ſmall, and lie enveloped in diſtinct little bags compoſed of a fine membrane. Theſe ſeem to be the auditory organs, and to anſwer to the incus, malleus, and ſtapes, in other animals; and by a diligent and careful inſpection, the age of a *fiſh* may be determined by the number and thickneſs of the laminæ and fibres of theſe bones, in the ſame manner as the age of a tree is known by the number of circles of the wood. The paſſages by which a tremulous motion is conveyed from without to theſe internal organs are to be diſcovered with care in moſt *fiſh*, and in particular in the pike; though Placentini could not diſcover them there. A cloſe examination of the head of this *fiſh* will ſhew ſeveral holes into which hog's briſtles may be thruſt, and theſe will be found to go directly into the internal auditory organs; and in diſſecting the head of a ſturgeon, the auditory duct is eaſily traced as far as the membranous body, in which the three pair of little bones are placed. Curious figures of theſe auditory ducts, and of the great variety of theſe oſſicula or lapilli,

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lapilli, are exhibited in Klein's Hiſtory of *Fiſh*, to which we refer, as much more expreſſive than any form of words can be. See an account of Klein's book in Phil. Tranſ. abr. vol. ix. p. 114, &c.

Mr. Baker aſcribes to the exquiſite ſenſibility of the organs of ſight and feeling in *fiſh* thoſe effects, which others have urged as arguments of their poſſeſſing the faculty of hearing, in Phil. Tranſ. vol. xlv. art. 4. p. 153. However, M. Camper has more lately endeavoured to ſhew, that *fiſh* are really endowed with this ſenſation, and deſcribed the organs adapted to this purpoſe in ſome particular ſpecies. Mem. de Mathem. & Phyſ. Roy. Acad. Sc. Paris, vol. vi. 1774. And the abbé Nollet has long ſince evinced, by diving under water for this purpoſe, that water is capable of receiving and tranſmitting to the animals contained in it, thoſe peculiar impreſſions that conſtitute ſound. Mem. de l'Acad. 1743.

FISH, *iſinglaſs*. See HUSO.

FISH, *iſland*. See ISLAND-*fiſh*.

FISH, *milt of*. See MILT.

FISH, *needle*. See NEEDLE-*fiſh*.

FISH, *noſtrils of*. See NARES *piſcium*.

FISH, *royal*. See ROYAL *fiſhes*.

FISH, *ſhell*. See SHELLS.

FISH, *ſtealing of*, by perſons armed and diſguiſed, is felony without benefit of clergy by 9 Geo. I. cap. 22. See BLACK *act*. And by 5 Geo. III. cap. 14. the penalty of tranſportation for ſeven years is inflicted on perſons ſtealing or taking *fiſh* in any water, within a park, paddock, orchard, or yard; and on the receivers, aiders, and abettors; and a forfeiture of five pounds to the owner of the fiſhery is made payable by perſons taking or deſtroying (or attempting ſo to do) any *fiſh* in any river or other water within any incloſed ground, being private property.

FISH, *ſwimming of*. See SWIMMING *of fiſh*, and AIR-*bladder*.

FISH, *teeth of*. See TEETH *of fiſh*.

FISH, in *Aſtronomy*. See PISCES.

FISH-*days*. See ABSTINENCE.

FISH, in *Heraldry*. See HERALDRY.

FISHER, in *Zoology*. See SABLE.

FISHERY, a commodious place for *fiſhing*; or a place wherein great quantities of *fiſh* are caught.

The principal *fiſheries* of Europe for ſalmon, herring, cod, and mackrel, are along the coaſts of England, Scotland, and Ireland; for cod, on the banks of Newfoundland; for whales, about Greenland; for pearls, in the Eaſt and Weſt Indies, &c.

FISHERY alſo denotes the commerce of *fiſh*; more eſpecially the catching them for ſale. The *fiſhery* makes a principal branch of the Britiſh commerce. A great quantity of veſſels and ſeamen are employed therein; and beſides what is ſpent at home, large ſums are yearly returned, merely for herring, cod, and pilchards, exported to Spain, Italy, and ſeveral parts of the Mediterranean, and the iſlands of the Archipelago.

Yet are our countrymen reproached, and with a good deal of juſtice, for their remiſſneſs in this branch of trade. The advantageous ſituation of our coaſts might be of immenſe benefit to us, did not we let our neighbours overreach us therein. The Dutch, French, Hamburghers, &c. come yearly in large ſhoals, and not only take the fiſh from our own coaſts, but ſell them to us for our money, when they have done.

Scotland ſuffers incredibly on this ſcore: no country in Europe can pretend to rival it in the abundance of the fineſt fiſh, wherewith its numerous harbours, loughs, rivers, &c. are ſtored. In the river Dee, it is ſaid, an hundred and ſeventy head of ſalmon is not very extraordinary for a ſingle draught of a net; and the pickled ſalmon ſent hence is allowed the beſt in Europe. The Scottiſh iſlands, eſpecially thoſe on the weſtern ſide, do certainly lie the moſt commodiouſly for carrying on the fiſhing-trade to perfection.

King Charles the firſt began the experiment in 1630 and 1633, in conjunction with a company of merchants; but the civil wars ſoon ſet it aſide. King Charles the ſecond, in 1661, made a like attempt; but having preſſing occaſion for money, he was perſuaded to withdraw what he had employed in the *fiſhery*; at which the merchants, joined with him, being diſpleaſed, did the like themſelves.

Since the Union, ſeveral efforts have been made to retrieve it; and in 1750 there was a corporation ſettled on that footing by parliament, called the *Free Britiſh Fiſhery*, for the term of twenty-one years, under the direction of a governor, preſident, vice-preſident, council, and other officers, who were empowered to make bye-laws, &c. and to raiſe a capital of 500,000*l.* and the Scotch *fiſhery*, encouraged by fiſhing chambers, erected in ſeveral cities, is likely to be put on a very advantageous baſis. See *Herring* FISHERY.

FISHERY, *anchovy*. See ANCHOVY.

FISHERY, *cod*. The cod is a fiſh of paſſage, pretty large, with a great head, and teeth in the bottom of the throat; its fleſh white; its ſkin browniſh on the back, white under the belly, and covered with a few thin tranſparent ſcales. See COD.

It eats excellently when freſh; and, if well prepared and ſalted, will keep a long time. This fiſh, thus prepared, is commonly eaten among us in Lent, &c. under the denomination of *ſalt-fiſh*, or *ſtock-fiſh*.

There are two kinds of *ſalt-cod*; the one called *green*, or *white*; and the other *dried*, or *cured*; though it is the ſame fiſh, only differently prepared.

They are alſo diſtinguiſhed by the places from whence they are brought, as well as by the manner of curing, into Aberdeen-fiſh, Iceland-fiſh, green-fiſh, ſtock-fiſh, North-ſea cod, poor Jack, and barrelled cod.

Green cod.—The chief *fiſheries* for *green cod* are in the bay of Canada, on the Great and Little Bank, near the coaſt of Newfoundland, the iſle of St. Peter, and the iſle of Sable; and thither veſſels are yearly ſent from divers parts both of America and Europe.

The veſſels uſed herein are from a hundred to a hundred and fifty tons burden; and theſe will bring thirty or thirty-five thouſand fiſh a-piece.

The moſt eſſential articles in this *fiſhery* are the perſons who know how to open the fiſh, to cut off the heads, and to ſalt them; upon the ability of which laſt the ſucceſs of the voyage chiefly depends.

Several authors will have it, that the Biſcayans, in purſuing their whales, made the firſt diſcovery of the Great and Little Banks of *cods* at Newfoundland, Canada, &c. a hundred years before Columbus's time; and that it was a Biſcayan Newfoundlander that gave the firſt intimation thereof to Columbus.

Others ſay, that the Great Bank was diſcovered by a native of St. Malo's, named Cartier. But be the diſcoverer of what name or nation he may, the diſcovery is certainly highly valuable; there is not a trading nation in Europe, but allows the commerce of *cod-fiſh* one of the moſt ſecure and gainful that is known.

The beſt, largeſt, and fatteſt *cod*, are thoſe taken on the ſouth-ſide of the great Bank, which is a kind of ſubmarine mountain, one hundred and fifty miles long, and fifty broad, and at the diſtance of twenty-five leagues from Newfoundland: thoſe on the north-ſide are generally much ſmaller.

The beſt ſeaſon is from the beginning of February to the end of April; at which time the *cod*, which during the winter had retired to the deepeſt part of the ſea, return to the Bank, and grow very fat.

Thoſe caught from March to June keep well enough; but thoſe taken in July, Auguſt, and September, ſoon ſpoil.

The fiſhing is ſometimes done in a month, or ſix weeks; and ſometimes it holds four or five months. As Lent draws on, if the fiſhermen have but half their cargo, they ſtrive who ſhall make homeward the firſt; the market being then the beſt.

Some will thus make a ſecond voyage, before others have got loading for the firſt. Each fiſher only takes one cod at a time; and yet the more experienced will take from three hundred and fifty to four hundred *per day*; but this is the moſt; for it is very fatiguing work, both on account of the weight of the fiſh, and of the extreme cold which reigns on the Bank.

The wages uſually allowed the captain and ſailors, is one third of the *cod* they bring home ſound.

They ſalt the *cod* on board. The head being cut off, the belly opened, and the guts taken out, the ſalter ranges them in the bottom of the veſſel, head to tail; and having thus made a layer thereof, a fathom or two ſquare, he covers it with ſalt; over this he lays another layer of fiſh, which he covers as before; and thus he diſpoſes all the fiſh of that day, taking care never to mix the fiſh of different days together.

By that time the *cod* has lain thus to drain three or four days, they are moved into another part of the veſſel, and ſalted afreſh. After this, they are no more to be touched, till the veſſel have its burden.

Sometimes they put them up in barrels, for the convenience of carriage.

Dry cod.—In the fiſhing of *dry cod*, veſſels of all ſizes are uſed; though ſuch are generally choſen, as have large holds, becauſe this ſort of fiſh incumbers more than it burdens.

As *cod* is only to be dried by the ſun, the European veſſels are obliged to put out in March, or April, to have the benefit of the ſummer for drying. Indeed, we ſend veſſels for *cod* in June and July; but thoſe only buy what had been fiſhed and prepared by the inhabitants of the Engliſh colonies of Newfoundland, and the neighbouring parts; in exchange for which, we carry them meal, brandies, biſcuits, pulſe, melaſſes, linen, &c.

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The principal *fiſhery* for *dry cod* is along the coaſt of Placentia, from Cape Roſe, to the Bay des Experts; in which compaſs there are divers commodious ports for the fiſh to be dried in.

The fiſh intended for this uſe, though of the ſame kind with the green cod, is yet much ſmaller; whence it is the fitter to keep, as the ſalt more eaſily penetrates it.

The method of fiſhing is much the ſame in both; only this latter is the more expenſive, as it takes up more time, and employs more hands; and yet ſcarce half ſo much ſalt is ſpent in this, as in the other.

When ſeveral fiſhing veſſels meet, and intend to fiſh in the ſame port, he whoſe ſhaloop firſt touches ground, becomes entitled to the quality and privileges of ADMIRAL; he has the choice of his ſtation, and the refuſal of all the wood on the coaſt at his arrival.

As faſt as the captains arrive, they unrig all their veſſels, leaving nothing but the ſhrouds to ſuſtain the maſts; and in the mean time the mates provide a tent on ſhore, covered with branches of fir, and ſails over them; with a ſcaffold, fifty or ſixty feet long, and about one third in breadth.

While the ſcaffold is making ready, the crew are fiſhing; and as faſt as they catch, they bring their fiſh, open them, and ſalt them on moveable benches; but the main ſalting is performed on the ſcaffold, called FLAKE.

When the fiſh have taken ſalt, they waſh them; and to drain them again, lay them in piles on the galleries of the ſcaffold; when drained, they range them on hurdles, a fiſh thick, head againſt tail, with the back uppermoſt; obſerving, while they lie thus, to turn and ſhift them four times every twenty-four hours.

When they begin to dry, they lay them in heaps of ten or twelve a-piece, to retain their warmth, and continue to enlarge the heap every day, till it becomes double its firſt bulk: at length they join two of theſe heaps into one, which they turn every day, as before. Laſtly, they ſalt them over again, beginning with thoſe that had been ſalted firſt; and thus lay them in huge piles, as big as hayſtacks.

In this manner they reſt, till they are carried a ſhip-board, where they are laid on branches of trees, diſpoſed for that purpoſe in the bottom of the veſſel, with mats all around, to prevent their contracting any moiſture.

There are four kinds of commodities drawn from *cod*; viz. the zounds, and tongues, which are ſalted at the ſame time with the fiſh, and barrelled up; the roes, or eggs, which, being ſalted and barrelled up, ſerve to caſt into the ſea, to draw fiſh together, and particularly pilchards; and laſtly, the oil, which is uſed in dreſſing of leather, &c.

By the definitive treaty between Great Britain and France in 1763, the French are now abſolutely deprived of the powerful fortifications of Cape Breton, and of the poſſeſſion of Canada and all its dependencies; and are entitled to no poſſeſſions contiguous to Newfoundland, except the ſmall iſlands of St. Peter's and Miquelon, ceded by the ſixth article of the ſaid treaty to his moſt Chriſtian majeſty, as a ſhelter for the French fiſhermen; and his moſt Chriſtian majeſty engages not to fortify the ſaid iſlands, to erect no buildings upon them, but merely for the convenience of the *fiſhery*, and to keep upon them a guard only of fifty men for the police. And by the eighteenth article of the ſame treaty, it is expreſly ſtipulated between Great Britain and Spain, that his Catholic majeſty deſiſts, as well for himſelf, as for his ſucceſſors, from all pretenſions which he may have formed in favour of the Guipuſcoans and other his ſubjects, to the right of fiſhing in the neighbourhood of Newfoundland.

The Scots catch a ſmall kind of *cod* on the coaſts of Buchan, which is highly prized, though very much like ling. They ſalt it, and dry it in the ſun, upon rocks; and ſometimes in the chimney; but the greateſt part of it is ſpent at home.

FISHERY, *coral*. See CORAL.

FISHERY, *herring*. The *herring* is a ſmall ſalt-water fiſh, with a bluiſh back, and a white ſilvered belly, not unlike a little ſhad-fiſh; whence it is called in Latin *aloſa minor*. Rondeletius calls it *harengus*.

It is a popular error to believe the *herring* to be the *halec* of the Romans. The *halec* was no particular fiſh, but a kind of ſawce, made of any kind of ſalt-fiſh. The modern *herring* ſeems to have been unknown to the ancients: it is neither the *halec*, nor *halex*, nor *mœnis*, nor *lencomenis*, nor the *gerres* of Pliny. See Rondelet. De Piſcib. Marin. lib. v. cap. 13. and Voſſius De Idolol. See HERRING.

Herrings are chiefly found in the North ſea. It is true, there are *fiſheries* elſewhere, but none ſo copious.

They uſually make two fiſhing ſeaſons for *herrings*; the firſt in June, July, and Auguſt; the ſecond in autumn; the latter of theſe is the more conſiderable, on account of the fogs, which are very favourable to this kind of fiſhing.

It is commonly ſaid, that nobody ever ſaw a *herring* alive, and that they die the minute they are taken out of the water; but there are inſtances to the contrary.

The *herring* is a fiſh of paſſage; ſo that it is allowed to catch them on holidays and Sundays: in the Decretal there is an expreſs chapter to this effect. They go chiefly in ſhoals, and are fond of following any fire, or light; and in their paſſage they reſemble a kind of lightning themſelves.

About the beginning of June, a ſhoal of herrings, in bulk not leſs than the whole extent of Great Britain and Ireland, comes from the North, on the ſurface of the ſea; and their approach is known to the Shetlanders by ſeveral tokens in the air and water; as by the birds, ſuch as gannets, and others, which follow, to prey on them, and the ſmoothneſs of the water. It is not certainly known from whence they come; though it is probable that their winter rendezvous is within the arctic circle, where the ſeas ſwarm with inſect food in greater abundance than in our warmer latitudes. But when they arrive in theſe ſeas, they caſt their ſpawn; for they come to us full, and are ſhotten long before they leave us. As the great ſhoal formed by the migrating herrings, and divided into diſtinct columns, five or ſix miles in length, and three or four in breadth, reflecting in bright weather many ſplendid colours, paſſes between the ſhores of Greenland and the North Cape, it is probably much ſtraitened, and as it reaches the extremities of Great Britain, it is ſeparated into two parts; one part ſteers weſt or ſouth-weſt, and, leaving the iſlands of Orkney and Shetland to the left, paſſes on towards Ireland; where being interrupted by that iſland, this part is again divided; ſome, keeping to the coaſt of Britain, go ſouthward down St. George's or the Iriſh channel, and the others, edging off for want of room to the weſt and ſouth-weſt, go along the Hibernian ocean, and, keeping on the coaſt, reach the ſouth ſhore of Ireland, from whence they ſteer ſouthward, and join the reſt in the Iriſh channel. The other part of the firſt diviſion made in the north, parting a little to the eaſt and ſouth-eaſt, come down into the German ocean: they paſs by Shetland, and make the point of Buchaneſs, and the coaſt of Aberdeen, filling the bays, friths, rivers, and creeks, with their innumerable multitudes. Hence they proceed ſouthward, paſs by Dunbar, and rounding the high ſhores of St. Tobbs and Berwick, are ſeen again off Scarborough, and not before, but not in bulk, till they come to Yarmouth roads in England, and thence to the mouth of the Thames; from whence paſſing the Britiſh channel, they are ſeen no more in any number. The herrings are found again upon the ſhores of North America, though not in ſuch quantities as with us; and they are ſeen no farther ſouth than the rivers of Carolina. Whether theſe may be part of that large ſhoal, which, at their firſt coming by the coaſt of Greenland, keep to the coaſts of America on the north-weſt ſide; or whether they are the remainder of thoſe that paſs our channels, is uncertain; but we know that they are not ſeen in quantities in any of the ſouthern kingdoms, as Spain, Portugal, or the ſouth parts of France, on the ſide of the ocean, or in the Mediterranean, or on the coaſt of Africa.

The Hollanders were the firſt who began the *herring-fiſhery*, and obſerved the ſeveral ſeaſons of their paſſage. Their firſt regular fiſhing is fixed to the year 1164.

In the year 1313 we have an account of the ſeizure of a ſhip of Lynn, in the port of Bergen, which had been fiſhing on the Norway coaſt for herrings. Rymer's Fœd. vol. iii. p. 400. And as ladings of herrings carried to a diſtance muſt have been ſalted, it is plain that ſalted herrings, either wet or elſe dried, called red herrings, were, in thoſe times, a merchantable commodity in foreign parts. And in 1338 we have an account of fifty laſts of herrings ſhipped from Portſmouth for the uſe of the army and fleet of Edward III. in Gaſcony, which muſt have been ſalted, either wet or dried. Fœd. vol. v. p. 12. And they were barrelled and ſalted at the port of Whitby, in Yorkſhire, in 1394. Fœd. vol. vii. p. 778.

But the preſent method of pickling them was not diſcovered till the year 1416; though others date it from the year 1397. Willughby, in his Hiſtory of Fiſhes, obſerves, that Will. Buekelſz, or Bachalen, a native of Bier Uliet, rendered his name immortal by the diſcovery of the ſecret of curing and pickling *herrings*, which he might probably have learned from the people of Yarmouth, and other parts of England, where *herrings* were not only ſalted and dried for *red-herrings*, but ſalted and barrelled up wet, at different times, from the year 1306 to 1360. Yarmouth has indeed been long famous for its

herring-

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herring-fair, which was regulated by an act, commonly called the ſtatute of *herrings*, in the thirty-firſt year of Edward III. He adds, that the emperor Charles V. coming into the Low Countries, made a journey to the iſle of Bier Uliet, with the queen of Hungary, on purpoſe to view the tomb of this firſt barreller of *herring*.

The Dutch begin their *herring-fiſhery* on the twenty-fourth of June, and employ no leſs than ten or eleven hundred veſſels therein. Theſe veſſels are a kind of barks, called *buſſes*, carrying from forty-five to ſixty ton, and two or three ſmall cannon.

Before the eſtabliſhment of the Society of the Free Britiſh *Fiſhery*, the number of Dutch veſſels employed in this *fiſhery* was more conſiderable, and amounted to fifteen hundred or two thouſand.

None of them are allowed to ſtir out of port without a convoy, unleſs there be enough of them together, to make eighteen or twenty pieces of cannon; in which caſe they are allowed to go in company. Before they ſet out, they make a verbal convention; which has the ſame force, as if it were in writing.

Theſe regulations of the admiralty of Holland are partly followed by the French, and other nations; and partly improved and augmented with new ones: as, that no fiſher ſhall caſt his net within a hundred fathoms of another boat; that while the nets are caſt, a light ſhall be kept on the hind part of the veſſel; that when a boat is by any accident obliged to leave off fiſhing, the light ſhall be caſt into the ſea; that when the greater part of a fleet leaves off fiſhing, and caſts anchor, the reſt ſhall do the ſame, &c.

By the act for encouraging the Britiſh white *herring fiſhery*, in 1750, it is required, that the buſſes employed in this *fiſhery*, entitled to the bounty of 30*s*. per ton, ſhall be decked veſſels, built in Great Britain, after the commencement of the act; and that each of them ſhall carry twelve Wincheſter buſhels of ſalt, for every laſt of fiſh which ſuch veſſel is capable of holding, and as many more new barrels as ſuch a ſhip is capable of carrying, and two fleets of tanned nets; i. e. every veſſel of ſeventy tons ſhall have one fleet of nets, each thirty yards full on the rope, and ſeventeen fathoms deep, and others in proportion; and be provided with one other fleet of fifty like nets, on board a jagger or tender, which is to attend the ſaid *fiſhery*. Every ſuch buſs properly manned and furniſhed, ſhall proceed either to Braſſey's Sound in Shetland, and be at the rendezvous of the ſaid *fiſhery* there, on or before the eleventh day of June, but ſhall not ſhoot their net till the thirteenth, and ſhall continue following the ſhoal and fiſhing, as they move ſouthward, to the firſt of October; or to Campbeltown in Argyleſhire, and be at the rendezvous of the ſaid *fiſheries* on or before the firſt day of December, unleſs they ſhall have ſooner completed their loading of fiſh. For other regulations of the *herring-fiſhery*, ſee HERRING.

The manner of fiſhing has nothing particular in it. The nets wherein the fiſh is drawn, ſhould, regularly, have their maſhes an inch ſquare, that none of the leſſer fry may be taken.

The commerce of *herring*, both white, i. e. pickled, and red, is very conſiderable; but there are ſo many different ſorts prepared, in ſuch different ways, and different places, that it is hard to ſay any thing preciſe thereupon.

The white *herrings* cured by the Dutch are in the greateſt repute: they are diſtinguiſhed into four kinds, according to their ſizes. The goodneſs of this commodity conſiſts in its being fat, fleſhy, firm, white; ſalted the ſame day it is taken, and with good ſalt, and well barrelled.

The Iriſh *herring* are the next in value after thoſe of Holland; and principally thoſe of Dublin, which are ſcarce inferior to the beſt *herring* of Rotterdam or Enkuyſen.

The Scotch *herring* is not ſo well prepared, gutted, ſalted, nor barrelled, as the Dutch; and yet its taſte is excellent, that of thoſe caught on the weſtern coaſt eſpecially; nor is it to be doubted, but that if the Scots were as careful in theſe circumſtances as their neighbours, their *herring* would be the beſt in the world. The *herring* fiſhed in England is inconſiderable; the fiſh being too dry for the market. However, at Yarmouth and Leoſtoff they take and cure about 50,000 barrels of *red-herrings* in a year; and very large quantities are alſo caught at the mouth of the Thames by the fiſhing-ſmacks of London, Folkſtone, Dover, Sandwich, &c. for the London markets, and near the ſea-coaſt of Kent and Suſſex for general conſumption.

Curing and preparing herring. 1. For *white* or *pickled herring*: as ſoon as the *herring* are taken out of the ſea, one of the crew, appointed for this office, cuts them open, and takes out the guts, and every thing but the milts and roes, which are always to be left in the body of the fiſh. Then, waſhing them in freſh water, they are left the ſpace of twelve or fifteen hours in a tub full of ſtrong brine made of freſh water, and ſea ſalt.

When they are taken out, they drain them; and when well drained, put them up in barrels; taking care to diſpoſe and range them evenly, in rows, or layers, preſſing them well down, and ſtrewing a layer of ſalt both at top and bottom.

When the barrel is full, they ſtop it up very cloſe, that no air may get in, nor any brine out; either of which is very prejudicial to the fiſh.

The Dutch, after opening and gutting the *herrings*, cure and ſalt them by lining or rubbing their inſide with ſalt; they are then packed, with handfuls of ſalt between each row, and ſtopped up cloſe.

2. For *red-herrings*: the fiſh being caught, they proceed to waſh, gut, and lay them in brine, as for *pickled-herring*; only they let them lie double the time in brine, viz. twenty-four hours; inaſmuch as they are to take all their ſalt here, whereas the other kind takes half its ſalt in the barrel.

When the *herrings* are taken out of the brine, they ſpit them, i. e. ſtring them by the head on little wooden ſpits, and thus hang them in a kind of chimney, made for the purpoſe; and when the chimney is as full as it will hold, which leſs than ten or twelve thouſand ſeldom effects, they make a little fire underneath of bruſh-wood, which yields a deal of ſmoke, but no flame.

Here the *herrings* remain, till ſufficiently ſmoked and dried; which ordinarily is in twenty-four hours. Then they are taken down, and barrelled up for keeping.

Their goodneſs conſiſts in being large, freſh, fat, oily, ſoft, and pliable; their outſide of a yellow, golden colour; their having roes, or milt, within them, and being well ſalted and barrelled. See HERRING.

FISHERY, *lobſter*. *Lobſters* are taken along the Britiſh channel, and on the coaſt of Norway, whence they are brought to London for ſale; and alſo in the frith of Edinburgh, and on the coaſt of Northumberland.

By 10 and 11 W. III. cap. 24. no *lobſter* is to be taken under eight inches in length, from the peak of the noſe to the end of the middle fin of the tail; and by 9 G. II. cap. 33. no *lobſters* are to be taken on the coaſt of Scotland from the firſt of June to the firſt of September.

FISHERY, *mackrel*. The *mackrel* is a ſalt-water fiſh, without ſcales. Its body is round, and fleſhy; terminating almoſt in a point, at each extreme.

Some perſons well ſkilled in the naval architecture, hold its figure the moſt commodious for ſwimming of all others, and propoſe it as a model for the building of ſhips.

It is ordinarily about a foot long; when in the water, it appears yellow, and when out of it, of a ſilver white, excepting four ſtreaks, or ſpeckles, of a deep blue, on the back and ſides. See MACKREL.

The *mackrel* is a ſummer fiſh of paſſage, found in large ſhoals, in divers parts of the ocean, not far north; but eſpecially on the French and Engliſh coaſts.

The fiſhing is uſually in the months of April, May, and June, and even July, according to the place. They enter the Engliſh channel in April, and proceed up to the ſtreights of Dover, as the ſummer advances; ſo that by June they are on the coaſts of Cornwall, Suſſex, Normandy, Picardy, &c. where the *fiſhery* is moſt conſiderable. They are an excellent food, freſh; and not to be deſpiſed, when well prepared, pickled, and put up in barrels; a method of preſerving them chiefly uſed in Cornwall.

Naturaliſts have obſerved, that the water wherein *mackrel* has been boiled, often yields a light, after ſtirring it a little. See FIRE, and *Luminouſneſs of the* SEA.

The fiſh is taken two ways; either with a line, or nets: the latter is the more conſiderable, and is uſually performed in the night-time. The rules obſerved in the fiſhing for *mackrel* are much the ſame as thoſe already mentioned in the *fiſhery* of herrings.

There are two ways of pickling them: the firſt is, by opening and gutting them, and filling the belly with ſalt, crammed in as hard as poſſible with a ſtick; which done, they range them in ſtrata or rows, at the bottom of the veſſel, ſtrewing ſalt between the layers.

In the ſecond way, they put them immediately into tubs full of brine, made of freſh water and ſalt; and leave them to ſteep, till they have imbibed ſalt enough to make them keep; after which they are taken out, and barrelled up, taking care to preſs them cloſe down.

Mackrel are not cured or exported as merchandize, except a few by the Yarmouth and Leoſtoff merchants, but are generally conſumed at home; eſpecially in the city of London, and the ſea-ports between the Thames and Yarmouth, eaſt, and the Land's end of Cornwall, weſt.

FISHERY, *oyſter*, is principally carried on at Colcheſter, in Eſſex; Feverſham and Milton, in Kent; the Iſle of Wight; the Swales of the Medway; and Tenby, on the coaſt of Wales. From Feverſham, and adjacent parts, the Dutch have ſometimes loaded a hundred large hoys with *oyſters* in

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in a year. They are alſo taken in great quantities near Portſmouth, and in all the creeks and rivers between Southampton and Chicheſter; many of which are carried about by ſea to London and to Colcheſter, to be fed in the pits about Wavenhoe, and other places.

FISHERY, *pearl*. See PEARL *fiſhery*.

FISHERY, *pilchard*. The *pilchard* is a ſmall ſalt-water fiſh, bigger than the anchovy, but leſs than the herring, which in other reſpects it reſembles. Its head is yellow; its belly white; and its back a ſea-green. It eats admirably, freſh, or lightly ſalted. See PILCHARD.

There are certain ſeaſons for fiſhing the *pilchard*; which, like the herring and anchovy, is a fiſh of paſſage; and its arrival is indicated by ſimilar ſigns with that of the herrings. They are prepared and ſalted much as the anchovy is; with this difference, that the head is cut off the latter; but the *pilchard* were diſtinguiſhable from the anchovy, even though its head were off likewiſe; the *pilchard* having a very flat back, and the anchovy a round one.

The chief *pilchard fiſheries* are along the coaſts of Dalmatia, to the ſouth of the iſland Iſſea; on the coaſts of Bretagne, from Belle iſland as far as Breſt; and along the coaſts of Cornwall and Devonſhire.

It is a ſaying of the Corniſh men, with regard to the *pilchard*, that it is the leaſt fiſh in ſize, moſt in number, and greateſt in gain, of any they take out of the ſea. This obſervation is amply confirmed by Dr. Borlaſe's account of this *fiſhery*; for beſides the great number of perſons employed by it, the poor are fed with the offals of the captures, the land with the refuſe of the fiſh and ſalt, the merchant finds the gains of commiſſion and commerce, and the fiſherman the gains of the fiſh. The uſual produce of the number of hogſheads exported each year, for ten years, from 1747 to 1756, incluſive, from the four ports of Fowey, Falmouth, Penzance, and St. Ives, amounted to 29,795 hogſheads. Every hogſhead for ten years laſt paſt, together with the bounty allowed for each hogſhead exported, and the oil made out of each, has amounted, one year with another, at an average, to the price of *1l.* 13*s.* and 3*d.*; ſo that the caſh paid for *pilchards* exported has, at a medium, annually amounted to the ſum of 49,532*l.* 10*s.* The number taken at one ſhooting out of the nets is amazingly great. In 1767, there were at one time incloſed in St. Ives's bay 7000 hogſheads, each hogſhead containing 35,000 fiſh; in all 245,000,000.

That on the coaſts of Dalmatia is ſo plentiful, that it not only furniſhes all Greece, but a great part of Italy. That on the coaſts of Bretagne employs yearly above three hundred ſloops, and moſt of the ſeamen of the country.

The fiſh caught on our own coaſts, though bigger, are not ſo much valued, as thoſe on the coaſts of France; owing principally to their not being ſo thoroughly cured. The ſeaſon is from June to September.

The *pilchards* naturally follow the light; and will gather about a boat that bears a light in the night-time; which contributes much to the facility of the *fiſhery*.

On the coaſts of France they make uſe of the roes of cod-fiſh, as a bait; which, thrown into the ſea, makes them riſe from the bottom, and run into the nets, placed for that purpoſe.

On our coaſts, there are perſons, called in Cornwall *huers*, poſted aſhore, who, ſpying by the colour of the water where the ſhoals are, make ſigns to the boats, to get among them, to caſt their nets.

When taken, the fiſh are brought to a warehouſe on ſhore, where they are laid up in broad piles, ſupported by backs and ſides.

As they pile them, they ſalt them with bay-ſalt; in which they lie ſoaking twenty or thirty days, and diſcharge a great quantity of blood, with dirty pickle, and bittern; which laſt draws much of the oil from the fiſh, to the great loſs of the owners. When taken out of the pile, there remains a quantity of ſalt, blood, ſcales, &c. at bottom, which, with freſh ſalt, ſerves for another pile.

They now proceed to waſh them in ſea-water to clear off the dirt and blood; and when dry, they put them up in barrels, and preſs them hard down, to ſqueeze out the oil, which iſſues away at a hole in the bottom of the caſk; and in this ſtate they are fit for ſale, or uſe.

FISHERY, *ſalmon*. The *ſalmon* is a northern fiſh, being unknown in the Mediterranean ſea, and other warm climates, and, according to ſome, breeds in the ſea; but the opinion of others ſeems better warranted, that it breeds in the clear ſandy parts of rivers, remote from their mouths. They commonly ſpawn in November; and when they have found a place fit for the purpoſe, the male and female unite in forming a proper receptacle for it in the ſand or gravel, about the depth of eighteen inches; in this the female depoſits her ſpawn, and the male his milt, which they cover carefully, as it is ſaid, with their tails; for after ſpawning they are obſerved to have no ſkin on that part. The ſpawn lies buried till the ſpring. The milter and ſpawner, having performed their office, betake themſelves to the ſea; and if their return be prevented by weirs, or the like, they become ſick, lean, and are then called *kipper*, pine away, and die in two years time. If they ſpawn in the mean time, the produce is a diminutive *ſalmon*, called *ſkegger*, which will never arrive at the natural bulk; it being the ſea that makes them grow big, and the rivers fat. The female is diſtinguiſhed from the male, in that its noſe is longer, and more hooked, its ſcales not ſo bright, and its body ſpeckled over with dark brown ſpots, its belly flatter, and its fleſh not ſo red; more dry, and leſs delicious to the taſte. In ſpawning time, when they repair from the ſea up to the rivers, ſcarce any thing can ſtop their progreſs. Many have ſeen them leap up cataracts and precipices, many yards high. See SALMON.

When the *ſalmon* firſt enter the freſh water, they have a number of inſects, the *lerneæ ſalmoneæ* of Linnæus, adhering to them, eſpecially above the gills, which are ſigns that the fiſh is in high ſeaſon; theſe die and drop off ſoon after the *ſalmon* have left the ſea. About the latter end of March, the ſpawn begins to exclude the young, which gradually increaſe to the length of four or five inches, and are then termed ſmelts or ſmouts; and about the beginning of May the Tweed, &c. is full of them; but they are ſoon hurried away to the ſea. About the middle of June the earlieſt of the fry begin to drop, as it were, into the river again from the ſea, being about twelve, fourteen, or ſixteen inches, and they gradually increaſe in number and ſize till about the end of July; (at Berwick the fiſh in this ſtage is called gilſe) when they again leſſen in number, and increaſe in ſize, ſome being ſix, ſeven, eight, or nine pounds in weight.

The chief *ſalmon fiſheries* in Europe are along the coaſts of England, Scotland, and Ireland. The fiſhing uſually begins about the firſt of January, and ends by the laſt of September. It is performed with nets, in the places where the rivers empty themſelves into the ſea, and along the ſea-coaſts thereabout. The fiſh are ſeen to croud thither frequently in ſhoals from all parts, in ſearch of the freſh water; they alſo fiſh for them higher up in the rivers; ſometimes with nets, and ſometimes with a kind of locks, or weirs, made for the purpoſe, with iron grates therein, ſo diſpoſed, as that the fiſh, in going up the river, open them with their head; but are no ſooner entered, than the gate claps to. Thus the *ſalmon* are incloſed as in a reſervoir, where it is eaſy to take them. In ſome places they fiſh for *ſalmon* in the night-time, by the light of torches, or kindled ſtraw. The fiſhermen watch when the fiſh draws towards the light, whereof he is naturally a great lover, and ſtrikes him with a ſpear, or liſter. In ſome parts of Scotland, it is ſaid, they ride a fiſhing up the rivers, and when they ſpy them in the ſhallow parts, ſhoot them with fire-arms.

Salmon form, in ſeveral countries, a great article of commerce; being cured in different ways, by ſalting, pickling, and drying. There are ſtationary *fiſheries* in Iceland, Norway, and the Baltic; but thoſe at Coleraine in Ireland, at Berwick in Great Britain, and in ſome of the rivers of Scotland, are the moſt conſiderable. The capture in the Tweed near Berwick, about the month of July, is prodigious; a boat load, and ſometimes near two, is taken in a tide; and it is common to take from fifty to a hundred fiſh at one hawl. At this time the coopers in Berwick begin to ſalt both *ſalmon* and gilſes in pipes, and other large veſſels, and then barrel them to ſend abroad. The *ſalmon* barrel holds above forty-two gallons, wine meaſure. Moſt of the *ſalmon* taken before April is ſent freſh to London; and that which they fail to ſend is boiled, pickled, and kitted. Freſh *ſalmon* has alſo been ſent to London in the latter end of September; but then the fiſh are full of large roes, very thin bellied, and are eſteemed neither palatable nor wholeſome. In the month of July a ſtone of freſh *ſalmon*, of eighteen pounds ten ounces and a half, has been ſold at Berwick for eight pence; but the more common price is between ſixteen pence, and two ſhillings and ſix pence. The ſeaſon for fiſhing in the Tweed begins the thirtieth of November, though the fiſhermen work very little till after Chriſtmas, and ends on Michaelmas day. There are on this river forty-one conſiderable fiſheries, beſides others of leſs value, rented for near 5400*l.* per annum.

Scotland poſſeſſes alſo great numbers of fine *fiſheries* on both ſides of that kingdom. The *ſalmon* are cured in the ſame manner as at Berwick; and a great quantity is ſent to London in the ſpring; but after that time the adventurer begins to barrel and export them to foreign countries; though the demand for them is much abated of late

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late years. They have alſo in Scotland a great deal of *ſalmon*, ſalted in the common way, which after ſoaking in brine for a competent time, is well preſſed, and then dried in ſmoke: this is called *kipper*, is chiefly made for home conſumption, and, if properly cured and prepared, is reckoned very delicious food. The north of Ireland abounds with this fiſh: the moſt conſiderable *fiſhery* is at Cranna, about a mile and a half from Coleraine, rented, in 1754, for 620*l.* a year. It is ſituated on the river Ban, where they fiſh with nets eighteen ſcore yards long, and are continually drawing night and day through the whole ſeaſon, which laſts about four months; eight hundred and forty fiſh have been taken at a ſingle draught. There is alſo a weir on the river, which takes the fiſh that eſcape the nets. In 1760, three hundred and twenty tons were taken in the Cranna *fiſhery*. The *ſalmon* are cured in this manner: they are firſt ſplit, and the guts and gills, and many of the bones, are taken out, and then rubbed with fine ſalt; and after lying in pickle in large tubs for ſix weeks, are packed up with layers of coarſe brown Spaniſh ſalt in caſks, ſix of which make a ton. Theſe are exported to Leghorn and Venice, &c. at the price of twelve or thirteen pounds a ton. Pennant's Brit. Zool. vol. iii. p. 284. 294.

The ſtat. 4 and 5 Anne, cap. 21. was made for the increaſe and preſervation of *ſalmon* in rivers in the counties of Southampton and Wilts, requiring that no *ſalmon* be taken between the firſt of Auguſt, and twelfth of November, or under ſize, &c. And by 1 Geo. I. cap. 18. *ſalmon* taken in the rivers Severn, Dee, Wye, Were, Ouſe, &c. are to be eighteen inches long, at leaſt; or the perſons catching them ſhall forfeit 5*l.* And by 30 Geo. II. cap. 21. no *ſalmon* is to be caught in the rivers Thames and Medway between the eleventh of November and twenty-fourth of Auguſt, or to be of leſs weight than ſix pounds.

Salmon is alſo fiſhed for in rivers, after the manner of trout, with a line and hook. He bites beſt in the afternoon, about three, in May, June, July, and Auguſt; the water being clear, and a little breeze of wind ſtirring; eſpecially if the wind and ſtream ſet contrary ways. The *ſalmon* is caught like a trout, with worm, fly, and minim; and eſpecially the garden-worm, if well ſcoured, and kept twenty days in moſs. The *ſalmon* never ſtays long in a place, but is continually ſhifting to be as near the ſpring-head as poſſible, and ſwimming generally in the deepeſt and broadeſt parts of the rivers, near the ground. Put two or three garden-worms well ſcoured on your hook at once, as if you were baiting for trout; and be ſure to give him time to gorge his bait, before you ſtrike. Some uſe a wire-ring on the top of the rod, through which the line may be let run to any length at pleaſure, by a reel near the hand.

FISHERY, *ſturgeon*. The *ſturgeon* is a large ſea-fiſh, which at its ſeaſon runs up the rivers; having a ſharp-pointed ſnout, a flat belly, and bluiſh back. *Sturgeons*, as well as whales, are reckoned among the number of ROYAL *fiſhes*.

There are *ſturgeons* of all ſizes; and we even read of ſome twenty feet long; but the middle ſize are reckoned the beſt; though ſome prefer the ſmaller. See STURGEON.

It is of the roe or eggs of this fiſh that the CAVEAR, or kavia, ſo much prized by the Italians, &c. is prepared.

Sturgeon, when freſh, eats deliciouſly. To make it keep, they ſalt or pickle it in large pieces, and put them up in cags, from twenty-five to fifty pounds.

The greateſt *ſturgeon fiſhery* in the world is in the mouth of the Volga, in the Caſpian ſea; where the Muſcovites find employment for a great number of men. We have lately had a conſiderable ſupply of *ſturgeon* from North America, which rivals that of the Baltic.

They are not caught in nets, but in a kind of incloſure, formed by huge ſtakes, diſpoſed in triangles, repreſenting the letter Z ſeveral times repeated. Theſe kinds of *fiſheries* are open on the ſide towards the ſea, and cloſe on the other; by which means the fiſh, aſcending in its ſeaſon up the river, embarraſſes itſelf in theſe narrow, angular retreats; and, not being able to turn itſelf, to go back again, on account of its bulk, is eaſily ſtruck, and killed with a ſort of harping-iron. They are alſo taken, during ſummer, in the lakes Friſchechaff and Curiſchhaff, near Pillau, in large nets, made of ſmall cord; the adjacent ſhores are formed into diſtricts, and farmed out to companies of fiſhermen; ſome of which are rented for ſix thouſand guilders, or near 300*l.* *per annum*.

The chief object of this *fiſhery* is the roe or ſpawn, which is a commodity as much uſed in Muſcovy as butter in Holland; and there are ſome *ſturgeons* that furniſh each four hundred pounds thereof. It is only the leſſer and younger *ſturgeon* that they pickle for eating.

FISHERY, *whale*, or *Greenland* FISHERY. This huge fiſh, we have elſewhere obſerved, is chiefly caught in the North ſea. The largeſt ſort are found about Spitzbergen, ſome of them being there two hundred feet in length. Thoſe on the coaſts of America are about ninety, or a hundred; and thoſe on the coaſts of Guyenne, and the Mediterranean, are the ſmalleſt of all.

The firſt perſons that ſeem to have been employed in the *whale-fiſhery* were the Norwegians; probably ſoon after their diſcovery of Greenland, about the year 837: for we find, that king Alfred received information from Octher, a Norwegian, in 887 or 890, that the Norwegians were employed in this *fiſhery*. He tells the king, that he ſailed along the Norway coaſt, as far north as the whale-hunters commonly uſe to travel; but it ſeems that all knowlege of this gainful employ was loſt, at leaſt in this country, for almoſt ſeven centuries. The Biſcayners were alſo concerned in it, for the ſake not only of the oil, but alſo of the whale-bone, before the Engliſh; for, though their north-eaſt diſcoveries in 1553 had pointed out the way to the *whale-fiſhery* at Spitzbergen, they were ſo ignorant of the buſineſs in 1575, as to be under a neceſſity of procuring information and aſſiſtance from Biſcay for this purpoſe. The firſt mention that occurs in the Engliſh hiſtory of whale-fins, or whale-bone, is in 1593, when eight hundred fins, part of the cargo of ſome Biſcay ſhips, that had been wrecked three years before, were brought to England from the bay of St. Laurence in America by an Engliſh ſhip; previous to which time, the ladies ſtays, as Mr. Anderſon obſerves, muſt have been made of ſplit or ſome other tough and pliant wood; the *whale-fiſhery* being carried on for the ſake of the oil long before the diſcovery of the uſe of the whale-bone, which was firſt brought to England, with the blubber or oil, in 1617. The Engliſh, having been accuſtomed to the Northern ſeas, by their repeated trials for a north-weſt and north-eaſt paſſage to China, in 1598 commenced their *fiſhery* for *whales* at or near Spitzbergen, where thoſe animals reſort in greater numbers than any where elſe. But the firſt Engliſh voyage for the purpoſe of killing *whales* was undertaken by the Ruſſian company in 1611, who ſent two ſhips thither, with ſix Biſcayners, expert in the buſineſs; the ſhips were loſt, though their men and boats, &c. were ſaved by a ſhip of Hull, then at Spitzbergen. In 1618, the Eaſt-India adventurers joined ſtock with the Ruſſian company for purſuing the *whale-fiſhery*, and fitted out thirteen ſhips, but the voyage proved unſucceſsful. The manner of managing the whale fiſhing both by the Engliſh and Dutch was then quite different from the preſent mode: the whales, having never been diſturbed, reſorted to the bays near the ſhore, ſo that their blubber was eaſily landed at Spitzbergen, where they erected cookeries, i. e. coppers, &c. for boiling their oil; and theſe they left ſtanding from year to year, and only brought home the purified oil, and the whale-bone. The Engliſh, having been the firſt in that *fiſhery*, kept poſſeſſion of the beſt bays; the Hollanders, coming later, were obliged to find bays farther to the North; the Danes, who came later into this trade than the Dutch, got in between the Engliſh and Dutch; the Hamburghers came after the Danes, and after them came the French, and alſo the Biſcayners, the moſt ancient whale fiſhers in Europe, except the Norwegians, and purſued the ſame method. But, ſince theſe times, the whales are leſs frequent in the bays, and are commonly among the openings of the ice farther from the land; ſo that the blubber is now cut from the whales, after they are killed, in the manner deſcribed in the ſequel of this article, and brought home to be boiled and purified, and the whale-fins are alſo to be cleaned at home. This latter method of fiſhing, being dangerous to ſhipping, diſcouraged our Engliſh adventurers who traded in a company; ſo that they ſoon after, viz. in 1619, relinquiſhed the *fiſhery*. Some private adventurers proſecuted the trade with various ſucceſs in 1621, 1622, and 1623, when they were moleſted by the Dutch, who were then ſuperior in number of ſhips, and had the prince of Orange's commiſſion; for in 1622, the Dutch, for preventing of diſturbance in their *whale-fiſhery*, had erected an excluſive company, who, by their own power, might protect it: however, the *fiſhery* was laid open, in 1643, to all the inhabitants of the ſeven provinces. As to the claims which different European nations have alleged in favour of a monopoly of the *whale-fiſhery* at Spitzbergen, it has been urged by the Engliſh, that they were the firſt diſcoverers, by Sir Hugh Willoughby, in 1553; by the Dutch, who deny his having been ſo far north as Spitzbergen, and maintain their having firſt diſcovered it in 1596; by the Danes, that Spitzbergen is a part of Old Greenland, poſſeſſed in early times by them. But all nations have now wiſely given up their excluſive pretenſions, and that part of the world remains now alike free to all nations

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for this *fiſhery*. In 1636, king Charles I. confirmed, by his proclamation, the Greenland *whale-fiſhery* ſolely to the Ruſſia company, who ſoon relinquiſhed it. In 1672 an attempt was made for reviving this *fiſhery*, when an act was paſſed for the encouragement of it; and this act was continued in 1690, but without any great effect. A corporation was eſtabliſhed by act of parliament, in 1693, for carrying on this *fiſhery*, called the GREENLAND *company*.

In 1725 the Engliſh South-ſea company revived this trade, but, after great loſſes, were obliged to diſcontinue it in 1733. At this time a bounty of 20*s*. per ton was granted by parliament to Britiſh ſhips of two hundred tons and upwards, fitted out for the *whale-fiſhery*, which bounty was not only continued in 1740, but an additional bounty of 10*s*. per ton was granted during the war with Spain, in which we were then engaged; and in 1749, a farther bounty or allowance of 20*s*. over and above that of 1733, was granted to all Britiſh whale-fiſhing ſhips, and extended to ſhips of the Britiſh American colonies; and in 1755 this bounty was extended to ſhips under two hundred tons burthen; and, as a farther encouragement to this *fiſhery*, foreign proteſtants, ſerving three years in it, were naturalized on certain conditions. See Hackluyt's Coll. Voyages, and Anderſon's Hiſtory of Commerce.

But, notwithſtanding the great importance and numerous advantages of this trade to England, and the encouragement which the legiſlature has given it, the Dutch have carried it on with much greater ſucceſs than the Engliſh; and it is now eſteemed one of the principal branches of their flouriſhing trade. The chief merchants of the ſeveral provinces aſſociate themſelves into a body for carrying it on, and ſend every year a great fleet of veſſels to the North ſeas for that purpoſe. They attempted to make their firſt eſtabliſhments in Greenland; but not ſucceeding, they have ſince fixed their *fiſhery* about the weſtern coaſt of Spitzbergen, from the latitude of 76 deg. 40 min. to 80 deg. and from eaſt to weſt about eighty-nine leagues.

To give ſome idea of the manner and importance of this trade, we ſhall here ſubjoin the diſcipline of a long time obſerved in the *whale-fiſhery*; the method of fiſhing; the cargo and equipage of a veſſel; and the produce thereof.

The diſcipline is adjuſted by a ſtanding regulation, conſiſting of twelve articles; the principal whereof are:

That in caſe a fiſhing-veſſel be ſhipwrecked, and the captain and crew ſaved, the next veſſel they meet ſhall take them in; and the ſecond veſſel take half of them from the firſt; but that no veſſel ſhall be obliged to take any of the loading of a veſſel ſhipwrecked; that the effects of a ſhipwrecked veſſel, which are abſolutely relinquiſhed, and which another captain ſhall find, and take up, upon his arrival in Holland, he ſhall account for one half of them to the proprietors of the ſhipwrecked veſſel, clear of all expences; that, if the crew deſert a ſhipwrecked veſſel, they ſhall have no claim to any of the effects ſaved, but the whole ſhall go to the proprietor; but if they be preſent when the effects are ſaved, and aſſiſt therein, they ſhall have one fourth thereof; that if a perſon kill a fiſh on the ice, it ſhall be reputed his own, ſo long as he leaves any perſon with it; but the minute he leaves it, it becomes the due of the firſt captain that comes that way; but that, if a fiſh be tied to an anchor, or a rope faſtened to the ſhore, it ſhall remain to its firſt proprietor, though he leave it alone; that if any perſon be wounded or lamed in the ſervice, the commiſſioners of the *fiſhery* undertake to procure him a reaſonable ſatisfaction; to which the whole fleet ſhall contribute.

Beſides this general regulation, to the obſervance of which all the captains, pilots, and maſters of veſſels, are obliged to ſwear, before they put to ſea, there is alſo a particular one for each ſhip's crew, which they are all ſworn to execute, in preſence of one of the commiſſioners, who goes aboard every ſhip, to receive the oath. This regulation is a kind of charter-party, importing, that they will attend prayers morning and evening, on pain of an amercement, at the diſcretion of the captain; that they will not get drunk, nor draw their knives, on forfeiture of half of their wages; nor fight, on forfeiture of the whole; that no one ſhall lay wagers on the good or ill ſucceſs of the fiſhing, nor buy or ſell, on theſe conditions, in caſe we take one or more fiſh, on penalty of twenty-five florins; that they will be contented with the proviſions allowed them; and that they will never light fire, candle, or match, by night or day, without the captain's leave, on the like penalty.

After the reading of this regulation, the crew are all called, to receive the cuſtomary gratuity before their ſetting out, with an aſſurance of another ſum at their return, in proportion to the ſucceſs of the fiſhing.

The captain, on this occaſion, receives from a hundred to a hundred and fifty florins; the pilot from forty to ſixty; each harpooner from forty to fifty florins; the other officers from twenty-ſix to thirty-ſix florins; the elder ſailors twenty; and the younger twelve.

The fleet, which conſiſts moſtly of fluyts, from two to three hundred tons, and from thirty-ſix men to forty-two, uſually ſets ſail about the beginning of April, and takes its courſe by the iſles of Iceland, from 60 to 61 degrees of latitude; after which, leaving them to the weſt, it ſteers northward, through 73, 74, and 75 deg. of latitude, where they begin to find the ice.

It is among theſe huge heaps of ice, wherewith the whole quarter is filled, that they firſt begin to ſpy the whales; and there moſt of the veſſels fix their abode for the fiſhing. But as the fiſh are larger and fatter the farther north they go, ſome captains will venture as far as 80 or 82 deg. of north lat. Each veſſel of three hundred tons has ſix ſhalloops; and each ſhalloop has ſix harpooners, with five ſeamen to row it. To every ſhalloop there are ſeven lines, of three inches circumference; five of them in the hind-part of the veſſel, and two before. The hind lines together make ſix hundred fathoms, and, with the addition of the other two, eight hundred and eighty. If the *whale* dive deeper, or run farther underneath the ice than this ſtint, the line muſt be cut, leſt the ſhalloop be drawn after it.

In the Engliſh *whale-fiſhery* every ſhip has ſix or ſeven boats; each of which has one harpooner, one boat-ſteerer, one manager of the line, and four ſeamen to row it. In each boat there are two or three harpoons, ſeveral lances, and ſix lines faſtened together, each line being a hundred and twenty fathom long. To each harping iron is faſtened a ſtrong ſtick, about ſix feet long, and a ſoft pliable line, about ſix fathom long, called the fore-gauger, which is faſtened to the lines in the boat. When more line is wanted, the lines of a ſecond boat are faſtened to thoſe of the firſt.

The inſtrument, wherewith the *whale* is ſtruck, is a HARPING-*iron*, or javelin, five or ſix feet long, pointed with ſteel, in a triangular ſhape, like the barb of an arrow.

The harpooner, upon ſight of the fiſh, from one end of the ſhalloop where he is placed, flings the harping iron with all his might againſt his back; and, if he be ſo happy as to make it penetrate the ſkin and fat into the fleſh, he lets go a ſtring faſtened to the harping-iron, at the end whereof is a dry gourd, which ſwimming on the water, diſcovers whereabout the *whale* is; for the minute he is ſtruck, he plunges to the bottom, commonly ſwimming againſt the wind.

If the *whale* return to breathe in the air, the harpooner takes occaſion to give him a freſh wound, till, fainting by the loſs of blood, the men have an opportunity of approaching him, and thruſting a long ſteeled lance under his gills into his breaſt, and through the inteſtines, ſoon diſpatch him; and when the carcaſe begins to float, they cut holes in the fins and tail; and, tying a rope in theſe holes, they tow him to the veſſel, where he is faſtened along the larboard ſide of the ſhip, floating upon his back almoſt level with the ſea. They then begin to take the blubber or fat, and the fins, as they are called, or *whale-bone*.

In order to this, ſeveral men ſtand upon the fiſh, with a kind of iron calkers, or ſpurs, to prevent their ſlipping; and cut off the tail, which is hoiſted upon deck, and then cut out ſquare pieces of blubber, weighing two or three thouſand pounds, which are hoiſted on board with the capſtan, where each piece is again cut into ſmaller pieces, each of two or three hundred pounds weight; and theſe are thrown into the hold, and left to drain for three or four days. When all the blubber is cut from the belly of the fiſh, it is turned on one ſide, by means of a piece of blubber, left in the middle, called the *cant* or turning-piece; and then they cut out this ſide in large pieces, called *hockies*, as before, and alſo the whale-bones with the gums, which are preſerved entire, and hoiſted on deck, where the blades are cut and ſeparated, and left till they have time to clean and ſcrape them. The fiſh is next turned on his back, and the blubber cut out from the back and crown bone; and laſt of all they cut the blubber from the other ſide, as before. They then cut out the two large jaw-bones, ſituated in the under-lip, which are hoiſted on deck, cleanſed and faſtened to the ſhrouds, and tubs are placed under them to receive the oil which they diſcharge; this oil belongs to the captain, and likewiſe the tail and fins. The carcaſe is left to float, and ſupplies food for Greenland birds, called mallemucks, &c. In three or four days, they hoiſt the pieces of blubber out of the hold, chop them, and put ſmall pieces through the bung-holes into their caſks.

A *whale*, the longeſt blade of whoſe mouth is nine or ten

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ten feet, generally fills thirty butts with blubber; but one of the largeſt fiſh will fill ſeventy butts and more. A good large *whale* is valued at about 1000*l.* ſterling. A full ſhip of three hundred tons is worth, clear of all expence, at leaſt 5000*l.* There is a premium aſſigned to every perſon in the ſhip for every *whale*: the captain has three guineas; the mate, one; each harpooner, one; the ſurgeon, one; carpenter, one; cook and boat-ſteerers, half a guinea each; a common man, a crown; and each boy, half a crown. The captain and harpooners have no wages; but the captain is allowed twenty-five pounds, and the harpooners, nine guineas each. In a ſucceſsful voyage they have ſix ſhillings for every ton of oil boiled in Greenland-dock; but the reſt of the ſhip's company have monthly wages, beſides the fiſh-money, but no oil-money.

Nothing now remains, but to ſail homewards, where the fat is to be boiled, and melted down into train-oil.

The *whale-fiſhery* of the Caroline iſlands is more eaſy and agreeable than that of all other places, and, beſide the great profit, affords a pleaſant ſpectacle to multitudes of people on the ſhores.

There are ten or twelve of theſe iſles diſpoſed in form of a circle, ſo that they make a ſort of port, in which the ſea is perpetually calm and pleaſant.

When a *whale* appears in this gulf, the people all get into their canoes, and rowing toward the ſea, keep between the creature and its retreat, and drive him forwards towards the iſles at the bottom of the port. They drive him in this manner before them into the ſhallows, where they plunge into the water themſelves, and ſome get ropes and chains about him, while others dart him with their ſpears. Their agility and addreſs is wonderful in this. The creature can never get away when they have once got him faſtened, but is ſoon killed, and got to the ſhore.

FISHERY, *produce of one year's whale:* To ſtate the produce, we make choice of the *fiſhery* of 1697, as being one of the greateſt, and moſt fortunate, that ever was known; to which we ſhall add that of the year 1725.

In the year 1697, there were a hundred and eighty-nine veſſels of divers nations; whereof a hundred and twenty-one were Dutch; forty-ſeven Hamburghers; two Swediſh; four Daniſh; twelve of Bremen; two of Embden; and one of Lubeck; who caught in all 1968 fiſh.

In the year 1725, there were two hundred and twenty-ſix veſſels; whereof one hundred and forty-four were Dutch, twelve Engliſh, forty-three Hamburghers, twenty-three of Bremen, two of Berghen, two of Flenſburg. Their captures were 349 fiſh.

The Dutch captures in 1697, produced		41344 puncheons
The Hamburghers	—— ——	16414 (of blubber.
The Swedes	—— ——	540
The Danes	—— ——	1710
The Bremeners	—— ——	3790
The Embdeners	—— ——	68

The Engliſh captures in 1725, produced 1000 puncheons of blubber, and 20 tons of whale-bone.

Now, eſtimating the puncheon of blubber at thirty florins, Dutch, or 2*l.* 15*s.* Engliſh, the current price in the year 1697, the total produce of the year's *fiſhing* amounts to 175,631*l.* 10*s.* ſterling. As to fins, or *whale-bones*, ſetting them at two thouſand weight per *whale*, and an hundred weight at 4*l.* 4*s.* they will yield 165,312*l.* which, added to the former ſum, amounts to 340,943*l.* 10*s.*

Mr. Anderſon, in his Hiſtory of Commerce, vol. ii. p. 350. obſerves, from an account of the Dutch *whale-fiſhing* for forty-ſix years, ending anno 1721, that in this time they had employed 5886 ſhips, and caught 32907 whales, which valued one with another at 500*l.* give an amount for the whole value of above 16 millions ſterling, gained out of the ſea moſtly by the labour of the people, deducting the expence of the wear and tear of ſhipping, the caſks, and the proviſions. The *whale-fiſhery* begins in May, and continues through the months of June and July; but whether the ſhips have had good or bad ſucceſs, they muſt come away and get clear of the ice by the end of Auguſt; ſo that in the month of September at fartheſt they may be expected home; but the more fortunate ſhips may return in June or July.

FISHES, aboard a *Ship*, are pieces of timber, convex on one ſide, and concave on the other, uſed to ſtrengthen the maſts and yards, when they begin to fail, through an extraordinary weight of ſail, or after damage in battle, or tempeſtuous weather. They both nail the *fiſhes* on with iron ſpikes, and alſo *would* them, as they call it, that is, wind ropes hard about them. There is alſo a tackle called the *fiſh*, which hangs at the end of the davit by the ſtrap of the block, in which is the runner of the *fiſh-hook*; by which means the fluke of the anchor is haled up to the ſhip's bow, or *chainwale*. See BLOCKS. Perhaps this tackle was called a *fiſh*, from that which the ancients called a *dolphin*, which was a pointed and vaſtly heavy piece of iron, which they uſed to heave up by a tackle to a good height, and then, when they came near enough to the enemies ſhip, let it fall at once, to break or pierce a hole through the bottom of the enemies veſſel, and ſink her.

FISH-*gig*, an inſtrument uſed to ſtrike *fiſh* at ſea, particularly dolphins. It conſiſts of a ſtaff, three or four barbed prongs, and a line faſtened to the end, on which the prongs are fixed; to the other end is fitted a piece of lead, which ſerves to give additional force to the ſtroke, when the weapon flies, and to turn the points upward after the *fiſh* is penetrated.

FISH-GARTH, according to Skinner, ſignifies an engine to take *fiſh*; but it ſhould rather ſeem to denote the dam or weir in a river, where theſe engines are laid and uſed.

FISH-GLUE. See ICHTHYOCOLLA and GLUE.

FISHING, the act or art of catching *fiſh*.

Right of *fiſhing* and the property of fiſh belong to the lord of the manor, when he hath the ſoil on both ſides of a river; but where a river ebbs and flows, and is an arm of the ſea, they are common to all; and he who claims a privilege to himſelf muſt prove it. In the Severn, the ſoil belongs to the owners of the land on each ſide; and the ſoil of the river Thames is in the king, &c. but the *fiſhing* is common to all. There are ſeveral ſtatutes for preventing the deſtruction of the fry of fiſh; and perſons uſing nets for that purpoſe, or taking ſalmon or trout out of ſeaſon, or any fiſh under certain lengths, are liable to forfeit 20*s.*; and juſtices of peace and lords of leets have power to put the acts in force. See 1 Eliz. cap. 17. 3 Jac. I. cap. 12. 30 Geo. II. cap. 21. See *Salmon* FISHERY and *Stealing of* FISH.

Fiſhing is diſtinguiſhed with regard to its inſtrument into that performed with the net for fiſh that go in ſhoals; and that with the hook, for ſolitary fiſh; which latter is properly called ANGLING.

Fiſhing, again, is diſtinguiſhed with regard to its object into that performed in ſalt water and that in freſh. The firſt practiſed for whales, herring, cod, ſalmon, pearls, mackrel, and other ſea-fiſh. The latter practiſed for pike, trout, carp, tench, perch, dace, eels, &c.

The inſtruments principally uſed in angling or *fiſhing* with the hook, are the rod, line, hook, and fly.

The points on which the art of *fiſhing* chiefly turns are the proper ſeaſon, place, bait, and manner of application. What relates to each thereof, we ſhall here give the reader in the ſeveral kinds of *fiſhing* chiefly practiſed among us.

In March, April, and September, the warmeſt days are the beſt for *fiſhing*, and the bait muſt be deep; for the *fiſh* in theſe cool months lie near the bottom. In fly-*fiſhing* it is always obſerved, that the *fiſh* will riſe beſt after a ſmall ſhower of rain, that has juſt beat down the flies upon the water without muddying it. March, April, May, and June, are the beſt months for fly-*fiſhing*, and the beſt hours are about nine in the morning, and three or four in the afternoon; in a ſtill warm evening, they will bite as long as the day-light laſts, at thoſe ſeaſons when the gnats are ſeen moſt plentifully about in the air.

In the extremity of heat, when the earth is parched with drought, there is but little ſport to be expected in *fiſhing*, in any water. In cold weather, when there is a white hoary froſt in the morning, the *fiſh* will not bite kindly all day, except in the evening, if that ſhould prove ſerene and warm.

Too much wind is never convenient for *fiſhing*, though a little is rather advantageous than otherwiſe. It is bad *fiſhing* about ſheep-ſhearing time, in waters where the ſheep are waſhed; for the fiſh glut themſelves in ſuch a manner with what is waſhed from theſe creatures, that they will not take any bait till that ſeaſon is over.

North and eaſt winds are enemies to *fiſhing*; and it is not right to fiſh ſoon after the time of the fiſh ſpawning, for they are then ſick, and have no great appetite, ſo that they do not bite readily. All fiſh have a natural fore-knowlege of a ſhower of rain, and when clouds are coming on, that will fall in rain, they will not bite; the expert angler, who is uſed to this, often eſcapes being wet to the ſkin by it.

The ſubterranean or underground *fiſhing* of the lake Ribeſkajamnia, has been much talked of by thoſe who have written of the Zirchnitzer ſea, of which it is a part; but on the whole it amounts to no more than this. The waters of this lake emptying themſelves through ſubterranean paſſages into another lake below, the whole body of the water, with the fiſh in it, is firſt received into a large opening, which conveys it into a ſort of ſubterra-

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hean baſon, in the bottom of which there are many holes, and through theſe the water is let out, but the fiſh left behind. The people of the place who know this, deſcend through the large hole into this ſubterraneous baſon with torches in their hands, and as the waters run off they ſeize upon the fiſh wherever they can catch them. This ſort of *fiſhing* is attended with one inconvenience; for the people being obliged to ſtand up to the middle more or leſs in the water, the horſe-leeches, which are extremely plentiful there, ſeize upon their legs and other parts, and are only to be got off by ſome perſons making water upon the part; the heat and nauſeous taſte of the urine always making them let go their hold. Phil. Tranſ. N° 91.

FISHING, *white-bait*. See BAIT.

The ſeaſon for taking *white-bait* is only from the firſt of Auguſt to the firſt of October. 30 Geo. II. cap. 21.

FISHING, *barbel*. See BARBUS.

No *barbel* is to be taken in the Thames or Medway under twelve inches in ſize, from the eye to the end of the tail, and only between the twenty-fourth of Auguſt and the twenty-firſt of March. 30 Geo. II. cap. 21.

FISHING, *carp*. The *carp* is generally held the queen of freſh-water fiſh. It is exceeding ſubtle, and of all others, the eel only excepted, lives longeſt out of water. Mr. Ray aſſures us, that in Holland they have a ſpeedy way of fattening them, by hanging them up in a net in a cellar, and feeding them with white bread and milk. See the method deſcribed under CARP. They breed ſeveral times in the year; for which reaſon we ſeldom meet with male or female without either milt or ſpawn. Their natural place is ſome ſtill water; in running waters they rarely, if ever, breed. To make them fat and large, it is a good way, when the pond is low, in April, to rake all the ſides thereof with an iron rake, and ſow hay-ſeeds thereon. By autumn there will be a crop of graſs, which, coming to be overflowed as the pond riſes, will be a fine feeding-place for them.

Great patience is requiſite in angling for *carp*, on account of their incredible policy. They always chooſe to lie in the deepeſt places; they ſeldom bite in cold weather; and in hot, a man cannot be too early or too late for them. When they do bite, there is no fear of the hold. The tackle muſt be very ſtrong, and it will be proper to bait the place beforehand where it is to be fiſhed for, with a coarſe paſte. It may be alſo proper to bring the *carp* to the place intended for angling, by throwing in cow-dung and blood, or bran and blood mixed together, or ſome chicken guts cut ſmall. The baits are the red-worm, in March; the cadew, in June; and the graſhopper, in July, Auguſt, and September. Proper paſtes may alſo be prepared for them; as honey and ſugar, wrought together with flour, and thrown in pieces into the water ſome hours before you begin to angle. Honey and white crums of bread mixed together, alſo make a good paſte. The following paſte is much recommended: take common wheat flour and veal, or any other young meat, of each equal quantities; beat them together in a mortar till the meat is thoroughly diſſolved or broke to pieces; then add about half the quantity of honey; beat it well together again, and add more flour till the whole is of a proper conſiſtence. This has the advantage of a paſte, and of an animal bait, and hangs well upon the hook, ſo that it ſeldom fails of ſucceſs.

The beſt ſeaſon for catching ſuch as are intended for ſale is autumn. See CARP.

FISHING, *chub*. The *chevin* or *chub* is a freſh-water fiſh with a large head. It ſpawns in March, and is very ſtrong, though inactive, yielding in a very little time after it is ſtruck; and the larger it is the quieter. His bait is any kind of worm or fly, particularly the large yellow moth; alſo grains, cheeſe, the pith in the bone of an ox's back, &c. He affects a large bait, and variety of them at the ſame hook. Early in the morning angle for him with ſnails; but, in the heat of the day, chooſe ſome other bait, and in the afternoon, fiſh for him at ground or fly. See CHUB.

No *chub* is to be taken under nine inches from the eye to the end of the tail, and only between Auguſt 24th and March 21 in the river Thames and waters of Medway. 30 Geo. II. cap. 21.

FISHING, *dace* or *dare*. See DACE.

No *dace* are to be taken in the Thames or Medway under ſix inches from the eye to the end of the tail in ſize, and only between Auguſt 24th and March 21. 30 Geo. II. cap. 21.

FISHING, *eel*. See EEL.

The *ſilver eel* may be caught with divers baits, particularly powdered beef, garden-worms or lobs, minnows, hens guts, fiſh, garbage, &c. But as they hide themſelves in winter in the mud, without ſtirring out for ſix months, and in the ſummer, they take no delight to be abroad in the day, the moſt proper time to take them is in the night, by faſtening a line to the bank ſide with a hook in the water; or a line may be thrown at large, with a good ſtore of hooks baited, and plumbed with a float, to diſcover where the line lies in the morning. A ſmall roach does well here for a bait, the hook being laid in his mouth. For other methods of catching *eels*. See BOBBING, BULTERS, EEL-*ſpear*, and SNIGGLING.

No leaps or rods for *eels* are to be laid in the Thames and Medway but from April 21 to October 30; but they may be hooked for all the year. 30 Geo. II. cap. 21.

FISHING, *flounder*. The *flounder* is a flat ſea or river fiſh, caught in April, May, June, and July, in any time of the day, in a ſwift ſtream, and ſometimes alſo in a ſtill deep. The beſt bait is red worms, waſps, and gentles.

Flounders may be taken in the rivers Thames and Medway at any time of the year; but their ſize muſt not be leſs than ſix inches from the eye to the end of the tail. 30 Geo. II. cap. 21.

FISHING, *gudgeon*. The *gudgeon* is a ſmall fiſh of a very delicious taſte. It ſpawns three or four times in the ſummer-ſeaſon, and feeds in ſtreams and on gravel, ſlighting all kinds of flies; but is eaſily taken with a ſmall red worm, *fiſhing* near the ground; and being a leather-mouthed fiſh, will not eaſily get off the hook when ſtruck. The *gudgeon* may either be fiſhed with a float, the hook being on the ground, or by hand, with a running line on the ground, without cork or float. He will bite well at waſps, gentles, and cadworms; and one may even fiſh for him with two or three hooks at the ſame time, which makes good ſport. When you angle for *gudgeons*, ſtir up the ſand or gravel with a long pole, which will make them gather to the place and bite the faſter.

The ſeaſon for *gudgeon fiſhing* in the Thames and Medway is from Auguſt 24th to March 21ſt. 30 Geo. II. cap. 21.

FISHING, *pearch* or *perch*. The *pearch* or *perch* is hook-backed; not unlike a hog, armed with ſtiff prickles, and his ſides with dry thick ſcales; he is voracious, and will venture on his own kind even with greater courage than the pike. He ſeldom grows much above a foot long. He ſpawns in February or March, and bites beſt when the ſpring is far ſpent. The proper baits are the braddling, minnow, and ſmall frog; as alſo the lob-worm, bob, oak-worm, gentle, waſp, and cad-bait. The minnow yields the beſt ſport, which is to be alive, and ſtuck on the hook through the upper-lip or back-fin, and kept ſwimming about mid-water. If the frog be uſed, he is to be faſtened to the hook by the ſkin of his leg. When the fiſh bites, as he is none of the leather-mouthed kind, he muſt have time to pouch his bait. The beſt place to fiſh for him is in the turning of the water-eddy in a good gravel bottom.

No *perch* is to be taken in the Thames or Medway under ſix inches from the eye to the end of the tail, and only between Auguſt 24th and March 21ſt. 30 Geo. II. cap. 21.

FISHING, *pike*. The *pike* is reputed the tyrant of the freſh waters. By the common conſent of naturaliſts, he is the longeſt-lived of all fiſhes. The larger he is found, the coarſer is his fleſh; and ſo *vice verſa*. This fiſh never ſwims in ſhoals, but always ſingle, being very rapacious, and preying even on his own kind. The *pike* ſpawns in February and March. The beſt ſort is in rivers; the worſt in meres and ponds. His ordinary food is frogs, and what fiſh he can lay hold on.

There are two ways of *fiſhing* for the *pike*; by the *ledger-bait* and the *walking-bait*. 1. The *ledger-bait* is that fixed in one certain place, and which the angler may leave behind him. Of this kind the beſt is ſome living bait, as a dace, roach, gudgeon, or a living frog. To apply it, if a fiſh, ſtick the hook through his upper-lip; then faſtening it to a ſtrong line twelve or fourteen yards long, tie the other end of the line to ſome ſtake in the ground, or bough of a tree, near the *pike*'s uſual haunt, letting the line paſs over the fork of a ſtick placed for the purpoſe, ſuſpending the hook, and about a yard of line in the water, but ſo as that when the *pike* bites the fork may give way, and let him have line enough to go to his hold and paunch. If the bait be a frog, the arming wire is to be put in at his mouth and out at his vent, and one of his legs to be ſtitched or tied over the upper joint of the wire. 2. The *walking-bait* is that which the fiſher caſts in, and conducts with a rod, &c. This is perforated by a troll, with a winch for winding it up. At the top of the line is to be placed a ring for the line to be run through. The line, for two yards and a quarter next the hook, to be of ſilk double, and armed with wire the length of ſeven inches. On the ſhank of the hook is to be faſtened a ſmooth piece of lead, ſo as to ſink the fiſh-bait, which is to be a gudgeon with its head downwards. Thus diſpoſed, the bait is to be caſt up and down; and

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if you feel the fiſh at the hook, give him length enough to run away with the bait, and paunch it; then ſtrike him with a ſmart jerk. To fiſh with a dead bait, uſe a yellow frog, dace, or roach, anointed in gum of ivy, diſſolved in oil of ſpike, and caſt it where the *pike* frequents. After it has lain a little while at the bottom, draw it to the top, and ſo up the ſtream, and you will quickly perceive a *pike* in earneſt purſuit thereof. This fiſh bites beſt about three in the afternoon in clear water, with a gentle gale, from the middle of ſummer to the end of autumn; but in winter, all day long; and in the ſpring he bites beſt early in the morning, and late at night. Another method of *fiſhing* for *pike*, ſee under HUXING.

No *pike* or jack is to be taken in the Thames or Medway under twelve inches from the eye to the end of the tail, and only between Auguſt 24th and March 21ſt. 30 Geo. II. cap. 21.

FISHING, *roach*. The *roach* or *rochet* is no delicate fiſh. Thoſe in rivers are more valued than thoſe in ponds, though the latter are much the larger. They ſpawn about the middle of May.

To angle for this fiſh in April, cads or worms are proper baits; ſo are ſmall white ſnails or flies in ſummer. The bait is always to be under water, for this fiſh will not bite at top. Others uſe May-fly in that ſeaſon with good ſucceſs. In autumn, a paſte muſt be uſed, made of the crumb of white bread moulded with a little water, laboured with the hands into a tough paſte, and coloured, not very deep, with red lead. In winter, gentles are the beſt bait. Sprouted malt, the young brood of waſps, and bees dipt in blood, and the thick blood of ſheep half dried, are noſtrums in this ſort of *fiſhing*.

In the neighbourhood of London they have a peculiar method of *fiſhing* for *roach*: they take a ſtrong cord, at the end of which is faſtened a three pound weight; and a foot above the lead, a packthread of twelve feet is made faſt to the cord; and to the packthread, at proper diſtances, they add twelve ſtrong links of hair with *roach* hooks at them, baited with a white ſnail or perriwinkle. Then holding the cord in their hands, the biting of the fiſh draws the packthread, and this the cord, which gives them notice what to do. By this means they ſometimes draw up half a dozen, and very commonly two or three at a draught. By 30 Geo. II. cap. 21. no *roach* is to be taken in the Thames or Medway under ſix inches from the eye to the end of the tail, and only between Auguſt 24th and March 21.

FISHING, *ſmelt*. See SMELT.

By 30 Geo. II. cap. 21. No *ſmelt* is to be taken in the Thames or Medway leſs than five inches from the eye to the end of the tail, or at any time, except from January 25th to June 1ſt; and thoſe that are caught in other waters muſt be of the above ſize. 33 Geo. II.

FISHING, *ſoal*. See SOAL.

FISHING, *tench*. The *tench* is a fine freſh-water fiſh, having very ſmall ſcales, but large, ſmooth fins, with a red circle about the eyes, and a little barb hanging at each corner of the mouth. It takes more delight among weeds in ponds than in clear rivers, and covets to feed in foul water. His ſlime is ſaid to have a healing quality for wounded fiſh; upon which he is commonly called the *fiſhes phyſician*. When the carp, pike, &c. are hurt, it is ſaid they find relief by rubbing themſelves againſt the *tench*.

The ſeaſon for catching this fiſh is in June, July, and Auguſt very early and late, or even all night, in the ſtill part of rivers. His bait is a large red worm, at which he bites very eagerly, eſpecially if firſt dipped in tar. He alſo delights in all ſorts of paſtes made up of ſtrong-ſcented oils, or with tar; or a paſte of brown bread and honey; nor does he refuſe the cad-worm, lob-worm, flag-worm, green gentles, cod-bait, or ſoft boiled bread-grain.

When a number of *tench* are to be taken out of a muddy pond, the method is to take a large caſting-net, well leaded, and with the meſhes from the crown to a full yard and a half, not too ſmall; for then, if the pond be deep, the fiſh will ſtrike away before the net gets to the bottom. The place where the net is to be thrown into muſt be cleared of weeds, &c. with a rake. A bait is next to be prepared for drawing the fiſh together; for this purpoſe put a quarter of a peck of wheat into three quarts of water, ſend it to an oven, and let it be well ſoaked; then add to it five pints of blood, and as much bran as is neceſſary to give it the conſiſtence of a paſte; mix with it ſome clay, and add a quart of lob-worms chopped to pieces. Let the whole be wrought up into a ſtiff paſte, and rolled into balls of the ſize of a hen's egg, and throw theſe into the pond in the place where the net is to be caſt. Let theſe, and ſome grains be occaſionally thrown in, and the place be thus baited for ſeveral days. When the fiſh may be ſuppoſed to be well acquainted with the place, let a good baiting be given in the morning, and in the cloſe of the evening let the caſting-net be carefully thrown in. When the net is ſunk, the mud all about is to be ſtirred with a long pole with a fork at the end; the net is to lie half an hour, and the mud to be thus ſtirred all the time; by this means the *tench* will be raiſed, and will be taken in pulling out the net; but if the net were to be thrown in and taken out in the common way, there would hardly be one fiſh taken; for the cuſtom of both *tench* and carp, when they are frighted, is to plunge their heads up to the eyes in the mud, and thus placed with their tails erect, the net muſt draw over them, without the poſſibility of entangling them.

FISHING, *trout*. The trout is a delicious freſh-water fiſh, ſpeckled with red and yellow, coming in and going out of ſeaſon with the buck, and ſpawning in the cold months of October and November, whereas all the other ſpecies ſpawn in hot ſummer weather. There are divers kinds of this fiſh, all valuable; but the beſt are the red and yellow *trouts*; and of theſe the female, diſtinguiſhed by a leſs head and deeper body, is preferred. They are known to be in ſeaſon by the bright colour of their ſpots, and by their large and thick back; which laſt may ſerve alſo as a rule for other fiſh. Through the whole winter they are ſick, lean, and unwholeſome, and frequently louſy. As the ſpring comes on, deſerting the ſtill, deep waters, they repair to the gravelly ground, againſt which they continue to rub till they get rid of their lice, which are a kind of worms with large heads. From that time they delight to be in the ſharp ſtreams, and ſuch as are ſwift, where they lie in wait for minnows and May-flies. At the latter end of May they are in their prime.

The uſual baits whereby the *trout* is caught are the worm, minnow, and fly, either natural or artificial. The proper worms are the brandling, lob-worm, ſquirrel-tail worm, which has a ſtreak round the back, a red head, and a broad tail, earth-worm, dung-worm, and maggot or gentle, eſpecially the three firſt; the brandling is commonly found in an old dunghill, or under cow-dung, or elſe among tanners bark; the others are found in the earth, and under large ſtones or ſtumps of trees; but whatever worms are uſed, they are the better for keeping, which is to be done in an earthen pot, with moſs, frequently changed. To take the *trout* with a ground-bait, the angler ſhould have a light, taper rod, with a tender hazel top; and may angle with a ſingle hair of three links, the one tied to the other, for the bottom of the line, and a line of three-haired links for the upper part: with this ſort of tackle, if the ſportſman has room enough, he will take the largeſt *trout* in any river. The angler muſt always keep out of ſight, and the point of the rod muſt be down the ſtream. The ſeaſon for *fiſhing* for the *trout* with the ground-bait begins in March, and the mornings and evenings are the beſt time of the day; but in cloudy weather the ſport may be followed all day long. There muſt be a plummet at ten inches from the hook, which the angler muſt feel always touching the ground; and this muſt be heavier as the ſtream is ſwifter. When the minnow is uſed, chuſe the whiteſt, and that of middling ſize; ſlip the hook through his mouth, and the point and beard out at the tail, ſo as it may lie almoſt ſtraight on the hook. Then try againſt the ſtream, whether it will turn. The tackle in this caſe may be ſtronger, for the *trout* will ſeize this bait as ſoon as it comes in ſight; the upper part of the line may be of three ſilk and three hairs, and the lower of two of each; and the hook may be moderately large. In defect of a minnow, a ſmall loach or a ſtickle-back may ſerve the turn; or for want of either, an artificial one may be made of cloth by the life, which is found every whit as good a bait as the natural one.

The moſt agreeable manner of *fiſhing* for *trout* is with the fly: the rod in this caſe muſt be light and pliable, and the line long and fine; if one hair be ſtrong enough, as it may be made by proper ſkill in the angler, there will be more fiſh caught than when a thicker line is uſed; and the fly-fiſher ſhould have the wind in his back, and the ſun before him. See ANGLING.

By 1 Eliz. cap. 21. no *trout* is to be taken under eight inches in length; and by ſtat. 24 Anne, cap. 21. *ſea-trout* is not to be taken in particular rivers, creeks, or arms of the ſea between June 30th and Nov. 11th. By 30 Geo. II. cap. 21. no *trout* is to be taken in the Thames or Medway between November 11th and Auguſt 24th, or to be of leſs weight than one pound.

FISHING-*fly*, a bait uſed in angling for divers kinds of fiſh.

The *fly* is either *natural* or *artificial*.

Natural flies are innumerable: the more uſual on this occaſion are the *dun-fly*, the *ſtone* or *May-fly*, the *red-fly*, the *moor-fly*, the *tawny-fly*, the *vine-fly*, the *ſhell-fly*, the *cloudy* and *blackiſh-fly*, the *flag-fly*; alſo *caterpillars*, *canker-*

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canker-flies, *bear-flies*, &c. all which appear ſooner or later, according to the forwardneſs or backwardneſs of the ſpring. To know the particular fly the fiſh moſt covets, when you come in the morning to the river-ſide, beat the buſhes with your rod, and take up what variety you can of all ſorts of flies; try them all, and you will quickly know which are in moſt eſteem; not but that fiſh will ſometimes change their fly; but it is only when they have ſometimes glutted themſelves therewith.

There are two ways to fiſh with *natural flies*, either on the ſurface of the water, or a little underneath it.

In angling for chub, roach, or dace, move not your *natural fly* ſwiftly, when you ſee the fiſh make at it; but rather let it glide freely towards him with the ſtream; but if it be in a ſtill and ſlow water, draw the fly ſlowly ſideways by him, which will make him eagerly purſue it.

The *artificial fly* is moſt ſucceſsfully uſed in bluſtering weather, when the waters are ſo troubled by the winds that the natural fly cannot be ſeen, nor reſt upon them.

Of this *artificial fly* there are reckoned ten principal ſorts:

1. The *dun-fly*, in March, made of dun wool, and the feathers of a partridge wing. 2. A *dun-fly*, made of black wool, and the feathers of a black drake; the body made of the firſt, and the wings of the latter. 3. The *ſtone-fly*, in April, the body made of black wool, dyed yellow under the wings and tail. 4. The *ruddy-fly*, in the beginning of May; the body made of red wool, and bound about with black ſilk, with the feathers of a black capon, which hang dangling on his ſides next his tail. 5. The *yellow* or *greeniſh fly*, in June; the body made of black wool, with a yellow liſt on either ſide, and the wings taken off the wings of a buzzard, bound with black broken hemp. 6. The *mooriſh-fly*; the body made of duſkiſh wool, and the wings with the blackiſh mail of a drake. 7. *Tawny-fly*, till the middle of June; the body made of tawny wool, the wings made contrary one againſt the other, of the whitiſh mail of a white drake. 8. The *waſp-fly*, in July; the body made of black wool, caſt about with yellow ſilk, and the wings of drakes feathers. 9. The *ſteel-fly*, in the middle of July; the body made of greeniſh wool, caſt about with the feathers of a peacock's tail, and the wings made of buzzards wings. 10. The *drake-fly*, in Auguſt; the body made of black wool, caſt about with black ſilk, his wings of the mail of a black drake, with a black head.

The beſt rules for *artificial fly-fiſhing* are,

1. To fiſh in a river ſomewhat diſturbed with rain, or in a cloudy day, when the waters are moved by a gentle breeze; the ſouth-wind is beſt; and if the wind blow high, yet not ſo but that you may conveniently guide your tackle, the fiſh will riſe in plain deeps; but if the wind be ſmall, the beſt angling is in ſwift ſtreams.

2. Keep as far from the water-ſide as may be; fiſh down the ſtream, with the ſun on your face, and touch not the water with your line.

3. Angle always in clear rivers with a ſmall fly and ſlender wings, but in muddy places uſe larger.

4. When after rain the water becomes browniſh, uſe an orange fly; in a clear day, a light-coloured fly; a dark fly for dark waters, &c.

5. Let the line be twice as long as the rod, unleſs the river be encumbered with trees.

6. For every ſort of fly have ſeveral of the ſame, differing in colour, to ſuit with the different complexions of ſeveral waters and weathers.

7. Have a nimble eye and active hand, to ſtrike preſently with the riſing of the fiſh, or elſe he will be apt to throw out the hook.

8. Let the fly fall firſt into the water, and not the line, which will ſcare the fiſh.

9. In ſlow rivers or ſtill places, caſt the fly croſs over the river, and let it ſink a little in the water, and draw it gently back with the current.

Salmon flies ſhould be made with their wings ſtanding one behind the other, whether two or four. That fiſh delights in the gaudieſt colours that can be; chiefly in the wings, which muſt be long, as well as the tail.

FISHING-*floats* are little appendages to the line, ſerving to keep the hook and bait ſuſpended at the proper depth, to diſcover when the fiſh has hold of them, &c.

Of theſe there are divers kinds, ſome made of Muſcovy duck quills, which are the beſt for ſlow waters; but for ſtrong ſtreams, ſound cork, without flaws or holes, bored through with an hot iron, into which is put a quill of a fit proportion, is preferable; pare the cork to a pyramidal form, and grind it ſmooth.

FISHING-*hook*, a little engine of ſteel-wire, of a proper form to catch and retain fiſh.

The *fiſhing-hook*, in general, ought to be long in the ſhank, ſomewhat thick in the circumference, the point even and ſtrait: let the bending be in the ſhank. For ſetting the hook on, uſe ſtrong, but ſmall ſilk, laying the hair on the inſide of your hook; for if it be on the outſide, the ſilk will fret and cut it aſunder.

There are ſeveral ſizes of theſe *fiſhing-hooks*, ſome big, ſome little; and of theſe ſome have peculiar names, as, 1. *Single hooks*. 2. *Double hooks*, which have two bendings, one contrary to the other. 3. *Snappers* or *gorgers*, which are hooks to whip the artificial fly upon, or to bait with the natural fly. 4. *Springers* or *ſpring-hooks*, a kind of double hooks, with a ſpring which flies open, being ſtruck into any fiſh, and ſo keeps its mouth open.

FISHING-*line*. See *Angling* LINE.

FISHING-*nets*. See NET.

FISHING-*rod*, a long, ſlender rod or wand, to which the line is faſtened for angling.

Of theſe there are ſeveral ſorts, as,

1, A *troller* or *trolling-rod*, which has a ring at the end of the rod for the line to go through when it runs off a reel. 2. A *whipper* or *whipping-rod*, a top-rod that is weak in the middle, and top-heavy, but all ſlender and fine. 3. A *dopper*, which is a ſtrong rod, and very light. 4. A *ſnapper* or *ſnap-rod*, that is, a ſtrong pole, peculiarly uſed for the pike. 5. A *bottom-rod*, being the ſame as the dopper, but ſomewhat more pliable. 6. A *ſniggling* or *poking-ſtick*, a forked ſtick, having a ſhort, ſtrong line, with a needle, baited with a lob-worm: this is only for eels in their holes.

Fiſhing-rods are made of different materials and ſtrength, according to the purpoſes for which they are uſed: in *fiſhing* with more than one hair, and with a ſilk-worm gut, red deal is reckoned the beſt, with hickery top, and the length of the whole rod ſhould be about four yards; but for a ſmall fly and ſingle hair, the length of three yards will be ſufficient, with the top of yellowiſh hickery, and about nine inches of whalebone, near as long as the ſtock, which ſhould be of white deal. The ſtocks or buts of rods are generally of ground hazle, aſh, or willow, about two or three feet long; and every joint ſhould gradually taper to the top. Hazle tops are preferred, though ſome uſe the Bamboo cane, and ſay it exceeds the beſt hazle. For ground angling, eſpecially in muddy waters, the cane or reed is preferred for a ſtock; with a hazle top, conſiſting of one, two, or three pieces, and a ſmall piece of round, ſmooth, taper whalebone, which is whipped to the hazle with ſtrong ſilk, rubbed with ſhoemakers wax; the whole length of the rod being five yards or five and a half yards. The beſt method of piecing hazle and bone is firſt to whip the end of the hazle with thread, and to bore it with a ſquare piece of iron of a proper ſize; and then make the thick end of the bone, firſt dipped in pitch, to go into it; after which let it be ſcraped, filed, and neatly whipped. However, the neateſt rod may be thus made: get a thick white deal or fir-board, free from knots, and ſeven or eight feet long; let this be divided by a joiner into ſeveral breadths, and with his planes let him ſhoot them round, ſmooth, and taper. To one of theſe faſten an hazle rod, ſix or ſeven feet long, which may conſiſt of two or three pieces; to the top of which fix a piece of yew, about two feet long, made round, taper, and ſmooth, and to the yew a piece of ſmall, round, ſmooth whalebone, five or ſix inches long. The fir may be coloured by warming it at the fire, and with a feather dipped in aqua fortis, ſtroking it over and chafing it into the wood, which will make it of a pure cinnamon colour.

It is found uſeful to have rings or eyes made of fine wire, and placed upon the rod from one end to the other, in ſuch a manner as that when the eye is laid to one you may ſee through all the reſt: through theſe rings the line is made to run, which will thus be kept in a due poſture; and you muſt have a winch or wheel affixed to the rod, about a foot above the end, by which, whenever it is proper, you may give range to the fiſh. See ANGLING.

FISHING-*veſſels*, or thoſe uſed in the ſeveral fiſheries at ſea, or on the coaſts, are the *buſs*, *coble*, *cock*, *dogger*, *driver*, *cel-boat*, *fly-boat*, *fluyt*, *hooker*, *Peter-boat*, *ſmack*, *ſtand-boat*, *trawler*, *trinker*, &c.

FISH-PONDS, reſervoirs of water, for the breeding, feeding, and preſerving of fiſh.

The quality of the pond, water, &c. proper for this end is ſcarce determinable by any certain ſymptom or rule: for ſome very promiſing ponds do not prove ſerviceable that way. One of the beſt indications of a breeding pond, is, when there is good ſtore of ruſh and grazing about it, with gravelly ſhoals, ſuch as horſe-ponds uſually have; and when a water takes thus to breeding, with a few milters and ſpawners, that is, males and females, two or three of each, a whole county may be ſtocked in a ſhort time.

Eels and perch are of very good uſe to keep down the

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ſtock of fiſh; for they prey much upon the ſpawn and fry of bred fiſh, and will probably deſtroy the ſuperfluity of them.

As for pike, perch, tench, roach, &c. they are obſerved to breed almoſt in any waters, and very numerouſly; only eels never breed in ſtanding waters that are without ſprings; and in ſuch are neither found, nor increaſe, but by putting in; yet where ſprings are they are never wanting, though not put in. And, which is moſt ſtrange of all, many ſay there is not in an eel the leaſt token of propagation, either by milt or ſpawn; ſo that how they are produced is a queſtion very myſterious. See EEL.

For *fiſh-ponds*, it is agreed, thoſe grounds are beſt which are full of ſprings and apt to be mooriſh; the one breeds them well, and the other preſerves them from being ſtolen. The ſituation of the pond is alſo to be conſidered, and the nature of the currents that fall into it; likewiſe, that it be refreſhed with a little brook, or with the rain-water that falls from the adjacent hilly ground. Add, that thoſe ponds which receive the ſtale and dung of horſes, and other cattle, breed the largeſt and fatteſt fiſh.

Fiſh-ponds are not only a thing of convenience to great families, but may be made a very profitable article with the farmer under due management. Watery and boggy land is often fit for no other uſe, and theſe are then a great improvement of it. Ponds made in dry grounds in the flat bottoms between hills, will alſo ſerve not only to ſupply the cattle with water, but the profit of the fiſh that may be bred in them, is greater than many are aware of, and comes without any labour or expence.

In making the pond, obſerve that the head be at the loweſt part of the ground; and that the trench of the flood gate or ſluice have a good ſwift fall, that it may not be long in emptying on occaſion.

The beſt way of making the head is by driving three or four rows of ſtakes about ſix foot long, and at about four foot diſtance from one another, the whole length of the pond-head: the firſt row of theſe is to be driven in four foot deep, that they may be very firm and ſecure; and if the bottom be not good, but be of a looſe ſand, ſome lime is to be added, which will harden into a ſort of ſtone. The earth dug out of the pond is to be laid between theſe ſtakes and rammed hard down. Other rows of ſtakes muſt be added behind and over theſe, and the ſpaces filled up till the whole is as high and as thick as is neceſſary. The face of it muſt be made even and ſlanting, and there muſt be a waſh left to carry off the ſuperfluous water in floods, &c.

If the pond carry ſix feet of water, it is enough; but it muſt be made eight feet deep, to receive the freſhes and rains that may fall into it.

It would alſo be advantageous to have ſhoals on the ſides for the fiſh to ſun themſelves in, and lay their ſpawn on; beſide, in other places, certain holes, hollow banks, ſhelves, roots of trees, iſlands, &c. to ſerve as their retiring-places. Conſider farther, whether your pond be a breeder; if ſo, never expect any large carp from thence, the greatneſs of the number of ſpawn overſtocking the pond.

Carp and tench will live and thrive very well together in the ſame pond. Where pike are kept, there ſhould be roach or ſome other quick breeding fiſh to ſupply them with food.

Some think that pike and tench may be kept in the ſame pond. They imagine that pike will not feed upon tench; but they are miſtaken, for the pike is fonder of this than of almoſt any other fiſh. Ponds with clear gravelly and ſandy bottoms are uſually the beſt for breeding of fiſh, and foul water with muddy bottoms are the beſt for them to fatten in. Carp have been known to grow in one year from five to eighteen inches long in ponds where the water of the common ſewers of any town have run into it.

The ordinary growth of a carp is not above two or three inches in that time, ſo that all the exceſs is to be attributed to the fatneſs of the water of the ſewers. See CARP.

Reſerve ſome great waters for the head-quarters of the fiſh, whence you may take, or wherein you may put any quantity thereof; and take care to have ſtews, and other auxiliary waters, ſo that you may convey any part of the ſtock from one to the other, and loſe no time in the growth of the fiſh, but employ the water as you do your land, to the beſt advantage. View the grounds, and find out ſome fall between the hills as nearly flat as may be, ſo as to leave a proper current for the water: if there be any difficulty in judging of ſuch, take an opportunity after ſome ſudden rain, or the breaking up of a great ſnow in winter, and you will plainly ſee which way the ground caſts, for the water will take the true fall, and run accordingly.

The condition of the place muſt determine the quantity of ground to be covered with water. For example, we may propoſe in all fifteen acres in three ponds; or eight acres in two, and no leſs; and theſe ponds ſhould be placed one above another, ſo as the point of the lower may almoſt reach the head or bank of the upper; which contrivance is no leſs beautiful than advantageous.

The head or bank, which, by ſtopping the current, is to raiſe the water, and to make a pond, muſt be built with the clay and earth taken out of the pan or hollow dug in the loweſt ground above the bank: the ſhape of the pan is to be an half-oval, whereof the flat is to come to the bank, and the longer diameter to run ſquare from it.

All *fiſh-ponds* ſhould be drawn once in three or four years, and the fiſh ſorted; if it be a breeding-pond, the ſmaller fiſh ſhould be taken out to ſtore other ponds with; and in feeding-ponds all the fiſh ſhould be kept as nearly as may be of a ſize, for the larger and ſmaller never all thrive well together.

Flounders will both thrive and breed in any pond, eſpecially in a clay pond, and will be much larger than in rivers.

Bitterns, herons, otters, water-rats, and ſea-gulls, are all great deſtroyers of fiſh, and the ponds ſhould be kept as clear as poſſible of them; but the greateſt of all deſtruction in *fiſh-ponds* is occaſioned by froſts.

To remedy this, ſome propoſe to break the ice and lay in pipes, ſtraw, and other things, to give air to the fiſh; but all theſe fail when the ponds are foul; but when they are clean, the fiſh ſeldom ſuffer any harm, be the froſt ever ſo long, though no holes be broke in the ice. The ſtench of foul water ſeems to be the occaſion of the death of the fiſh, in this caſe of its being locked up by froſts, and not the want of air. The cleaning of ponds frequently is of great uſe as well on this as on many other occaſions; and it is done at no expence, becauſe the mud ſerving as manure to the lands, more than pays the expence of taking it out.

When the ground is boggy, and carts cannot come up to take the mud, it is beſt to cut the ponds long and narrow in form of moats, that it may be thrown out at one toſs by the labourers in clearing them; for if it require two toſſes, the difference will be juſt the double price of labour.

FISSURE, FISSURA, in *Surgery*, a longitudinal fracture of a bone; or a ſolution of the continuity of a bone, whereby it is only cloven or cracked.

Fiſſures are of two kinds; the one apparent, by the Greeks called ῥαγμα or ῥηξις; and by the Latins, *ſciſſura*; the other ſo ſmall as not to be viſible, called τριχισμος, or *capillary*, as reſembling a thread.

The cauſes of *fiſſures* are falls, leaps, and contuſions of the parts againſt hard bodies.

Fiſſures, eſpecially in the cranium, either happen on the part where the ſtroke was given, or on the oppoſite part: that on the oppoſite part is called *counter-fiſſure*, or *counter-cleft*, by the Greeks, απηχημα, and the Latins, *reſonitus*. See CONTRA-*fiſſure*.

Old men are more ſubject to *fiſſures* than young ones, becauſe their bones are drier.

Fiſſures are difficult to be diſcovered; but they are the eaſieſt cured of all fractures; though if they be not known, or be neglected, they bring on ulcers and caries, and in ſuch caſe become very dangerous, ſo that there is frequently a neceſſity of having recourſe to the ſevereſt operations.

The ſigns of a *fiſſure* of the cranium are bilious vomitings, vertigoes, fluxes of the blood at the mouth or noſe, dumbneſs, delirium, &c. If there be any *fiſſure* in the ſcull, the patient will feel a pain in the place, upon holding a ſtring between his teeth, while the ſurgeon pulls it ſtrongly.

In ſuch caſes it is frequently neceſſary to perforate the cranium, to give a vent for the blood and ſanies. See CONTUSION.

FISSURES, in the *Hiſtory of the Earth*, certain interruptions that horizontally or parallely divide the ſeveral ſtrata of which the body of our terreſtrial globe is compoſed.

FISTUCA, in *Antiquity*, an inſtrument of wood uſed in driving piles, and fitted with two handles. It was either raiſed with pullies fixed at the head of large beams, and then let fall again directly on the piles, or was wrought by the hand only.

FISTULA, in the *Ancient Muſic*, an inſtrument of the wind kind, reſembling our flute or flageolet.

The principal wind inſtruments of the ancients were the *tibia* and *fiſtula*; though how theſe were conſtituted, or wherein they differed, or how they were played on, does not at preſent appear. All we know is, that the *fiſtula* was at firſt made of reeds, and afterwards of other matters. Some had holes, ſome none; ſome again were

ſingle

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ſingle pipes; others a combination of ſeveral; witneſs the ſyringa of Pan.

FISTULA, in *Surgery*, a deep, winding, cavernous ulcer, with a narrow entrance, but opening thence into a ſpacious bottom, ſeated in the cellular membrane, and generally yielding a ſharp and virulent matter.

Fiſtulas differ from ſimple ſinuſes in this, that the former are callous, at leaſt in their progreſs, and the latter not.

They attack all parts of the body without exception; but particularly the anus, foramen lachrymale, thorax, &c.

The general cauſe of *fiſtulæ* is ſome abſceſs or ulcer, which, either being inveterate, or having been ill treated, comes to be callous, the orifice being at firſt lined or incruſtrated therewith, and at length the whole ſinus.

In the firſt ſtage of *fiſtulas*, before they are become callous, the readieſt way of curing them is by an inciſion to the bottom whenever it can be ſafely done, and afterwards deterging and conſolidating them. They ſhould then be gently preſſed from the bottom towards the orifice in order to diſcharge the peccant matter; for which purpoſe a compreſs or ſmall ſlip of plaſter wrapped up in ſuch a form ſhould be applied to the bottom of the *fiſtula*, after it has been cleanſed, and proper dreſſings have been uſed, and ſecured with lint, plaſter, and bandages; and if this method fails, recourſe muſt be had to the manual operation; becauſe, by laying open all the ſinuſes of the *fiſtula*, proper paſſages are made for the diſcharge of the corrupted matter, and ſuitable remedies may be conveniently applied to the ſeveral diſeaſed parts.

The ancients gave the name *fiſtula* to this kind of ulcers, from the reſemblance they bear on account of their depth to a flute or pipe, called by the Latins *fiſtula*.

FISTULA *in ano*, is a *fiſtula* formed in the anus or fundament. Of this ſome reckon four kinds, viz. the *cæcum internum*, which is open outwards, but not into the rectum; the *cæcum externum*, which has an aperture into the rectum, but none outwards; the *complete*, which opens both ways; and the *cuniculatus*, or that with ſeveral ſinuſes, which diſcharge themſelves into one common cavity, which is the fund, and, as it were, the reſervoir of them all.

Others, as Wiſeman, reduce *fiſtulas in ano* into two claſſes. The firſt are thoſe ariſing from a phyma; theſe are very painful, and difficult to cure, enter deep among the interſtices of the muſcles, and form various cuniculi or ſinuſes; which, the more remote they are from the anus, the worſe they are, becauſe they do not allow of being cut.

The ſecond owe their origin to an internal hæmorrhage, or extravaſation between the coats of the rectum, and have a ſmall perforation near the circumference of the anus, whence they yield a thin ſanies or ichor without pain, which in time bring on itchings and excoriations; and the orifices at length become callous, and are ſometimes cloſed, and ſometimes open again.

Some *fiſtulæ*, if they do no harm by the copiouſneſs of the flux, the ſtench, or the like accidents, are a benefit to nature, becauſe they carry off cachectic humours, and ought not to be cured, but kept open. The freſh, ſimple *fiſtula* may be cured without danger.

The chief way is by cutting, where that may be done without damage to the muſcle of the anus, which might occaſion an involuntary diſcharge of the excrements.

The cutting is either performed with a thread or with a cutting inſtrument.

The method by ligature is to take a thread of ſilk or horſe hair, and threading it in the eye of a leaden or tin probe, to introduce the end of the thread into the *fiſtula*, and with the fore-finger of the other hand, anointed with oil of roſes, and thruſt up into the anus, to lay hold of the end of the probe and draw out the thread, and then tie the two ends together as tight as the patient can well bear it; and thus by tying it afreſh, ſomewhat ſtraiter every day, it will cut quite through, and the *fiſtula* will be laid open; after that the callus muſt be conſumed, and the ulcer healed. Mr. Pott adviſes the operation by inciſion, to be performed in the following manner: let a curve probe-pointed knife with a narrow blade be introduced into the ſinus, while the ſurgeon's fore-finger is in the inteſtine; when there is no opening in the inteſtine, the leaſt degree of force will thruſt the point of the knife through, and thereby make one; if there be an opening already, the ſame point will find and paſs through it: in either caſe, it will be received by the finger *in ano*, will thereby be prevented from deviating, and, being brought out by the ſaid finger, muſt neceſſarily divide all that is between the edge of the knife and the verge of the anus. When the operation is finiſhed, a ſoft doſſil of fine lint muſt be introduced between the lips of the wound, and the reſt of the ulcer dreſt with the ſame. He obſerves, in his remarks on this diſeaſe, that it is much more uncommon than is generally imagined; and that a mere abſceſs or collection of matter, without *fiſtula* or calloſity, is often miſtaken for it. A total ſuppreſſion of urine is a ſymptom frequently attendant on the formation of an abſceſs near the rectum and bladder; for the relief of which, recourſe is often had to the catheter; but as this complaint is ſpaſmodic, he adviſes evacuation and anodyne relaxation, ſuch as veneſection, gentle cathartics, ſemicupium, bladders of hot water applied to the pubes and perineum, and glyſters compoſed of warm water, oil, and opium, as the true, ſafe, and rational method of relieving it.

FISTULA, in the *Epidydymis*. We have in the Lond. Med. Obſ. vol. ii. p. 273. a caſe of this kind, related by Mr. Ingham: a man of thirty-five years of age hurt his teſticles by a fall, a ſuppuration followed, and the matter was diſcharged externally. After this, the ſwelling being reduced by means of emollient and reſolvent cataplaſms, a *fiſtula* was diſcovered in each epidydymis: a fine probe-director was then introduced into the ſinus of the left teſtis, which was cut open through its whole length; after which all the indurated parts and the diſeaſed ſkin were cut off; the ſame was done to the other teſtis, and a large portion of the lower part of the epidydymis was extirpated. A ſuppuration came on in five or ſix days, and the patient was cured by the common method of dreſſing in three weeks; ſo that the functions of the teſtes were properly executed.

FISTULA *lachrymalis* is a *fiſtula* in the greater canthus of the eye: this is frequently confounded with ÆGILOPS.

It is a little deep callous ulcer in the greater caruncle, or the place of the glandula lachrymalis. It uſually begins with an abſceſs, called *anchilops*, which in time produces an ulcer, called *ægilops*, which afterwards degenerates into a *fiſtula*. When preſſed with the finger it yields a ſtinking matter, not unlike the yolk of an egg; and the corroſive humour, finding or making itſelf a paſſage, there enſues a perpetual ouſing.

Sometimes the os ethmoides itſelf is corroded, and rendered carious by it; in which condition it is ſuppoſed to be only curable by an actual cautery; ſometimes it becomes cancerous; and then Riverius directs all medicines to be laid aſide.

This malady is ſeldom or ever cured by any other means than external and chirurgical operation; and the operator muſt be guided by the various circumſtances of the diſeaſe. If the lachrymal ſac and its integuments be diſtended with only a ſmall degree of inflammation and thinneſs of the ſkin, a ſingle inciſion, made with a ſmall ſharp round-pointed knife, and continued from the upper to the lower extent of the tumor quite down into the cavity of the cyſt, will ſometimes be found ſufficient, for the purpoſe of applying proper dreſſings to the bottom of the diſeaſed ſac. Where the ſkin is much lifted up and grown thin, and diſcoloured from a large quantity of matter that has long been depoſited and confined in the ſac, or where the integuments have burſt, become callous and livid; it will be found expedient, in the firſt inſtance, to remove an oval piece of the integuments and ſac, by making the inciſions equally long with the diſtended ſkin, and of ſuch a breadth as will admit the removal of the greateſt part of the diſeaſed integuments and ſac; and, in the ſecond inſtance the whole of the callous integuments, together with the upper part of the lachrymal ſac, muſt be cut away; by theſe means every advantage which art can procure will be obtained for the treatment of an hollow ill-conditioned ſore. Warner, &c. on the eye, 1775, p. 19.

Mr. Lamorier propoſes to abridge the operation of the *fiſtula lachrymalis*, and to ſecure a paſſage for the tears into the noſe. The os unguis is to be laid bare at the firſt inciſion, and pierced with a pair of ſtrong, ſharp-pointed and crooked forceps, and then the perforation dilated by opening the forceps. After the inflammation is over, a piece of ſmall wax-candle, ſhaped like a tent, is to be introduced by the wound into the noſe, and ſecured by the other dreſſings. He continues the uſe of this bougie till the paſſage is made callous, and out of hazard of reuniting: after which he allows the external wound to cure. Medic. Eſſ. Edinb.

Dr. Hunauld has communicated ſome thoughts on the operation of the *fiſtula lachrymalis*, and propoſes, that no tent ſhould be put into the perforation of the os unguis, becauſe the tears will of themſelves keep it open. Phil. Tranſ. N° 437. § 5. or Abr. vol. ix. p. 121, &c.

Mr. Petit conſiders the canals for the tears from the *puncta lachrymalia* as a ſyphon, the longer leg of which is the naſal duct, and therefore thinks that a ſhorter paſſage made through the os unguis would not convey away the tears; for which reaſon he would always have the natural paſſage forced open in the *fiſtula lachrymalis*, and a ſmall bougie kept in it till it heals. Mem. Acad. Scienc. 1734.

A French

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A French ſurgeon, named Anel, found out a new way, viz. by putting a probe and ſyringe of an inconceivable fineneſs through the puncta lachrymalia into the ſaccu-lus lachrymalis.

The expediency of perforating the os unguis has been a ſubject of diſpute, eſpecially when it does not appear to be carious, known by being diveſted of its perioſteum. But Mr. Warner obſerves, from his own experience, that there is no curing a diſeaſe of this kind without de-ſtroying the os unguis, at leaſt in part, even when that bone is not denuded and carious. The neceſſity of break-ing through this bone ariſes from the diſeaſed ſtate of the hinder part of the ſac and perioſteum: the os unguis is ſo thin as to require very little force in breaking it; a paſſage may be made through it into the noſtril with the edge of the inciſion-knife, and ſo effectually as not to require the aſſiſtance of any other inſtrument beſides a large probe or bougie, bent and fitted to the ſize and di-rection of the orifice, and inclining downwards into the noſtril. The perforation of the os unguis is ſometimes known by its cracking, and by a diſcharge of blood, which in a ſmall quantity trickles down the noſtril. If a trocar be uſed for this purpoſe, it ſhould not be too much curved; otherwiſe it will be brought too much forwards and outwards, inclining to the naſal proceſs of the ſu-perior maxillary bone, which is thick and ſtrong, and cannot be broke without very great force. When the perforation is made, Mr. Warner immediately intro-duces a ſmall long ſpunge tent through the wound into the noſtril, and continues the uſe of the tent for ten or twelve days, or longer; together with thin and ſoft in-jections for keeping the parts clean and open whenever the wound is dreſſed, which is generally at firſt neceſ-ſary to be done twice a day. When the opening through the os unguis is ſufficiently confirmed, known by being able to introduce into the noſtril a ſmall bougie, or a large ductile probe, without reſiſtance; he uſes ſoft tents of lint for a week or ten days longer, and then dreſſes the wound to the bottom, ſometimes with pledgets of deterſive ointments, and ſometimes with dry lint only, occaſionally touching the ſprouting and looſe fleſh with the lunar cauſtic, which he prefers to vitriol. He afterwards dreſſes the wound almoſt ſuperficially with lint, or ceratum epuloticum ſpread upon lint, till the parts are healed; and the cure is uſually completed in five or ſix weeks.

Some have recommended preſſure upon the integuments and ſubjacent lachrymal ſac, by means of inſtruments adapted to this purpoſe, in incipient abſceſſes and diſten-ſions of theſe parts; but Mr. Warner obſerves, that he has ſeldom or ever found ſuch an application of ſervice. The beſt preſſure in ſuch caſe is that of one of the fingers applied to the inferior part of the tumour when the ſac is loaded and diſtended: by this ſimple treatment, joined with purgative medicines, and a moderately cooling and aſtringent eye-water, the diſeaſe has been checked, and may poſſibly be cured. In this diſeaſe, opiates occa-ſionally adminiſtered, evacuations by bleeding, gentle purges or glyſters, and antiphlogiſtic medicines, joined with a proper regimen in diet, ought to be continued till the inquietude, ſpaſms, pain, and ſymptomatic fever, ariſing from the ſeverity of the operation, are removed. In many inſtances it will be neceſſary to uſe alteratives; ſometimes of the mercurial, and ſometimes of the anti-monial kind, given alone or joined with antiſeptics, as the bark in ſubſtance or decoction, or infuſions with com-mon or ſimple lime-water, the aqua calcis magis or mi-nus compoſita of the London Diſpenſatory, or decoctions of equal parts of ſaſſafras and ſarſaparilla. Warner on the Eye, p. 18—26.

FISTULA *in perinæo* is uſually the conſequence of lithotomy, or making a puncture near the urethra, or from a ſeroſity of the proſtrate gland, or from a wound or ulcer, the lips of which become callous, and form a *fiſtula*, through which the urine is preternaturally diſcharged. The circumſtances attending different caſes of this kind are ſo various, that only general rules can be laid down for a cure. Accordingly, the outward opening muſt be enlarged by cutting away the callous lips, or deſtroying them by cauſtic: in ſome caſes it will be ſufficient to in-troduce a bougie into the urethra for diſtending it. Le Dran obſerves, that though there are ſeveral fiſtulous ori-fices, and ſeveral calloſities in the perinæum, and when the water paſſes off through the natural paſſage in a ſmall ſtream, the chief remedy will be the introduction of bougies; and that as this canal is enlarged, the external orifices are leſſened and healed, and the calloſities ſoften-ed. See Le Dran's Operations.

FISTULA *pulmonis*, in *Anatomy*, a term uſed by ſome writers for the *aſpera arteria*.

FISTULA *ſacra*, in *Anatomy*, is that part of the back-bone which is perforated.

FISTULA *urinaria*, in *Anatomy*, the ſame with the urethra.

FISTULAR, or FISTULOUS, is applied by the ſurgeons to wounds and ulcers which degenerate into fiſtulas.

FISTULAR is alſo applied to the leaves of plants which are round and hollow within; as the leaves of leeks, &c.

FISTULAR *flowers*, among *Herbaliſts*, are thoſe made up of many ſmall, long, hollow flowers, like pipes.

FIT, in *Medicine*, an acceſs or PAROXYSM.

Dr. Cheyne is of opinion, that *fits* of all kinds, whether epileptic, hyſteric, or apoplectic, may be cured ſolely by a milk diet, of about two quarts of cow's milk a day, without any other food. Cheyne, Nat. Meth. of Curing, p. 265. See CONVULSIONS.

FITS *of eaſy reflection* and *eaſy tranſmiſſion*. See LIGHT.

FITS *of the mother*. See HYSTERIC *affection*.

FITCHEE, or FICHEE, in *Heraldry*, is when the lower part of any croſs is ſharpened into a point fit to fix into the ground.

Thus, he bears azure, a croſs-potent *fitchee*. See *Tab. Heraldry*, *fig.* 24.

The origin hereof M'Kenzie aſcribes to the primitive Chriſtians, who uſed to carry their croſſes with them wherever they went; and when they ſtopped at any place in a journey, fixed them in the ground.

FITCHES, a name given by our farmers to a ſort of pulſe which they ſow in their fields. Many ſuppoſe it the ſame with the tare, but erroneouſly; it is the chich or chich-pea of authors. There are two principal kinds of this in uſe among us, the winter and the ſummer *fitch*. The one is ſown before winter, and abides the extre-mity of it; the other is ſown in ſpring. They are pro-pagated in the ſame manner as peaſe, and they make a very good and nouriſhing food for cattle, whether given in ſtraw or threſhed out. They are ſometimes ſown only to improve the land. In this caſe they are to be plowed in, juſt as they are beginning to bloſſom, and in this manner they finely enrich a tough ſtiff clay.

FITCHET, a name uſed in ſome places for the WEASEL; called alſo the *fitchel* and the *foumart*. See POLE-*cat*.

FITTING-*out*, in *Naval Language*, the act of providing a ſhip with a ſufficient number of men, to navigate and arm her for attack or defence; as alſo of furniſhing her with proper maſts, ſails, yards, ammunition, artillery, cordage, anchors, and other naval furniture, together with ſufficient proviſions for the ſhip's company. See CREW.

FITZ, a French term, literally denoting *ſon*; ſometimes given by way of addition to the natural ſons of the kings of England; as James *Fitz-roy*, duke of Grafton, &c.

FIVE-*leaved Graſs*, *Cinquefoil*, in *Heraldry*, is uſed by ſuch as would introduce a blazon by herbs and flowers inſtead of metals and colours, to ſignify VERT, or *green*.

FIVES, among *Farriers*. See VIVES.

FIXATION, the act of fixing, or of rendering a thing firm and fixed.

FIXATION is applied in the general to any proceſs that fixes and binds together what, of its own nature, is volatile; and enables it to ſuſtain the loſs of fire for ſome con-ſiderable time.

Geber defines *fixation* an operation whereby a volatile thing, i. e. a thing that cannot endure the fire is render-ed capable of enduring it. In the general, *fixation* is the changing of a volatile body into a fixed one.

FIXATION, among *Alchemiſts*, denotes a peculiar prepara-tion of mercury, whereby it is to be put in a condition to bear the fire without evaporating, or the hammer with-out flying or ſeparating.

The alchemiſts hold, that if they had the true ſecret of fixing mercury without the addition of any foreign leſs heavy and ſolid ingredient, they could make gold, or at leaſt ſilver.

M. Homberg had a long proceſs of many months to pre-pare an oil from the fæcal matter of human excrements; which, he imagined, would have fixed mercury into ſilver; but it failed.

FIXED *Air*. See AIR.

FIXED *bodies*, in the general, are thoſe which neither the fire nor any corroſive has ſuch effect on, as to reduce or reſolve them into their component elements; i. e. abſo-lutely to deſtroy them.

Chauvin holds it not ſufficient to denominate a body *fixed* that it can withſtand the fire or any one agent, but it ſhould withſtand all. He contends, that *fixity* ſhould not be reſtrained, as it uſually is, to an exemption from evaporation, but from deſtruction, or reſolution into pri-mary elements: in this ſenſe, gold, precious ſtones, and glaſs, and even ſulphur, and mercury itſelf, are properly *fixed bodies*; for mercury and ſulphur retain their nature notwithſtanding all their evaporation.

The chemiſts divide all natural bodies into *fixed* and vo-latile; i. e. ſuch as bear the utmoſt force of the fire without

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without diſſipating or ſpending themſelves in fume, and ſuch as do not.

Of *fixed bodies*, the principal are platina, gold, ſilver, precious ſtones, particularly the diamond; ſalts, &c.

Of all metals, gold and ſilver alone are fixed; i. e. on remaining a long time expoſed to the moſt intenſe flame, they, alone, loſe nothing of their weight.

Whence this property ſhould ariſe is difficult to ſay. If the reader is not contented with the cauſes enumerated under FIXITY, he may add the following one from Boerhaave, viz. the homogeneity and equality of the parts. The parts, e. gr. of gold being all homogeneous, and equal, will equally ſuſtain each other, and leave equal pores between them; through which pores, when fuſed, the fire finding an eaſy, equal paſſage, goes off, without carrying any thing of the metal with it; or rather the particles of gold being of all others the moſt ſolid and heavy (as appears from the weight of that metal), and of all others the moſt ſtrongly united or bound together (as appears from the immenſe ductility of that metal), the force of the fire is not ſufficient to overcome ſo powerful a reſiſtance; the ſolidity of the particles, and their freedom from air, prevents their being rarefied, or ſet farther apart, which might leſſen their ſpecific gravity, and diminiſh their *vis coheſionis*; ſo that what has the chief effect in the raiſing of fumes and vapours, viz. the rarefaction or expanſion of the body being here precluded, the metal maintains its natural weight and tendency to the center.

Mr. Boyle, the prince of Mirandola, M. Homberg, and others, have made numerous experiments on gold, ſilver, &c. to ſee how far their fixity extended: in theſe, pure gold, kept in an intenſe heat for two months, loſt nothing ſenſible of its weight: SILVER, under the like circumſtances, and in the like time, loſt one-twelfth part of its weight; but Mr. Boyle attributes this to the metal's not being fine and pure.

Indeed, by the great burning-glaſſes of Meſſ. Tſchirnhauſen and Villette, the moſt *fixed bodies*, as gold itſelf, are rendered volatile, and loſe of their weight; ſo that there is no body in all nature abſolutely *fixed*.

FIXED *line of defence*, a line drawn along the face of the baſtion, and terminating in the curtain. See DEFENCE.

FIXED *nitre*, a preparation of ſaltpetre, made by fuſing it in a crucible, and then inflaming it, with throwing in a few coals; and thus again and again, till no more flame or detonation ariſe; then, letting it cool, they pulverize and diſſolve it in water, and afterwards evaporate it into a fine white ſalt, which ſerves to draw the tinctures out of vegetables. This ſalt, *per deliquium*, yields what they call the *liquor of fixed nitre*.

FIXED *ſalts* are thoſe extracted or gained from bodies by calcination and lotion. See SALTS.

They are called *fixed*, becauſe the fire was not able to ſublime or raiſe them; as thoſe carried off in the courſe of calcination by the vehemence of fire are called *volatile*.

The aſhes of all plants yield *fixed ſalts*. See LIXIVIUM.

FIXED *ſigns of the Zodiac*, according to ſome, are the *ſigns* Taurus, Leo, Scorpio, and Aquarius.

They are ſo called becauſe the ſun paſſes them reſpectively in the middle of each quarter, when that ſeaſon is more ſettled and *fixed* than under the ſign which begins and ends it.

FIXED *ſtars* are ſuch as conſtantly retain the ſame poſition and diſtance with reſpect to each other.

By which they are contra-diſtinguiſhed from erratic or wandering ſtars, which are continually ſhifting their ſituation and diſtance.

The *fixed ſtars* are what we properly and abſolutely call STARS; the reſt have their peculiar denomination of PLANET and COMET.

FIXEN, among *Sportſmen*. See VIXEN.

FIXES is a name given by the workmen in gold and ſilver to a ſolution of ſilver, from its uſe in carrying down and *fixing* the heterogeneous acids mingled with aqua fortis.

FIXING *Sulphur*. See SULPHUR.

FIXITY, or FIXEDNESS, in *Philoſophy*, the quality of a body which denominates and renders it fixed; or a property which enables it to endure the fire and other violent agents.

According to Chauvin, *fixity* conſiſts in this; that the component principles of the body are ſo cloſely united or cohere ſo ſtrongly, and are mixed in ſuch proportion that they cannot eaſily be divided either by fire or any other corroſive menſtruum, or their integral parts ſeparated and carried off in vapour: for a body may be ſaid to be fixed in two reſpects:

Firſt, When, on being expoſed to the fire, or a corroſive menſtruum, its particles are indeed ſeparated, and the body rendered fluid, but without being reſolved into its firſt elements. The ſecond, when the body ſuſtains the active force of the fire or menſtruums whilſt its integral parts are not carried off in fumes. Each kind of *fixity* is the reſult of a ſtrong or intimate coheſion between the particles mixed.

FIXITY, or FIXEDNESS, in *Chemiſtry*, is, in a peculiar manner uſed for the affection oppoſite to VOLATILITY; i. e. the property whereby bodies bear the action of the fire, without being diſſipated in fumes.

The principal cauſes of *fixity*, or the qualifications that contribute moſt to the rendering a body fixed, according to Mr. Boyle, are, 1. That its corpuſcles be ſingly of a certain proportionable bulk, too big and unwieldy to be carried up by heat, or buoyed up in the air. 2. That they have alſo a proper degree of weight or ſolidity. 3. That their figure be ſuch as unfits them for evaporation or flying off; ſome being branched, others hooked, &c. ſo that being entangled with one another, they cannot eaſily be extricated, looſened, and ſeparated. To theſe may be added a fourth circumſtance, viz. the nearneſs of the particles, and their being contiguous in a great many points, or large extent of ſurface, which produces a ſtronger force of attraction and coheſion.

FLACCIDITY, in *Medicine*, &c. a diſorder of the fibres or ſolid parts of the body, oppoſite to *rigidity*.

The too great *flaccidity* of the parts is cured by cardiacs, exerciſe, friction, a dry warm air, proper food, &c.

FLAG, a general name, including colours, ſtandards, ancients, banners, enſigns, &c. which authors frequently confound with each other.

The faſhion of bearing the *flags* pointed or triangular, which now obtains, Roderic. Toletanus aſſures us, came from the Mahometan Arabs or Saracens, upon their ſeizing of Spain, before which time all the enſigns of war were ſquare, ſtretched, or extended, on croſs pieces of wood, like church-banners; on which account they were called in Latin *vexilla*, q. d. *velilla, à veli diminutione*, as is remarked by Iſidore.

The pirates of Algiers, and thoſe throughout the coaſts of Barbary, are the only people that bear an hexagonal *flag*. It is gules, charged with a moreſk head, coifed with its turban, &c. though this be expreſsly contrary to their law, which prohibits the making any image or repreſentation of a man, founded on an opinion, that they who make them ſhall be obliged at the day of judgment to find ſouls for them, and that in defect hereof they ſhall be damned. But this portrait which they carry is that of Hali, Mahomet's ſon-in-law, to whoſe party the Africans all retain, who ordered that his effigy ſhould be expreſſed on their *flags* and ſtandards, believing himſelf ſo formidable to the Chriſtians, that the bare ſight of his image would carry undoubted victory over them. Leunclavius.

FLAGS, in the *Military Art*, are ſmall banners of diſtinction ſtuck in the baggage-waggons of the army, to diſtinguiſh the baggage of one brigade from another, and of one battalion from another, that they may be marſhalled by the waggon-maſter-general according to the rank of their brigades, to avoid the confuſion that otherwiſe might ariſe.

FLAG is more particularly uſed in *Sea-language*, for the colours, ancients, ſtandards, &c. borne on the top of the maſts of veſſels, to notify the quality of the perſon who commands the ſhip, of what nation it is, and whether it be equipped for war or trade.

In the Britiſh navy *flags* are either red, white, or blue, and are diſplayed from the top of the main-maſt, fore-maſt, or mizzen-maſt, according to the rank of the admiral. The firſt flag in Great Britain is the Royal ſtandard, which is only to be hoiſted when the king or queen are aboard the veſſel. The ſecond is that of the anchor of hope, which characteriſes the lord high admiral, or lords commiſſioners of the admiralty; and the third is the union *flag*, in which the croſſes of St. George and St. Andrew are blended: this laſt is appropriated to the admiral of the fleet, who is the firſt military officer under the lord high admiral.

The admiral or commander in chief carries his *flag* on the main-maſt; the vice-admiral carries his on the fore-maſt; and the rear-admiral his on the mizzen-maſt.

The next *flag* after the union is that of the white ſquadron, at the main-maſt; and the laſt which characteriſes an admiral is the blue, at the ſame maſt-head. For a vice-admiral, the firſt *flag* is the red; the ſecond, the white; the third, the blue, at the *flag*-ſtaff on the fore-maſt. The ſame order proceeds with regard to the rear-admirals, whoſe flags are hoiſted on the top of the mizzen-maſt; ſo that the loweſt flag in our navy is the blue on the mizzen-maſt. When a council of war is held at ſea, if it be on board the admiral, they hang a *flag* on the main-ſhrouds; if in the vice-admiral, in the fore-ſhrouds; and if in the rear-admiral, in the mizzen-ſhrouds. The *flags* borne on the mizzen are particularly called *gallants*. See MAST, &c.

The

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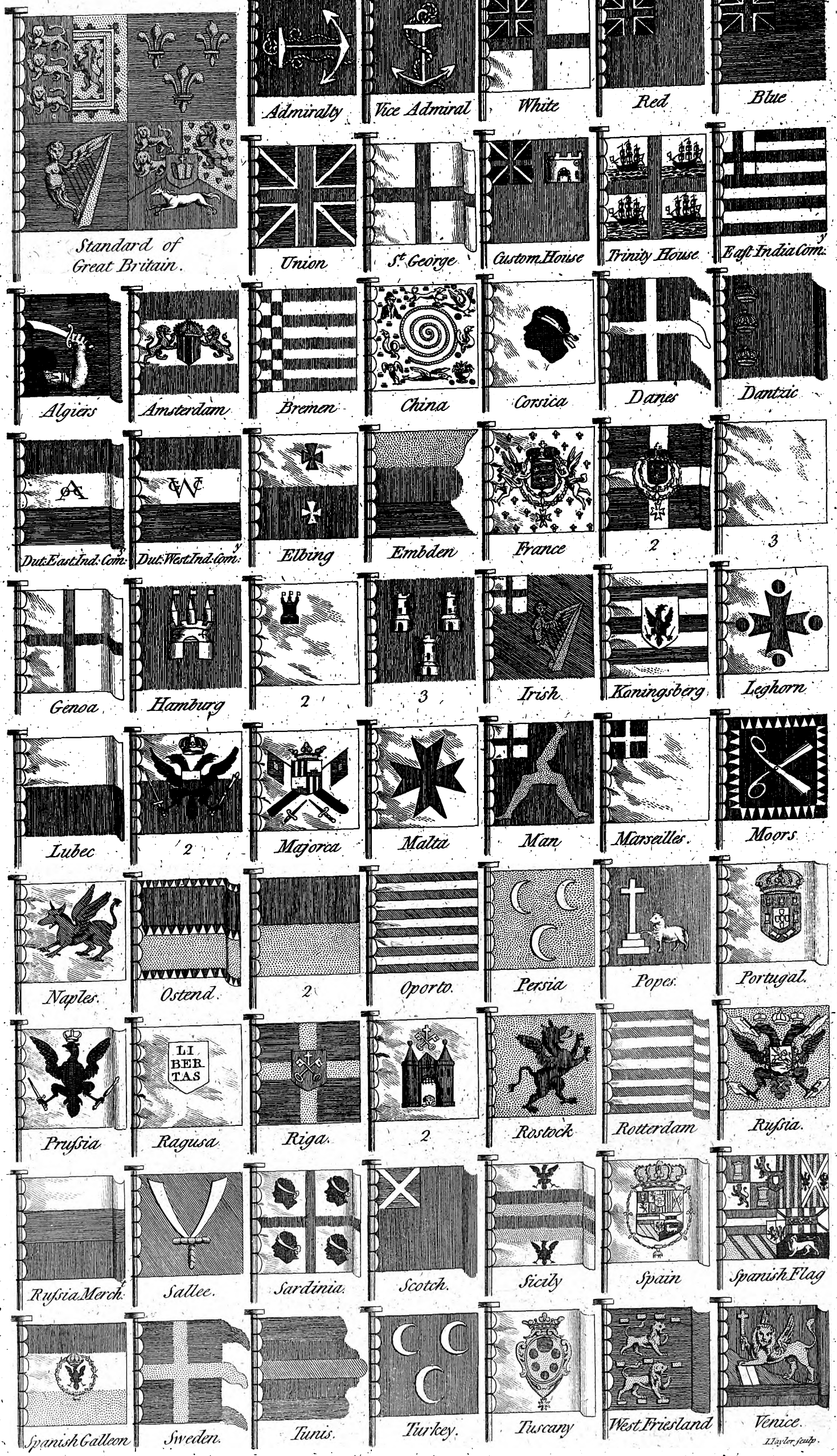
FLAGS.



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The *flag* of the French nation is blue, charged with a white croſs, and the arms of France.

Beſide the national *flag*, merchant-ſhips frequently bear leſſer *flags* on the mizzen-maſt, with the arms of the city where the maſter ordinarily reſides, and on the fore-maſt with the arms of the place where the perſon who freights them lives. See *Table of Flags*.

FLAG, *to heave out the*, is to put out or hang abroad the *flag*.

FLAG, *to hang out the white*, is to aſk quarter; or it ſhews when a veſſel is arrived on a coaſt that it has no hoſtile intention, but comes to trade, or the like. The red *flag* is a ſignal of defiance, and battle.

FLAG, *to lower* or *ſtrike the*, is to pull it down or take it in, out of reſpect or ſubmiſſion, when a weaker party meets a more powerful one.

By an ordinance of Philip II. king of Spain, 1565, the captains are peremptorily commanded to periſh rather than lower their royal *flag* when once hung out.

The way of leading vanquiſhed ſhips in triumph is, to tie the *flags* to the ſhrowds, or the gallery in the hind-part of the ſhip, and let them hang down towards the water, and to tow the veſſels by the ſtern. It was thus the Romans uſed thoſe of Carthage, as Livy relates.

FLAG-*officers*, thoſe who command the ſeveral ſquadrons of a fleet; as admirals, vice-admirals, and rear-admirals.

The *flag-officers* in our ſea-pay are the admiral, vice-admiral, and rear-admiral, of the white, red, and blue.

FLAG-*ſhip*, a ſhip commanded by a general or *flag*-officer, who has a right to carry a *flag*, in contra-diſtinction to the ſecondary veſſels under the command thereof.

FLAG-*ſtaves* are the ſtaves ſet on the heads of the top-gallant maſts, ſerving to let fly and unfurl the *flag*.

FLAG, in *Natural Hiſtory*, a genus of harſh and rough STONES, compoſed of a viſible grit of a laminated ſtructure, and ſplitting only horizontally or into plates. M. da Coſta diſtributes them into alkaline *flag*, or laminated ſand-ſtone, and ſuch as are not acted upon by acids. Of the former kind are the aſhen-coloured *flag*, the laminæ of which are numerous and very viſible, and ſo thin as ſometimes not to exceed the thickneſs of brown paper; ſo that in a piece of half an inch thick ſeven or eight perfect laminæ are often diſcernible: this, by being burnt, becomes extremely friable, and of a white colour: it is dug in ſeveral parts of the kingdom, and is frequently uſed to cover houſes inſtead of tiles, though it is very unfit for the purpoſe, as it bears the weather badly, and crumbles after froſts: and the aſhen brown-coloured flag, of a more compact texture, and heavier than the former, though compoſed like that of an irregular grit cemented by a coarſe ſpar; this becomes friable by being burnt, but ſuffers no change of colour: there are quarries of it at Burford in Oxfordſhire, where it is uſed to ſlate houſes, for pavements, &c. Neither this nor the former will ſtrike fire with ſteel.

The *flag* or *ſlate ſtone* common in Northumberland and ſome of the neighbouring counties is called by ſome *Carliſle* and *white flag*. It is a white foſſile ſtone, eaſily ſplitting into thin plates, and is full of ſmall ſpangles of a fine glittering talc. It is alſo common in Yorkſhire and the neighbouring places; it varies a little in colour, being ſometimes grey, ſometimes browniſh, and ſometimes merely whitiſh. Its ſtrata are very thick, but they eaſily ſeparate into laminæ of about half an inch thick, and the workmen ſeldom attempt to ſplit it any thinner; the upper ſtrata, however, grow gradually thinner, and the bottom ones are ſo thick as not to be uſed for ſlates. Theſe they raiſe, however, and uſe for tanners fats, the pavements of floors, and ciſterns for water.

The Stunsfield ſlate is of a pale browniſh colour, very hard and heavy, and its flats or the ſurfaces of the laminæ are always thick ſet with ſmall bivalves, but few or none are imbedded in its ſolid ſubſtance: it burns to a browner colour. This *flag-ſtone* is dug out of the quarries at Stunsfield in Oxfordſhire, in the winter ſeaſon, and laid in large maſſes in the open air till ſummer, and thus rendered fiſſile: the plates into which it is ſplit are the common ſlating-ſtone in thoſe parts: the upper ſtratum of the quarries is a ſoft gritty laminated ſtone, violently fermenting in aqua fortis, uſed as a ſort of whet-ſtone: neither of theſe two laſt ſpecies will readily ſtrike fire with ſteel. The pale, whitiſh, brown-coloured *flag* is of a compact and uniform ſtructure; and the grit that forms it is ſo intimately blended with marine bodies, and ſaturated and cemented to ſuch a degree with fine ſparry matter, that the gritty texture of the ſtone is hardly viſible. No part of it is changed by burning, except the ſhells, that are lodged in it. It will not ſtrike fire with ſteel. There are ſeveral ſtrata of this ſtone in the neighbourhood of Bath, where it is uſed as ſlate for covering houſes. The deep, duſky, lead-coloured *flag* is extremely hard and heavy, of a compact texture, compoſed of a ſmall grit, which is cemented together by an earthy, ſparry, and cryſtalline ſubſtance: its flat ſurfaces are beſpangled with great numbers of fine talcy particles; the plates are generally very regular and thin, not exceeding the tenth part of an inch in thickneſs, and cohere ſo firmly together as not to be eaſily ſeparated. This ſtone readily ſtrikes fire with ſteel, and, being burnt, acquires a reddiſh brown colour. It is dug in ſeveral parts of Italy, and much uſed in building. The firſt, ſecond, and fifth ſpecies above enumerated are deſtitute of any brightneſs; the fourth has, interiorly, ſome ſmall degree of luſtre; but the third and laſt are very bright and glittering. Of *flags* which are not acted upon by acids, there are the following ſpecies: the *flag* of ſullied white colour, which is compoſed of a large irregular cryſtalline grit cohering looſely together, and cemented with a terrene cryſtalline ſubſtance: the flat ſurfaces of the plates are covered with great quantities of ſmall ſpangles of ſilver talc, which render them very bright and dazzling. This ſtone is very heavy, and pretty hard, and the laminæ are generally very regular and thin; a *flag* of two inches thick, having often fourteen or fifteen plates: it will not ſtrike fire with ſteel; when burnt, it acquires a clearer white colour, with a ſlight reddiſh hue, and becomes very friable. It is dug in ſeveral parts of the kingdom, and uſed much as ſlate, for pavements, &c.

The bright and glittering *flag* is the hardeſt ſtone of this genus, and generally variegated with white and purple, and often the plates have one of theſe colours only. It is of a compact texture, and thickly ſpangled with ſmall laminæ; ſtrikes fire with ſteel, and acquires a paler colour by being burnt. It is much uſed in Italy, where it is dug for pavements. The brown coloured *flag* is compoſed, like the others, of an irregular grit, cemented by a cryſtalline ſubſtance; it is moderately hard and heavy; its flat ſurfaces are covered with ſmall ſpangles of a ſilvery talc, and its laminæ are thin and numerous: it burns to a pale reddiſh colour. It is dug in England, and very commonly in Sweden, but not applied to any particular uſe. Da Coſta's Foſſils, p. 144—148. Hill's Hiſt. of Foſſils, p. 433, &c.

FLAG or FLAG-*flower*, in *Botany*. See IRIS.

FLAG is alſo uſed for a kind of ruſh called ſedge, as well as for the upper part of turf pared off to burn.

FLAG, *corn*, in *Botany*, *gladiolus*, a genus of the *triandria monogynia* claſs. Its characters are theſe: the flowers are included in ſheaths; the petal of the flower is cut into ſix parts, and form a ſhort incurved tube with their baſe; they have three awl-ſhaped ſtamina, which are inſerted into every other petal. The germen is ſituated below the flower, which afterward becomes an oblong ſwelling three-cornered capſule with three cells, filled with roundiſh ſeeds. Miller reckons ſix ſpecies.

The root of the common *corn flag* or *gladiola* is accounted diſcutient, and good in malignant and peſtilential caſes.

FLAG, *ſweet-ſcented*. See ACORUS.

FLAGS, in *Falconry*, are the feathers in a hawk's wing near the principal ones.

FLAG-*worm*, a worm ſo called from being found in ſedgy places.

FLAGELLANTES, a ſect of wild fanatics who chaſtiſed and diſciplined themſelves with whips in public.

The ſect of the *Flagellantes* had its riſe in Italy in the year 1260; its author was one Rainier, a hermit; and it was propagated from hence through almoſt all the countries of Europe. It was in all probability no more than the effect of an indiſcreet zeal. A great number of perſons of all ages and ſexes made proceſſions, walking two by two with their ſhoulders bare, which they whipped till the blood ran down, in order to obtain mercy from God, and appeaſe his indignation againſt the wickedneſs of the age. They were then called the *devout*; and having eſtabliſhed a ſuperior, he was called the *general of the devotion*. Though the primitive *Flagellantes* were exemplary in point of morals, yet they were joined by a turbulent rabble, who were infected with the moſt ridiculous and impious opinions; ſo that the emperors and pontiffs thought proper to put an end to this religious phrenzy, by declaring all devout whipping contrary to the Divine law, and prejudicial to the ſoul's eternal intereſt.

However, this ſect revived in Germany towards the middle of the next century, and rambling through many provinces, occaſioned great diſturbances. They held, among other things, that *flagellation* was of equal virtue with baptiſm, and the other ſacraments; that the forgiveneſs of all ſins was to be obtained by it from God, without the merits of Jeſus Chriſt; that the old law of Chriſt was ſoon to be aboliſhed, and that a new law enjoining the baptiſm of blood to be adminiſtered by whipping was to be ſubſtituted in its place: upon which Clement VII. by an injudicious as well as unrighteous policy, thundered

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thundered out anathemas againſt the *flagellantes*, who were burnt by the inquiſitors in ſeveral places; but they were not eaſily extirpated. They appeared again in Thuringia and Lower Saxony in the fifteenth century, and rejected not only the ſacraments, but every branch of external worſhip, and placed their only hopes of ſalvation in faith and flagellation, to which they added other ſtrange doctrines concerning evil ſpirits. Their leader Conrad Schmidt and many others were committed to the flames by German inquiſitors, in and after the year 1414. Moſheim's Eccl. Hiſt. vol. iii. p. 94, &c. 206 and 277, &c. Eng. 8vo. edit. 1758.

FLAGELLARIA, in *Botany*, a genus of the *hexandria trigynia* claſs, without any corolla; the calyx is divided into ſix ſegments, and the fruit is a berry containing a ſingle ſeed.

FLAGELLATION, *whipping*, a voluntary diſcipline or penance, frequently practiſed by the ancient penitents. See DISCIPLINE.

The parliament of Paris prohibited all public *flagellations* by an arret of 1601. See FLAGELLANTES.

FLAGELLATION is a term more peculiarly appropriated to the ſufferings of Jeſus Chriſt when whipped and ſcourged by the Jews; from the Latin, *flagellum*, *a ſcourge* or *whip*.

We ſay, a painting of the *flagellation*; or, ſimply, a *flagellation*, to denote a picture or print repreſenting this torment inflicted on the Saviour of the world.

In this ſenſe we ſay, the *flagellation* of ſuch a painter, &c.

FLAGEOLET, or FLAJOLET, a kind of little flute; or a muſical inſtrument of the flute kind, uſed chiefly by ſhepherds and country people.

It is uſually made of box, or ſome other hard wood, ſometimes of ivory. It has ſix holes or ſtops beſide that at bottom, the mouth-piece, and that behind the neck.

The ambit of the *flageolet*, according to the ſcale exhibited by Merſennus, is two octaves from *g ſol re ut* upwards.

FLAIL. See THRASHING.

FLAIR, in *Sea-language*. The ſeamen ſay that the work doth *flair-over*, when a ſhip being houſed in near the water, ſo that the work hangs over a little too much, and thus is let out broader aloft than the due proportion will allow.

FLAIRS, in *Ichthyology*, a name given by ſome to the SKAITE, a ſpecies of the RAIA.

The ancient Greeks called this BATOS, when they ſpoke of the male, and when of the female, BATIS.

FLAIRING, in *Sea-language*. See FLAIR.

FLAKE, in the *Cod-fiſhery*, a ſort of ſcaffold or platform, made of hurdles, and ſupported by ſtanchions, and uſed for drying cod-fiſh in Newfoundland. Theſe *flakes* are uſually placed near the ſhores of fiſhing-harbours.

FLAKE, in *Gardening*, a name given by the floriſts to a ſort of carnations, which are of two colours only, and have very large ſtripes, all of them going quite through the leaves.

FLAKE, *white*, in *Painting*, is lead corroded by means of the preſſing of grapes, or a ceruſs prepared by the acid of grapes. It is brought here from Italy, and far ſurpaſſes both with regard to the purity of its whiteneſs and the certainty of its ſtanding, all the ceruſs or white lead made with us in common. It is uſed in oil and varniſh painting for all purpoſes, where a very clean white is required. The white *flake* ſhould be procured in lumps as it is brought over, and levigated by thoſe who uſe it, becauſe that which the colourmen ſell in a prepared ſtate is levigated and mixed up with ſtarch, and often with white lead, and worſe ſophiſtications.

FLAMBEAU, or FLAMBOY, a luminary made of ſeveral thick wicks, covered over with wax, ſerving to burn at nights in the ſtreets; as alſo at funeral proceſſions, illuminations, &c.

Flambeaux differ from links, torches, and tapers. See TORCH.

They are made ſquare, ſometimes of white wax, and ſometimes of yellow: they uſually conſiſt of four wicks or branches near an inch thick, and about three feet long, made of a ſort of coarſe hempen yarn, half twiſted. They are made with the ladle, much as torches or tapers are, viz. by firſt pouring the melted wax on the top of the ſeveral ſuſpended wicks, and letting it run down to the bottom; this they repeat twice. After each wick has thus got its proper cover of wax, they lay them to dry; then roll them on a table, and ſo join four of them together by means of a red-hot iron.

When joined, they pour on more wax till the *flambeau* is brought to the ſize required, which is uſually from a pound and half to three pounds.

The laſt thing is to finiſh their form or outſide, which they do with a kind of poliſhing inſtrument of wood by running it along all the angles formed by the union of the branches.

The *flambeaux* of the ancients were different from ours. They were made of woods, dried in furnaces, or otherwiſe. They uſed divers kinds of wood for this purpoſe; the wood moſt uſual was pine. Pliny ſays, that in his time they frequently alſo burnt oak, elm, and hazle. In the ſeventh book of the Æneid, mention is made of a *flambeau* of pine; and Servius, on that paſſage, remarks, that they alſo made them of the cornel-tree.

FLAMBO, in *Natural Hiſtory*, a name given by ſome to a long anguilliform fiſh, a ſpecies of the tænia, called CAVAGIRO.

FLAME, the brighteſt and ſubtleſt part of the fuel, aſcending above it in a pyramidal or conical figure.

Flame ſeems to be the ſmoke; i. e. the fumes or volatile part of the fuel, greatly rarefied, and at laſt kindled or heated red hot. By this great rarefaction the matter becomes ſo light as to be raiſed with great velocity in the air; and by the preſſure of the incumbent atmoſpherical fluid, it is kept for ſome time together, the air forming a ſort of arch or ſphere around it that prevents its immediate diffuſion and diſſipation, and by its contiguity and fixation ſuſtains and feeds the fire of the *flame*; the aqueous and earthy parts of the fume being naturally incapable of being ignited, are only rarefied, and ſo impelled upwards in a duſky cloud without flaming.

Flame is defined by Sir Iſaac Newton, in his little piece De Acido, to be *fumus candens*, *red-hot ſmoke*. But Dr. Prieſtley has properly obſerved, that the ſmoke of common fuel conſiſts of two very different things: that which riſes firſt is mere water, loaded with ſome of the groſſer parts of the fuel, and is hardly more capable of becoming red-hot than water itſelf; but the other kind of ſmoke which alone is capable of ignition, is properly *inflammable* AIR, which is alſo loaded with other heterogeneous matter, ſo as to appear like a very denſe ſmoke. A lighted candle ſoon ſhews them to be eſſentially different; for one of them inſtantly takes fire, whereas the other extinguiſhes a candle. Prieſtley on Air, vol. i. p. 207.

Flame may be conſidered as vapour compoſed of inflammable parts, and kindled by contact with an ignited body; by which means, together with the acceſs of air or nitrous acids, it may be made to undergo thoſe effects which are produced upon all bodies during their combuſtion, viz. the decompoſition of its parts, the diſſipation of its phlogiſton, and the emiſſion of light and heat. Moreover, it is not merely the vapour of an inflammable body, but the body itſelf, that may, by contact with an ignited body, or by any other mode of exciting heat, as friction, &c. together with acceſs of air or nitrous acid, emit a *flame*, which conſiſts of particles flying off from that body in the act of combuſtion. Thus, by applying a hot iron to ſulphur, we may ſee a *flame* immediately produced upon the ſurface of the ſulphur; and bodies thus kindled can only *flame* at their ſurfaces, becauſe there only they are contiguous to the air; whereas, when nitre is intimately mixed with the inflammable ſubſtance, as in gunpowder, the whole ſubſtance is inſtantly inflamed, becauſe the nitrous acid has, like air, the property of maintaining combuſtion. See *Nitrous* AIR. Hence we may alſo conceive why the external ſurface of a *flame*, by being contiguous to air, is much hotter than its internal parts, which may be eaſily evinced by applying any ſubſtance, alterable by heat, alternately to the exterior and interior parts of the *flame* of a candle; and when a vapour of a foot or eighteen inches diameter is kindled, and the combuſtion maintained only by the air contiguous to it, the *flame* will then be only an inch or two thick, while the vapour near the center, ſurrounded by the *flame*, is not inflamed. See the remarks of the ingenious tranſlator of the Chemical Dict. Art. *Flame*.

Sir Iſaac Newton, to whoſe reaſoning we return after this digreſſion, argues, Is not *flame* a vapour, fume, or exhalation heated red-hot; that is, ſo hot as to ſhine? For bodies do not *flame* without emitting a copious fume; and this fume burns in the *flame*. The ignis fatuus is a vapour ſhining without heat; and is there not the ſame difference between this vapour and *flame* as between rotten wood ſhining without heat, and burning coals of fire? In diſtilling hot ſpirits, if the head of the ſtill be taken off, the vapour which aſcends will take fire at the *flame* of a candle, and turn into *flame*. Some bodies, heated by motion or fermentation, if the heat grow intenſe, fume copiouſly; and if the heat be great enough, the fumes will ſhine, and become *flame*. Metals in fuſion do not *flame*, for want of a copious fume. All *flaming* bodies, as oil, tallow, wax, wood, foſſil coal, pitch, ſulphur, &c. by burning, waſte in ſmoke, which at firſt is lucid; but at a little diſtance from the body ceaſes to be ſo, and only continues hot. When the *flame* is put out, the ſmoke is thick, and frequently ſmells

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ſmells ſtrongly: but in the *flame* it loſes its ſmell; and, according to the nature of the fuel, the *flame* is of divers colours. That of ſulphur, e. gr. is blue; that of copper opened with ſublimate, green; that of tallow, yellow; of camphire, white, &c.

From this difference of the colours of the *flames* proceeds the difference of the colours of bodies as viewed by day-light, candle-light, or any one of theſe *flames*; and for making curious experiments of this kind, oil may be impregnated with copper, &c.

We find that when gun-powder takes fire, it goes off in a *flaming* ſmoke. The manner we conceive to be this: the charcoal and ſulphur eaſily take fire, and ſet fire to the nitre; by which the ſpirit of the nitre being rarefied into vapour, ruſhes out like the vapour of water out of an æolipile. Then the acid ſpirit of the ſulphur entering violently into the fixed body of the nitre ſets looſe the ſpirit of the nitre, and excites a greater fermentation, whereby the heat is increaſed, and the fixed body of the nitre rarefied into fume, and thus is a vehement exploſion effected. The *flame* of gun-powder ariſes from a violent action, whereby the mixt being quickly and vehemently heated, is rarefied and converted into fume and vapour; which vapour, by the violence of the action becoming ſo hot as to ſhine, appears in the form of *flame*. Newt. Optics, p. 318. See AIR, FIRE, HEAT, and PHLOGISTON.

It is a remarkable phænomenon of the *flame* of a candle, torch, or the like, that in the dark it appears bigger at a diſtance than near at hand. The reaſon is, that at a diſtance, e. gr. of ſix feet, the eye can readily diſtinguiſh between the *flame* and the contiguous air illuminated by it, and ſees preciſely where the *flame* terminates; but at the diſtance, e. gr. of thirty feet, though the angle ſubtended by the *flame* be much ſmaller than before, yet the eye, not being able to diſtinguiſh the preciſe bound of the *flame*, takes part of the ſphere of air illuminated by it for the *flame* itſelf.

We have ſeveral inſtances of actual *flame* being produced by the mixture of two cold liquors. Dr. Slare gives us a liſt of the oils which burſt into *flame* upon mixing them with compound ſpirit of nitre; ſuch are thoſe of caraways, cloves, ſaſſafras, guaiacum, box, camphire, pepper, hartſhorn, blood, &c. Philoſoph. Tranſact. N° 213.

It is evident to every curious obſerver, that *flame* dwells and plays only about the ſurface of fuel, having nothing to do with its interior parts. If a lamp-glaſs be filled with ſpirit of wine, another with oil of turpentine, and others with other liquors, and each ſet on fire, it will be eaſily diſtinguiſhable through the ſides of the glaſs, that they all burn and *flame* only on their ſurface, the *flame* continually ſinking lower and lower in the glaſſes as the liquors conſume. The ſame obſervation holds good in ſolid as well as liquid fuel, and appears to be univerſal; and hence we are directed to the choice of proper fuel on the different occaſions we want it for. Shaw's Lect. p. 33.

It is obſerved by Neumann, that the face viewed by the *flame* of zinc looks like that of a dead corpſe; the *flame* of phoſphorus, and of ſpirit of wine impregnated with ſea-ſalt, exhibit the ſame phenomenon. For the effect of joining the *flame* of two candles, ſee CANDLES. For an account of the generation and extinction of *flame*, according to the theory of Dr. Crawford, ſee HEAT *of inflammable, &c. bodies.*

FLAME *from cold liquors.* See FIRE.

FLAME-*heat*, the ſame with white-heat. See IRON.

FLAME, *vital*, FLAMMA, or FLAMMULA *vitalis*, a fine, warm, igneous ſubſtance, ſuppoſed by many both of the ancients and moderns to reſide in the hearts of animals, as neceſſary to life, or rather as that which conſtitutes life itſelf.

To the preſervation of this *flame* they ſuppoſe air as neceſſary as it is to the preſervation of common *flame*; and hence they aſcribe the neceſſity of reſpiration to animal life.

Mr. Boyle, by experiments in an exhauſted receiver, found, that the *vital flame* of animals, if life may be ſo called, ſurvives or outlaſts the *flame* of ſpirit of wine, or of a wax or tallow candle, &c. Some animals would remain alive and well *in vacuo* for three or four minutes, whereas no common *flame* would laſt there one minute. The light of the glow-worms, he found, would preſently be deſtroyed by exhauſting the air, and retrieved again upon its re-admiſſion. Dr. Quincy could find nothing more in the notion of vital *flame* than the natural warmth, which is the effect of a circulating blood, and which is always as its velocity. See *Animal* HEAT.

FLAMEN, among the ancient Romans, was a prieſt or miniſter of ſacrifice.

There were as many kinds of *flamens* at Rome as there were gods who had prieſts and ſacrifices offered them. Romulus and Numa, at firſt, only inſtituted three; one for Jupiter, called *flamen Dialis*; another for Mars, called *flamen Martialis*; and a third for Romulus or Quirinus, called *flamen Quirinalis*. Plutarch and Dionyſius Halicarnaſſeus maintain, that Numa created only the laſt in honour of Romulus; but Livy aſſures us, that Romulus had inſtituted only the firſt, and that the two others were added by Numa; and Varro ſpeaks in the plural number, of the *flamines* inſtituted by Numa. In after-times twelve more were added, which made the number of *flamens* fifteen.

The three firſt were taken from among the patricians, and were held of a rank and diſtinction ſuperior to the reſt. They were called *greater flamens*, *flamines majores*, in contradiſtinction to the other twelve, who were choſen from among the plebeians, and were therefore called *leſſer flamens*, *flamines minores*. The *flamen Dialis*, or of Jupiter, was the firſt inſtituted, and held in the greateſt repute. He bore a peculiar ornament on his head, called *albugalerus*, which was made of the ſkin of a white victim ſacrificed to Jupiter.

One of theſe prieſts revived an ancient pretenſion to a ſeat in the ſenate in right of his office, which, by the indolence of his predeceſſors, had not been claimed or enjoyed for many generations. The prætor rejected his claim, nor would ſuffer him to ſit in that aſſembly; but upon his appeal to the tribunes of the people; that is, to the people, his right was confirmed, and he was allowed to take his place as a ſenator. Liv. xxvii. 8. Middlet. of Rom. Sen. p. 49.

The cap worn by the reſt was called *flamma* or *apex*. It was made of a ſheep's ſkin, with the wool on; to which was faſtened a little branch of an olive-tree. That of the *flamen* of Jupiter ended in a point called *tutulus*. It was tied under the chin with ſtrings; but in the ſummer-time it was only a woollen thread tied round the head, it being prohibited them ever to appear quite bare-headed. And hence, according to Feſtus, came their denomination of *flamen*, viz. from *filamen* or *filum, thread.*

Though the *flamens* bore one common appellation, yet did not they conſtitute any company or college. Each god had his ſeveral ſacrifices, feaſts, and ceremonies a-part; nor had one *flamen* any relation to another, only they were all ſubordinate to the pontifex maximus. Aulus Gellius aſſures us, that they were created by the people in the comitia curiata; but the pontifex maximus afterwards conſecrated them. Their prieſthood, called *flaminatus*, was perpetual, though on ſome occaſions they might be depoſed.

The names of the ſeveral *flamens* are as follow: the three great *flamens*, as already obſerved, were the *flamen Dialis*, *flamen Martialis*, and *flamen Quirinalis*: the twelve leſſer were the *flamen Carmentalis*, or prieſt of the goddeſs Carmenta, mentioned by Cicero in his Brutus; *flamen Falacer*, or prieſt of the god Falacer, a name whoſe origin, Varro obſerves, is not known; *flamen Floralis*, or of the goddeſs Flora; *flamen Furinalis*, whoſe etymology is not known; *flamen Levinalis*; *flamen Lucinaris*; *flamen Palatualis*, whom ſome moderns will have to be the prieſt of the goddeſs that preſided over the palatium, though Varro owns himſelf at a loſs for its original; *flamen Pomonales*, or of Pomona, goddeſs of fruits; *flamen Virbialis*, or of the god Virbius, whom ſome take for the ſame with Hippolytus; *flamen Vulcanalis*, or of Vulcan; and *flamen Volturnalis*, or of the god Volturnus. Some authors alſo ſpeak of the *flamen Hadrianalis*, prieſt of Hadrian; *flamen Julii Cæſaris*, of Julius Cæſar; and *flamen Auguſtalis*; and Commodus likewiſe had a *flamen* created under the title of *flamen Herculaneus Commodianus*.

They had alſo their *flaminæ* or *flaminicæ*, who were wives of the *flamens*, or the prieſteſſes of the deities. In an ancient marble, quoted by Gruter, p. cccclix. n. 9. the word *flamina* is uſed for prieſteſs; and in the ſame author, p. cccviii. n. 3. the prieſteſs of the goddeſs Feronia is called FLAM. FERON. that is, *flamina*, or *flaminica Feroniæ*. The *flamina* bore the ſame ornament on her head with the *flamen*. She had alſo the ſame ſurname of office with her huſband, as *flamina Dialis*, *Martialis*, &c.

FLAMETTE, in *Zoology*, a name given by the French writers to a ſpecies of chama or ſhell-fiſh of the bivalve kind, with its ſhells always more or leſs open: this ſpecies is as hot as pepper to the taſte.

FLAMINGO, in *Zoology*, the name of a very beautiful and very remarkable bird; it has long legs, and a long neck; yet has webbed feet, and is remarkable for the fine bright red of its wings.

Its beak is broad, and of a very ſingular figure; the upper chap being bent, depreſſed, and dentated; the lower, much thicker and firmer. It is black at the end, and in the other part of a duſky blue. Its neck and body are white; the long flight-feathers of its wings black;

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but the ſhorter feathers, which make the covering of the wings, are of a very elegant and bright red, whence the bird has its name. It lives about waters, and feeds on fiſh: it is common in many parts of America, and is ſeen at times in many parts of Europe: it is well known to the ancients; and its tongue was accounted a very great delicacy among the nice eaters of old times. See *Tab.* II. *of Birds*, N° 10.

One thing very remarkable about it is, that its beak is ſo long and crooked that the whole head muſt be immerſed before the water can get into it. See a learned and elaborate hiſtory of the bird in the Phil. Tranſ. Abr. vol. v. p. 63, &c.

FLAMMA *Jovis*, a name given by many writers to a plant of the *clematis* or VIRGIN's *bower* kind, called by the Greek writers PHLOGUS.

FLAMMULA, or FLAMULA, under the *Eaſtern Empire*, was a kind of flag terminating in a point ſomewhat like a flame, ſerving as a mark or badge to diſtinguiſh the ſoldiers of the ſeveral companies, battalions, regiments, &c. In Greek it was called φλαμυλον: it was ſometimes placed on the caſque, ſometimes on the cuiraſs, and ſometimes at the end or tip of the pike, &c.

The emperor Maurice ordered, that the *flammulæ* of each diviſion ſhould be of a particular colour, to diſtinguiſh them from the other battalions or brigades.

They uſed to lay aſide the *flammula* before an engagement, leſt it ſhould prove an incumbrance. The cavalry had alſo *flammulæ* on their horſes, to diſtinguiſh the troops they belonged to.

FLAMMULA, in *Botany*, a name given by ſome authors to a particular ſpecies of the crowfoot, commonly called the ranunculus flammeus.

FLAMMULÆ *auri*, in *Natural Hiſtory*, a name given by Dr. Woodward, and others, to thoſe ſmall pieces of gold found among the ſands of rivers in ſome places. They are ſometimes found in roundiſh pieces, but more uſually in their ſhining flakes, whence the name *flammula* ſeems to have been given them, as being very bright and gloſſy. This ſort of gold is pure and malleable, and loſes ſcarce any part of its weight in fuſion.

The gold duſt, as it is called, which is brought from Guinea is much of this kind; its particles are uſually very ſmall, though ſometimes lumps of the ſize of a pea or horſe-bean are found, and ſometimes maſſes of an irregular figure of three or four ounces weight; but theſe loſe the name of *flammulæ* when they become ſo thick and ſolid, and ſo large, and are called by the merchants rock-gold. Woodw. Cat. Foſſ. vol. ii. p. 30. See GOLD.

FLANCH, FLANQUE, or FLASQUE, an ordinary, in *Heraldry*, formed by an arched line, which begins at the corners of the chief, and ends in the baſe of the eſcutcheon.

He beareth ermin two *flanches* vert. See *Tab. Herald. fig.* 25. *Flanches* are always borne by pairs.

Leigh makes *flanque* and *flaſk* two diſtinct bearings, whereof the former is more bent than the latter; but Gibbon judiciouſly makes them but one, which he calls *flanque*.

FLANCONADE, in *Fencing*, is the action of dropping the point of your ſword under your adverſary's hilt, in ſeizing with force the feeble of his blade; which, binding without quitting it, form the parade in octave, and then throw in your thruſt.

FLANEL, or FLANNEL, a kind of ſlight, looſe, woollen ſtuff, not quilted, but very warm, compoſed of a woof and warp, and wove on a loom with two treddles, after the manner of BAYS.

It has been obſerved that new *flanel*, after ſome time wearing, acquires the property of ſhining in the dark, but loſes it on being waſhed. Philoſ. Tranſ. N° 483. § 7. See ELECTRICITY.

FLANK, or FLANC, in the *Manege*, is applied to the ſides of a horſe's buttocks, &c.

In a ſtrict ſenſe, the *flanks* of a horſe are the extremes of the belly, where the ribs are wanting, and are below the loins.

The *flanks* of a horſe ſhould be full, and at the top of each a feather. The diſtance between the laſt rib and haunch bone, which is properly the *flank*, ſhould be ſhort, which they term *well coupled*, ſuch horſes being moſt hardy, and fit to endure labour.

A horſe is ſaid to have no *flank* if the laſt of the ſhort ribs be at a conſiderable diſtance from the haunch-bone; as alſo when his ribs are too much ſtreightened in their compaſs.

FLANK, in *War*, is uſed by way of analogy for the ſide of a battalion, army, &c. in contradiſtinction to the *front* and *rear*.

To attack the enemy in flank, is to diſcover and fire upon them on one ſide. See FILE.

FLANK, in *Fortification*, is a line drawn from the extremity of the face towards the inſide of the work. Such is the line BA, *Tab. Fortification, fig.* 1. and EF and LN, *fig.* 16.

Or, *flank* is that part of a baſtion which reaches from the curtain to the face, and defends the oppoſite face, the *flank*, and the curtain.

FLANK, *oblique* or *ſecond*, is that part of the curtain, EI, intercepted between the greater line of defence, EC, and the leſſer, IC; and from which they can ſee to ſcour the face of the oppoſite baſtion.

FLANK, *low*, *covered*, or *retired*, is the platform of the caſement which lies hid in the baſtion; otherwiſe called the ORILLON.

FLANK *fitchant* is that from whence a cannon playing, fireth bullets directly in the face of the oppoſite baſtion.

FLANK *razant*, or *raſant*, is the point from whence the line of defence begins, from the conjunction of which with the curtain, the ſhot only raſeth the face of the next baſtion, which happens when the face cannot be diſcovered but from the *flank* alone.

FLANKS, *ſimple*, are lines going from the angle of the ſhoulder to the curtain, whoſe chief office is for defence of the moat and place.

FLANKED, FLANQUE', is uſed by the French heralds to expreſs our party per ſaltier; that is, when the field is divided into four parts, after the manner of an X.

Though Colombiere uſes the term in another ſenſe, which appears more natural, viz. for the taking of flanches or rounding ſections out of the ſides of the eſcutcheons; the firſt from the angles of it, the latter in ſtrait lines, forming an angle at the feſs, without making any ſaltier.

FLANKED *angle*, in *Fortification*, is the angle formed by the two faces of the baſtion, and which of courſe forms the point of the baſtion.

FLANKED *line of defence*, in *Fortification*. See ANGLE and *Line of* DEFENCE.

FLANKED *tenaille*, is called alſo TENAILLE.

FLANKING, in the general, is the act of diſcovering and firing upon the ſide of a place, body, battalion, &c.

To *flank* a place, is to diſpoſe a place or other work in ſuch a manner as that there ſhall be no part of the place but what may be played on, both in front and rear.

Any fortification that has no defence but juſt right forwards is faulty; and to render it complete, one part ought to be made to *flank* the other. Hence the curtain is always the ſtrongeſt part of any place, becauſe it is *flanked* at each end.

Battalions alſo are ſaid to be *flanked* by the wings of the cavalry. A houſe is ſometimes ſaid to be *flanked* with two pavilions, or two galleries, meaning it has a gallery, &c. on each ſide.

FLANKING *angle*. See ANGLE.

FLANKING *line of defence*. See *Line of* DEFENCE.

FLASK, in the *Artillery*. See POWDER *flaſk*.

FLASK, FLASQUE, a bearing more properly called *flanque* or FLANCH.

FLAT, in *Sea-language*, denotes a level ground lying at a ſmall depth under the ſurface of the ſea, and is alſo called a ſhoal or ſhallow.

FLAT *baſtion*, in *Fortification*. See BASTION.

FLAT-*bottomed boats* are ſuch as are made to ſwim in ſhallow water, and to carry a great number of troops, artillery, ammunition, &c. They are conſtructed with a twelve-pounder, bow-chaſe, and an eighteen-pounder, ſtern-chaſe; their keel is from ninety to one hundred feet, and from twelve to twenty-four feet beam: they have one maſt, a large ſquare main-ſail, and a jib-ſail, are rowed by eighteen or twenty oars, and can carry four hundred men each. The gun takes up one bow, and a bridge the other, over which the troops are to march. Thoſe that carry horſes have the fore-part of the boat made to open when the men are to mount and ride over a bridge.

FLAT-*bottomed moat*, in *Fortification*. See MOAT.

FLAT *crown*, in *Architecture*. See CORONA.

To FLAT-*in*, in *Sea-language*, is to draw in the aftmoſt lower corner or clue of a ſail towards the middle of the ſhip, to give the ſail a greater power of turning the veſſel. Thus, if the mizzen or after-ſails are *flatted-in*, this action is intended to carry the ſtern to leeward, and turn the head nearer to the direction of the wind; and if the head-ſails are *flatted-in*, the intention is to make the ſhip fall off, when by accident or deſign ſhe has come ſo near the wind as to make the ſails ſhiver.

To FLAT-*in forward* is to draw in the fore-ſheet, jib-ſheet, and fore-ſtay-ſail ſheet towards the middle of the ſhip. This operation is ſeldom performed, except in light breezes of wind, when the helm has not ſufficient government of the ſhip.

FLATS, in *Muſic*, a kind of additional or half-notes, contrived

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trived together with ſharps, to remedy the defects of muſical inſtruments.

The natural ſcale of muſic being limited to fixed ſounds, and adjuſted to an inſtrument, the inſtrument will be found defective in ſeveral points; as particularly, in that we can only proceed from any note by one particular order of degrees; that for this reaſon we cannot find any interval required from any note or letter upwards or downwards; and that a ſong may be ſo contrived, as that if it be begun by any particular note or letter, all the intervals or other notes ſhall be juſtly found on the inſtrument, or in the fixed ſeries; yet where the ſong begun with any other note, we could not proceed.

To remove or ſupply this defect, muſicians have recourſe to a ſcale proceeding by twelve degrees; that is, thirteen notes, including the extremes, to an octave, which makes the inſtrument ſo perfect that there is but little to complain of. This, therefore, is the preſent ſyſtem of the ſcale for inſtruments, viz. between the extremes of every tone of the natural ſcale is put a note, which divides it into two unequal parts, called *ſemitones*; and the whole may be called the *ſemitonic ſcale*, containing twelve ſemitones betwixt thirteen notes in the compaſs of the octave.

Now, to preſerve the diatonic ſeries diſtinct, theſe inſerted notes either take the name of the natural note next below with a character called a *ſharp*; or they take the name of the natural note next above with a mark called *flat*. Thus D *flat* ſignifies a ſemitone below the D natural: and it is indifferent, in the main, whether the inſerted note be accounted as a *flat* or a *ſharp*.

The ſemitonic ſeries or ſcale is very exactly repreſented by the keys of a ſpinnet; the foremoſt range of keys being the natural notes, and keys behind, the artificial notes, or the *flats* and *ſharps*.

FLAT-*third*, in *Muſic*, the third minor. See INTERVAL.

FLATTER, or FLATTENER. } See COINING.
FLATTING, or FLATTENING. }

FLATTING-*courſe*, among *Brick-makers*. See BRICK.

FLATTING-*mill*. See MILL and GOLD-*wire*.

FLATULENCY, a word uſed by medical writers to expreſs a diſtempered ſtate of the body, in which there is an uncommon and unnatural generation of flatuſes or halituous and elaſtic matter of the nature of air, ariſing from the humidity of the abdomen, and attended with ſeveral very bad ſymptoms.

Some authors mention flatuſes of the uterus and of the bladder; but theſe are very rare caſes, though they do ſometimes happen; and what is uſually underſtood by the word *flatulency*, are ſuch flatuſes in the ſtomach and bowels. Theſe are either torpid or impetuous. The torpid *flatulencies* of the bowels give the patient very little uneaſineſs; people of phlegmatic habits are much ſubject to them, and generally very little regard them. But the impetuous kind very often occaſion the utmoſt diſorders, on the ſlighteſt accidental occaſions irritating them; people of a ſanguine and melancholic habit, are moſt ſubject to them. *Flatulencies* differ alſo greatly in regard to their cauſes; for ſome are only occaſioned by a ſimple languor, or ſmall loſs of tone in the inteſtines, in which caſe the flatuſes are generally diſcharged upwards in eructations, or downward, without trouble. Other *flatulencies* have their origin from a tough viſcid matter, which deſtroys the intent of the periſtaltic motion to this purpoſe; and in this caſe the patient is ſometimes troubled with ſpaſtic conſtrictions of the inteſtines, ſometimes with troubleſome relaxations of them; and finally ſome *flatulencies* take their origin from a turbulent commotion of the blood about the vena porta, from the ramifications of this veſſel having connections with the inteſtines.

Signs of flatulencies. The moſt obvious of theſe are the rumblings that are felt in the bowels, with noiſes in them; and in the place of theſe rumblings, there are ſometimes plainly perceived fixed diſtenſions of them in particular parts, with tenſion and ſtraitneſs of the abdomen. From the continuance of theſe ſymptoms ariſe pains which ſometimes change place, and ſometimes remain fixed, and ſeem to ſwell the inteſtines in ſuch manner as to endanger burſting; and when commotions of the blood are the cauſe of theſe, there are uſually pains felt attending them on the left ſide, and about the region of the heart, and the patient complains of the uſual ſymptoms of hypochondriacal people.

An obſtinate coſtiveneſs alſo uſually attends this diſtemper, which always makes it more violent; and a ſtraitneſs of the breaſt, attended with anxieties and difficulties of breathing, are uſually the attendant ſymptoms on it, when violent. The more the *flatulency* has been owing to crudities in the primæ viæ, the more will the patient be affected with vertiginous complaints, and other diſorders of the head; and when the cauſe is a commotion of blood about the vena porta, the pains are always very violent, and are often attended with bad conſequences.

Perſons ſubject to it. *Flatulencies* attack perſons of all ages, ſexes, and conſtitutions, but eſpecially the phlegmatic, whoſe parts are of a weaker tone, and naturally more ſubject to expanſion; after theſe, perſons of a ſanguine habit are moſt ſubject to them, and thoſe of choleric and melancholy habits, though naturally leſs ſubject to them, yet often fall into them after illneſſes.

People who are particularly ſenſible of the changes of the air from warmer to colder, are alſo more ſubject to them, than thoſe of a more robuſt and leſs delicate frame; hence women are more ſubject to them than men, and thoſe eſpecially in the times of the menſes and lochia.

Cauſes of them. Theſe are in general a relaxation of the periſtaltic motion of the guts; but this not extending to the whole canal, but only to ſome one part, the tranſpiration of the halituous matter being chiefly into this flaccid part, which it diſtends in a manner that it could not do by any part that had its natural tone and motions. And the defect in one part is always attended with the exceſs of the periſtaltic motion in another, in order to the driving off the cauſe; hence proceed alternate conſtrictions and relaxations, to which, in a great meaſure, the pain is owing; and in caſes of the commotions of the blood about the vena porta, the ſame conſtrictions and relaxations always happen. The material cauſes of *flatulencies*, are thoſe ſubſtances ſwallowed in food, which are of a mucous and tenacious conſiſtence, and by their obſtinately adhering to the bowels are capable of giving great trouble. Of this kind are the herbs in uſe in food, which are of a thick tough juice; or the leguminous tribe, as peas, beans, and the like; alſo dried ſea-fiſh, and all animal fats, as that of ſheep and calves, eſpecially if the perſon drink immediately after eating heartily of them. The drinking fæculent liquors will alſo occaſion them very violently, as new malt-liquors, or the ſame when the veſſels are almoſt out; the ſummer-fruits are alſo chargeable with theſe effects, and above all things honey. To all theſe cauſes, the habit of the patient greatly concurs, and a general coolneſs of the body, and dryneſs of the bowels, are a frequent occaſion of them.

Prognoſtics in them. *Flatulencies* often prove an extremely troubleſome complaint, and people of an idle ſedentary life, eſpecially women, owe a great many uneaſy hours to them; and when they grow into a habit, they are always attended with colic pains, cardialgias, anxieties, and ſuffocatory emotions. It is always to be obſerved, that the forcible ſuppreſſion of flatuſes, brings on much worſe complaints, eſpecially in plethoric and ſanguine habits; for ſpaſtic tormina of the bowels, and vibrative convulſions, with faintings, are often the conſequences of it; and the phyſician is apt to accuſe foulneſſes or ſcorbutic habits of the blood, for the ſymptoms he diſcovers, which, in truth, are only owing to ſuch a ſuppreſſion. The free diſcharging of *flatulencies*, on the other hand, is attended with its ill conſequence, becauſe it naturally degenerates into a habit.

The ſuppreſſion of habitual *flatulencies* brings on tumors, indurations of the abdomen, hectics, and a tympanites, and particularly the anterior flatuſes: theſe, which might be avoided by eructations, when ſuppreſſed, bring on cardialgious and vertiginous diſorders of the head.

Method of cure. In this it is firſt to be conſidered, whether the flatuſes have their origin in the bowels, or whether they affect them only by conſent, as is often the caſe in diſeaſes of the neighbouring parts in hypochondriac and hyſteric patients, and in perſons afflicted with hæmorrhoidal and nephritic complaints, and in caſes where women have been ill managed in lyings-in, or in miſcarriages: in all theſe caſes, the original cauſe is to be conſidered and treated with its proper remedies. But in caſes of direct and ſimple *flatulencies*, the following method will be uſually found effectual. The bowels muſt be carefully kept gently open; for in caſes of coſtiveneſs, *flatulencies* will always be increaſed. To this purpoſe, the common clyſters muſt be given at repeated times, and to theſe, by way of increaſing the ſtimulus, ſome of the leſſer centaury is to be added, and ſome common ſalt. After theſe the laxative medicines of the gentler kind are to be given, and in the intermediate days, the digeſtive ſalts, to attenuate the viſcous matter in the bowels; to theſe nitre and a little cinnabar may be added, and theſe always have a much better effect than all the hot carminatives uſually given. After theſe, thoſe things are to be given which reſtore the tone of the part; ſuch are the bitter and aromatic extracts, with ſpirit of ſalt of tartar, ſpirit of nitre dulcified, and the volatile urinous ſalts aromatiſed. Externally ſtomachic plaſters may be applied to the pit of the ſtomach, as may alſo the ſtomachic balſams, ſuch as the oils of nutmeg, carui, fennel, and the like.

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The general method of treating *flatulencies*, is by the hot aromatics; but theſe are to be given with great caution; for when the commotions of the blood about the vena porta are in fault, theſe things always irritate rather than do good; but beyond all things, the too common methods of giving a vomit in theſe caſes is to be avoided; for the diſcharge of the *flatulencies* upwards is inverted by this means, and then uſually follow exquiſite pains and tenſions of the parts, difficulty of breathing, and vertiginous complaints in the head, with noiſes in the ears, and many other complaints, which are continually increaſing, till they are a little eaſed for the preſent by an eructation. The happy way of getting rid of theſe anterior flatuſes, is by driving the cauſe of them downwards, and reſtoring the loſt tone of the parts. Continued exerciſe is alſo of the utmoſt ſervice. Junker's Conſp. Med. p. 600.

Dr. Whytt recommends æther and laudanum as the moſt effectual medicines for expelling wind. He generally gave the laudanum in a mixture with pepper-mint water and tincture of caſtor, or ſweet ſpirits of nitre; and ſometimes opium in pills, with aſſa fœtida. The doſe of æther is a tea-ſpoonful mixed with two table ſpoonfuls of water. He alſo in ſome caſes adviſes external applications; as equal parts of the antihyſteric and ſtomachic plaſter, ſpread on a piece of ſoft leather, of ſuch ſize as to cover a great part of the belly; and a table ſpoonful of the following ingredients mixed together, and well rubbed on the parts at bed-time; viz. Bate's anodyne balſam, an ounce; the expreſſed oil of mace, half an ounce; and two drams of oil of mint. For ſtrengthening the ſtomach and bowels, and leſſening the production of *flatulence*, he recommends the Peruvian bark, bitters, chalybeats, and exerciſe. To remove the coſtiveneſs, which often attends windy complaints, four or five of the following pills ſhould be taken every night at bed-time: take of aſſa-fœtida, two drams; Soccotrine aloes, ſalt of iron, and powdered ginger, of each one dram; and as much of the elixir proprietatis as will be ſufficient to form them into pills. When the body is too open, twelve or fifteen grains of rhubarb, with half a dram, or two ſcruples, of the Japonic confection, may be taken every other evening with advantage. *Flatulencies* that attend the ceſſation of the menſes are relieved by repeated ſmall bleedings. With regard to diet, tea and all flatulent aliments ſhould be avoided; and as for drink, water, with a little brandy or rum, is not only preferable to malt liquor, but, in moſt caſes, to wine.

FLATULENT, ſomething that has a relation to flatuſes, or blaſts of wind.

Peas, and moſt kind of pulſe, onions, &c. are *flatulent* foods.

FLAUTINO, in the *Italian Muſic*, the name of a ſmall flute or FLAGEOLET.

FLAUTO, in the *Italian Muſic*, is uſed to denote a flute, or the part to be played by that inſtrument.

FLAUTO *tranſverſo*, in the *Italian Muſic*, a German FLUTE.

FLAW, at *Sea*, ſignifies a ſudden guſt of wind, otherwiſe called *ſquale*.

FLAX, *Linum*, in *Botany*, a genus of the *pentandria pentagynia* claſs. Its characters are theſe: the flower has a permanent empalement, compoſed of five ſmall ſpear-ſhaped acute leaves, and five large oblong petals, which ſpread open; and five awl-ſhaped erect ſtamina, terminated by arrow-ſhaped ſummits. In the center is ſituated an oval germen, ſupporting five ſlender ſtyles, crowned by reflex ſtigmas, and afterward turns to a globular capſule with ten cells, opening with five valves; in each cell is lodged one oval, plain, ſmooth ſeed, with an acute point. There are fourteen ſpecies. Miller.

The common *flax* is an annual plant that will grow in any kind of good ſound land, but that does beſt for it, which has lain ſome time unplowed. The beſt land yields the beſt *flax*, and makes the greateſt improvement; and upon the whole, it is an excellent commodity, and the tilling and ordering it is ſo good a piece of huſbandry, that it well deſerves to be more frequently practiſed among us. It is a plant that exhauſts the land very much; on which account it is beſt to ſow it on very rank ground, and not two years together on the ſame piece. If the land is ſituated in a valley, or the ſoil has been thrown up by rivers; or if there be water at a ſmall depth below the ſurface, it is thought better. To this laſt circumſtance it is owing, that Zealand is remarkable for the fineneſs of its *flax*, and that the other provinces of Holland do not ſucceed ſo well in the culture of this plant. However, M. Du-Hamel obſerves, that ſtrong land can hardly yield ſuch fine *flax* as that which grows on lighter ground; though a moiſt ſtiff ſoil yields larger quantities, and better ſeed. The time of ſowing is in the latter end of March, when the weather is mild and warm; the land ſhould be well prepared, cleared from weeds, and laid even, and the drieſt ſeaſon that can be ſhould be choſen for the ſowing it. The ground ſhould be fallowed two winters and one ſummer; and between each ploughing it ſhould be well harrowed, in order to deſtroy the weeds, and pulverize the ſoil. The dung ſhould not be laid on till the laſt ploughing, when it muſt be buried in the ground, and care ſhould be taken that the dung be free from weeds. The Livonians, when they clear wood land, burn the wood upon it, and then plough it, and in this ſtate prefer it to any other ſoil for *flax*. The beſt way of ſowing *flax*-ſeed is to drill it in equidiſtant rows, about ten inches from one another. When the *flax* is thus ſown, the ground may be eaſily hoed, to deſtroy the weeds, which, repeated twice in dry weather, will keep the ground clean till the *flax* is ripe. Some have recommended feeding the ſheep with *flax*, when it is riſen to a good height; but Mr. Miller condemns this as a wrong practice; becauſe, if the ſheep gnaw the *flax*, the plants will ſhoot up very weak, and never come to half the ſize they would have done, if not cropped. *Flax* is ſometimes damaged by inſects, when it is about three or four inches high; it has been ſaid that they may be deſtroyed by a ſlight ſtrewing of ſoot, aſhes, &c. This dreſſing will, at leaſt, give vigour to the *flax*, though it ſhould not kill the inſects.

Two or three buſhels of good ſeed, ſown in broad-caſt, are required for an acre; but half the quantity in drills will produce a greater crop. The thicker the ſeed is ſown, the finer thread will the *flax* produce; but the ſeed will be of an inferior quality. Towards the latter end of Auguſt the *flax* will begin to ripen, but it muſt not ſtand till too ripe, but muſt be pulled as ſoon as the ſeed grows brown, and bends down the heads.

The beſt ſeed is that brought from the eaſt country, particularly from Riga, whence great quantities are imported into Scotland and Ireland, to the amount of many thouſand pounds ſterling *per annum*. The beſt ſeed is ſhort, roundiſh, firm, oily, heavy, and of a ſhining or clear brown colour; which, though dear, repays the charges with abundance.

Flax, pulled up in the bloom, proves whiter and ſtronger, than if left ſtanding till the ſeed is ripe; but then the ſeed is loſt. However, the thread will be ſtronger, when the *flax* is left till the ſeed is ripe, provided it is not left to ſtand too long; but the colour of it will not be ſo good. In Holland, when the *flax* is pulled, it is laid in handfuls on the ground, with the heads towards the ſouth, and thus piled in heaps, when the weather is uncertain; but in dry weather it is ſpread in handfuls on the field, and left for twelve or fourteen days to dry. However, this drying is not neceſſary for the rippling; and therefore, in ſome parts of Brittany, they ripple the *flax* after it has been in the air two or three days; and even one day will be ſufficient, if the weather be dry.

The Siberian perennial *flax* anſwers very well for making common ſtrong linen; but the thread ſpun from this is not ſo fine or white as that produced from the common ſort; but the roots of this kind of *flax* will continue many years, ſo that there will be a great ſaving of culture, as it will require no other care, beſides keeping it conſtantly clean from weeds. The fineſt *flax* is moſt liable to be laid in ſtormy weather; to guard againſt this accident, ſome perſons run acroſs their *flax-field* ſlender poles fixed to ſtakes; but a better method is to run ſmall ropes acroſs the field, both lengthwiſe and breadthwiſe; for theſe, being faſtened where they interſect one another, and ſupported by ſtakes at due diſtances, form a kind of netting, which is proof againſt almoſt any accident that can happen from tempeſtuous weather.

For the preparations *flax* muſt undergo, to fit it for ſpinning, as pulling, drying, and ſwingling, ſee HEMP.

They have a very good way of beating their hemp and *flax* in Derbyſhire, which is this: they make the axle-tree of the main wheel of their corn-mills longer than ordinary, and place pins in it to raiſe large hammers, like thoſe uſed in the paper and fulling-mills; and with theſe they beat the ſtalks, and ſave a great deal of labour. See HEMP.

In the Swediſh Tranſactions for 1747, we have the following method of preparing *flax* ſo as to reſemble cotton, in whiteneſs and ſoftneſs as well as in coherency. For this purpoſe, a little ſea-water is directed to be put into an iron pot, or an untinned copper kettle, and a mixture of equal parts of birch-aſhes, and quick-lime ſtrewed upon it. A ſmall bundle of *flax* is to be opened and ſpread upon the ſurface, and covered with more of the mixture, and the ſtrata are to be continued till the veſſel is ſufficiently filled. The whole is then to be boiled with ſea-water for ten hours; freſh water being occaſionally ſupplied in proportion to the evaporation, that the matter may never become dry. The boiled *flax*

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is to be immediately waſhed in the ſea, by a little at a time, in a baſket, with a ſmooth ſtick; when it is become cold enough to be borne by the hands, it muſt be well rubbed, waſhed with ſoap, and laid to bleach, and turned and watered every day. Repetitions of waſhing with the ſoap, expedite the bleaching; after which the *flax* is to be beat, and again well waſhed. When dry, it is to be worked and carded in the ſame manner as common cotton, and preſſed betwixt two boards for forty-eight hours. It is now fully prepared, and fit for uſe. It loſes in this proceſs near one half of its weight, which is abundantly compenſated by the improvement made in its quality.

Flax has one quality not taken notice of by botanical writers, which is, that the herb, infuſed in water, as in ponds or rivers, as is practiſed, in order to rot the ſtem, and procure the bark for mechanical purpoſes, communicates to the water a very poiſonous quality; inſomuch that cattle which drink of it die, and the fiſh in ſuch waters are poiſoned; it is therefore forbid to be watered in any running ſtream, or common pond, by 33 Hen. VIII. cap. 17.

This plant yields, by means of a retort, a greaſy ſubſtance, reſembling oil of mace, and called by ſome butter of *flax*.

The ſeed, which is uſually called LINSEED, is emollient, digeſting, and ripening; of great uſe againſt inflammations, tumors, and impoſthumes; and is frequently put into fomentations and cataplaſms for thoſe purpoſes. Cold drawn linſeed oil is of great ſervice in all diſeaſes of the breaſt and lungs; as peripneumonies, pleuriſies, coughs, aſthmas, conſumptions, colics, and conſtipations of the belly. It likewiſe helps the colic and ſtone, both when taken by the mouth, and given in clyſters. The oil by expreſſion is the only officinal preparation.

This oil, when carefully drawn, without the application of heat, has no particular taſte or flavour, though in ſome properties it differs conſiderably from moſt of the other oils of this kind; not congealing in winter; not forming a ſolid ſoap with fixed alkaline ſalts; and acting more powerfully, as a menſtruum, on ſulphureous bodies, than any other expreſſed oil that has been tried. It is alſo ſuppoſed to be of a more healing and balſamic nature than the other oils of this claſs. Lewis, Mat. Med. In pleuritic pains, ſays Ruygerus, Ephem. Germ. An. 6 & 7. he has often experienced linſeed oil to be the moſt ſucceſsful medicine he could preſcribe; for it immediately facilitated reſpiration, and promoted ſpitting. In a hæmoptoe alſo, he exhibited the ſame oil with the deſired ſucceſs; for by its balſamic and emplaſtic virtue it conſolidates the affected parts.

Linſeed oil is of ſuch ſubtile parts, as not to be kept in earthen veſſels without tranſudation. Meyerus de Luſu ſerio. Tumors of the belly are very happily cured by the uſe of linſeed oil. Ephem. Germ. An. 3.

FLAX, *Carolina*. See POLYPREMUM.

FLAX, *purging*. See LINUM *catharticum*.

FLAX, *toad*, *Linaria*, in *Botany*. Its characters are theſe: the flower hath a permanent empalement of one leaf, divided into five parts almoſt at the bottom, and one petal of the ringent kind, having an oblong ſwelling tube, with two lips above, and the chaps ſhut. The upper lip is bifid and reflexed on the ſides; the lower lip is trifid and obtuſe. It hath an oblong nectarium, awl-ſhaped, and prominent behind, and four ſtamina, which are included in the upper lip, two of which are ſhorter than the other; and a roundiſh germen, ſupporting a ſingle ſtyle, crowned by an obtuſe ſtigma, which afterward turns to a roundiſh, obtuſe capſule, with two cells, filled with ſmall ſeed. There are ſeventeen ſpecies. Miller.

This is joined by Linnæus to the *antirrhinum*. See SNAP-DRAGON.

The firſt ſpecies of theſe plants grows in great plenty on the ſides of dry banks in moſt parts of England. It flowers in July and Auguſt, and would make an agreeable appearance in gardens, where it might be allowed a place, were it not for its creeping roots, which ſpread too much. It is one of the ſimples, in the catalogue of ſimples, of the College Diſpenſatory, to be uſed in medicine. The leaves have a bitteriſh, and ſomewhat ſaline taſte; and when rubbed between the fingers yield a faint ſmell, reſembling that of elder.

The whole herb is uſed, and is of an aperitive and diuretic nature, opening obſtructions of the liver and ſpleen, relieving the dropſy and jaundice, which it carries off by urine. The ointment made with hog's lard, and a good quantity of this herb, is accounted excellent for the piles, being mixed with the yolk of an egg, and applied to the part. James.

The only officinal preparation is the *unguentum linariæ*.

FLAX-*plant*, is a name which we may give to a plant that ſerves the inhabitants of New Zealand inſtead of hemp and *flax*. Of this plant there are two ſorts; the leaves of both reſemble thoſe of flags, but the flowers are ſmaller, and their cluſters more numerous; in one kind they are yellow, and in the other a deep red. Of the leaves of theſe plants, with very little preparation, they make all their common apparel, and alſo their ſtrings, lines, and cordage, for every purpoſe, which are ſo much ſtronger than any thing we can make with hemp, that they will not bear a compariſon. From the ſame plant, by another preparation, they draw long ſlender fibres, which ſhine like ſilk, and are as white as ſnow: of theſe, which are very ſtrong, they make their fineſt cloaths; and of the leaves, without any other preparation than ſplitting them into proper breadths, and tying the ſtrips together, they make their fiſhing-nets, ſome of which are of an enormous ſize. Hawkeſworth's Voyag. vol. iii. p. 39.

The ſeeds of this valuable plant have been brought over into England; but, upon trial, appeared to have loſt their vegetating power.

The filamentous parts of different vegetables have been employed in different countries for the ſame mechanic uſes as hemp and *flax* among us. Putrefaction, and in ſome degree alcaline lixivia, deſtroy the pulpy or fleſhy matter, and leave the tough filaments entire. By curiouſly putrefying the leaf of a plant in water, we obtain the fine flexible fibres, which conſtituted the baſis of the ribs and minute veins, and which form, as it were, a ſkeleton of the leaf. In Madagaſcar, different kinds of cloth are prepared from the filaments of the bark of certain trees boiled in ſtrong ley; and ſome of theſe cloths are very fine, and approach to the ſoftneſs of ſilk, but in durability come ſhort of cotton; others are coarſer and ſtronger, and laſt thrice as long as cotton; and of theſe filaments they make ſails and cordage to their veſſels. The ſtalks of nettles are ſometimes uſed for like purpoſes even in France; and Sir Hans Sloane relates, in one of his letters to Mr. Ray, that he has been informed by ſeveral, that muſlin and callico, and moſt of the Indian linens, are made of nettles. A ſtrong kind of cloth is ſaid to be prepared in ſome of the provinces of Sweden of hop-ſtalks; and in the Tranſactions of the Swediſh academy for 1750, we have an account of an experiment relating to this ſubject: a quantity of the ſtalks was gathered in autumn, which was equal in bulk to a quantity of *flax* ſufficient to yield a pound after preparation. The ſtalks were put into water, and kept covered with it during the winter. In March they were taken out, dried in a ſtove, and dreſſed as *flax*. The prepared filaments weighed nearly a pound, and proved fine, ſoft, and white; they were ſpun and wove into ſix ells of fine ſtrong cloth. Unleſs the ſtalks are fully rotted, which will take much longer time than *flax*, the woody part will not ſeparate, and the cloth will prove neither white nor fine. See Dr. Lewis's notes to Neumann's Chemiſtry, p. 428, 429.

FLEA, *Pulex*, in *Natural Hiſtory*, a genus of the *aptera* claſs of inſects; of a roundiſh compreſſed figure, with two eyes, ſix feet formed for leaping, and filiform antennæ; the mouth is bent downwards, and conceals a ſmall ſting or piercer. The generation of this familiar vermin affords ſomething very curious, firſt diſcovered by Sig. Diacinto Ceſtone.

Fleas bring forth eggs, or nits, which they depoſit on animals that afford them a proper food; theſe eggs being very round and ſmooth, uſually ſlip ſtrait down; unleſs detained by the piles, or other inequalities, of the clothes, hairs, &c.

Of theſe eggs are hatched white worms, of a ſhining pearl colour, which feed on the ſcurfy ſubſtance of the cuticle, the downy matter gathered in the piles of clothes, or other the like ſubſtances.

In a fortnight they come to a tolerable ſize, and are very lively and active; and if, at any time diſturbed, they ſuddenly roll themſelves into a kind of ball.

Soon after this, they come to creep, after the manner of ſilk-worms, with a very ſwift motion. When arrived at their ſize, they hide themſelves as much as poſſible, and ſpin a ſilken thread out of their mouth, wherewith they form themſelves a ſmall round bag, or caſe, white within as paper, but without always dirty, and fouled with duſt. Here, after a fortnight's reſt, the animalcule burſts out, transformed into a perfect *flea*; leaving its exuviæ in the bag.

While it remains in the bag it is milk-white, till the ſecond day before its eruption; when it becomes coloured, grows hard, and gets ſtrength; ſo that, upon its firſt delivery, it ſprings nimbly away. Phil. Tranſ. N° 249.

The *flea* when examined by the microſcope affords a very pleaſing object. It is covered all over with black, hard, and ſhelly ſcales, or plates, which are curiouſly jointed, and folded over one another in ſuch a manner, as to com-

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ply with all the nimble motions of the creature. Theſe ſcales are all curiouſly poliſhed, and are beſet about the edges with ſhort ſpikes in a very beautiful and regular order. Its neck is finely arched, and much reſembles the tail of a lobſter; the head alſo is very extraordinary; for from the ſnout part of it there proceed the two fore-legs, and between theſe is placed the piercer or ſucker, with which it penetrates the ſkin to get its food.

Its eyes are very large and beautiful, and it has two ſhort horns or feelers. It has four other legs joined all at the breaſt. Theſe, when it leaps, fold ſhort one within another, and then exerting their ſpring all at the ſame inſtant, they carry the creature to a ſurpriſing diſtance. The legs have ſeveral joints, and are very hairy, and terminate in two long and hooked ſharp claws.

The piercer or ſucker of the *flea* is lodged between its fore-legs, and includes a couple of darts or lancets, which after the piercer has made an entrance, are thruſt farther into the fleſh, to make the blood flow from the adjacent parts, and occaſion that round red ſpot, with a hole in the center of it, vulgarly called a *flea-bite*.

This piercer, its ſheath opening ſideways, and the two lancets within it, are very difficult to be ſeen, unleſs the two fore-legs, between which they are hid, be cut off cloſe to the head; for the *flea* rarely puts out its piercer, except at the time of feeding, but keeps it folded inwards; and the beſt way of ſeeing it is by cutting off firſt the head, and then the fore-legs, and then it is uſually ſeen thruſt out in convulſions.

By keeping *fleas* in a glaſs tube corked up at both ends, but ſo as to admit freſh air, their ſeveral actions may be obſerved, and particularly their way of coupling, which is performed tail to tail; the female, which is much the larger, ſtanding over the male: they may alſo be thus ſeen to lay their eggs, not all at once, but ten or twelve in a day, for ſeveral days ſucceſſively, which eggs will be afterwards found to hatch ſucceſſively in the ſame order. The *flea* may eaſily be diſſected in a drop of water, and by this means the ſtomach and bowels, with their periſtaltic motion, may be diſcovered very plainly, as alſo their teſtes and penis, with the veins and arteries, though minute beyond all conception. Mr. Leuwenhoek affirms alſo, that he has ſeen innumerable animalcules ſhaped like ſerpents, in the ſemen maſculinum of a *flea*. Baker's Microſ. p. 191 and 194.

FLEA-*bane*, in *Botany*, *Conyza*, a genus of the *ſyngeneſia polygamia ſuperflua* claſs. Its characters are as follow: it hath a compound flower, made up of many hermaphrodite florets, which compoſe the diſk, and female half florets, which form the rays; the hermaphrodite florets are funnel-ſhaped, and cut into five parts at the brim, and have each five ſhort hairy ſtamina; in the bottom of each floret is ſituated a germen. The female half florets, or rays, are funnel-ſhaped, and cut into three parts at the top; theſe have a germen. The hermaphrodite and female florets are each ſucceeded by one oblong ſeed, crowned with down, ſitting upon a plain receptacle, and are included in the empalement. Miller enumerates ſeventeen ſpecies.

The common *flea-bane* ſtands recommended by the old authors as a remedy for many cutaneous diſorders. They had an opinion alſo, that the ſmoke of it when burnt in a room deſtroyed fleas, and other inſects.

FLEA-*bane, ſhrubby, African.* See TARCHONANTHUS.

FLEA-*bane, ſweet.* See GROUNDSEL.

FLEA-*bane, marſh, Inula.* See ELECAMPANE.

FLEA-*wort, Pſyllium*, in *Botany*, the name of a genus of plants, the flowers and fruit of which are like thoſe of the PLANTAIN, to which Linnæus has joined it; but the ſtalks are ramoſe and foliaceous.

The ſeeds of *pſyllium* are recommended by many in jaundices and dyſenteries; but the preſent practice receives it only as a mucilaginous ſeed.

FLEA-*bitten colour* of a horſe is white, ſpotted all over with dark reddiſh ſpots.

FLEAM, a ſmall inſtrument of pure ſteel, compoſed of two or three moveable lancets, for bleeding a horſe, or the like.

A caſe of *fleams*, as it is called by farriers, comprehends ſix ſorts of inſtruments; two hooked ones, called drawers, and uſed for cleanſing wounds; a penknife, a ſharp pointed lancet for making inciſions; and two *fleams*, one ſharp, and the other broad pointed: theſe laſt are ſomewhat like the point of a lancet, fixed in a flat handle, only no longer than is juſt neceſſary to open the vein.

Fleams imported, beſide the duty on ſteel, pay each $\frac{38\frac{1}{2}}{100}d.$ and drawback on exportation $\frac{34\frac{3}{5}}{100}d.$

There are many ſurgeons in Germany who bleed, or perform the operation of phlebotomy with this inſtrument, which they uſe in this manner: they hold one finger upon the end of it, which ſerves as a handle, and applying the point to the vein they are to open; ſtrike upon the back over the point with one of the fingers of the other hand, opening the vein much as farriers bleed horſes. Others uſe a ſpring *fleam*, ſomething like a ſingle point of the ſcarifying inſtrument uſed in cupping; and others employ a ſort of inſtrument in form of a dart; but as the poſition and ſize of the veins is different, in different ſubjects, no inſtrument will ever be found ſo uſeful as the common lancet of a proper ſize. Heiſter's Surgery, p. 274.

FLEDWITE, or FLIGHT-WITE, in our *Ancient Laws*, a diſcharge, or freedom, from amercements; when one, having been an outlawed fugitive, comes to the peace of our lord the king, on his own accord, or with licence. Raſtal.

Others rather take it to denote a mulct, or fine, ſet upon a fugitive to be reſtored to the king's peace.

FLEECE, the covering of wool ſhorn off the bodies of ſheep.

FLEECE, *the golden*, is famous among the ancient writers. It was this that the Argonauts, under the command of Jaſon, went in purſuit of to Colchis, a province of Aſia, now called Mingrelia.

The myſtery of the *golden fleece* is variouſly explained; either of the profit of the wool-trade to Colchis; or of the gold that they commonly gathered there, with fleeces, in the rivers. Arbuth. Diſſ. p. 224. See ARGONAUTS.

FLEECE, *order of the Golden.* See GOLDEN *Fleece.*

FLEET, a number of veſſels, going in company, whether on a deſign of war, or commerce.

In times of peace, merchant ſhips go in *fleets*, for their mutual aid and aſſiſtance: in times of war, beſides this ſecurity, they likewiſe procure convoys of men of war; either to eſcort them to the places whither they are bound, or only a part of the way, to a certain point or latitude, beyond which they are judged out of danger of privateers, &c.

The admirals of his majeſty's *fleet* are claſſed into three ſquadrons, viz. the red, white, and blue. When any of theſe officers are inveſted with the command of a ſquadron, or detachment of men of war, the particular ſhips are diſtinguiſhed by the colours of their reſpective ſquadron; the union is common to them all, and in thoſe of the red ſquadron it is diſplayed on a red field; on a white for thoſe of the white ſquadron, and on a blue field for the blue ſquadron. A *fleet*, whatſoever be the number of ſhips of which it conſiſts, is uſually divided into three SQUADRONS, and theſe again, when the ſhips are numerous, into three DIVISIONS, diſtinguiſhed by a particular flag or pendant, and uſually commanded by a general officer. The admiral, or principal officer, commands the center; the vice-admiral, or ſecond in command, ſuperintends the van-guard; and the operations of the rear are directed by the rear-admiral, or officer next in rank. The moſt convenient order of a *fleet*, proceeding on a voyage, is that in which it is ranged into three lines or columns, each of which is parallel to a line cloſe-hauled, according to the tack on which the line of battle is deſigned to be formed. The *fleet* being thus more incloſed, will more readily obſerve the ſignals, and with greater eaſe form itſelf into the LINE of battle. See ENGAGEMENT.

The Spaniſh *fleet* ſent againſt England by Philip II. conſiſted of a thouſand veſſels. In the Eaſt there have been *fleets* ſeen of three thouſand veſſels.

Merchant *fleets* generally take their denomination from the place they are bound to; as the Turky *fleet*, Eaſt India *fleet*, &c.

The Spaniards call ſimply the *fleet*, or *flota*, a certain number of veſſels, belonging partly to the king, and partly to merchants, ſent every year to Vera Cruz, a port of New Spain.

The *flota* conſiſts of the captain, admiral, and patach or pinnace, which go on the king's account; and about ſixteen ſhips, from four hundred to a thouſand tons, belonging to particular perſons. They are all ſo heavy laden, both going and coming, that they have much ado to defend themſelves when attacked. The *fleet* puts out from Cadiz about the month of Auguſt, and makes it eighteen or twenty months before its return.

The *fleet* ſent annually from the ſame port to Peru, they call the GALLEONS.

When the two *fleets* put out together, they go in company as far as the Antilles, where they ſeparate; the galleons for Carthagena, and Porto Bello; and the *flota* for Vera Cruz; at their return they join at the Havanna.

Of the two *fleets* the *galleons* are the moſt richly laden; not but the cargo of the *flota* is alſo very conſiderable.

FLEET is alſo a famous priſon in London, thus called from the river Fleet, on the border whereof it once ſtood.

To this priſon perſons are uſually committed for contempt of the king and his laws; or upon abſolute command of the king, or ſome of his courts, particularly that of chancery; and laſtly, for debt.

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FLEETING, in *Sea Language*, is the act of changing the ſituation of a tackle, when the blocks are drawn together; or what is called BLOCK and block by ſailors. The uſe of *fleeting* is to replace the mechanical powers into a ſtate of action, and the operation is nearly ſimilar to that of winding up a clock or watch.

FLEGM, FLEGMATIC, FLEGMAGOGUE, &c. See PHLEGM, PHLEGMATIC, &c.

FLEMENEFRIT, FLEMENEFRINTHE, or FLYMENAFRYNTHE, in our *Old Writers*, ſignifies the receiving or relieving of a fugitive or outlaw.

FLEMESWITE. Fleta, who writes of this word, interprets it *habere catalla fugitivorum*.

FLEMINGIANS, or FLANDRIANS, in *Eccleſiaſtical Hiſtory*, a ſect of rigid anabaptiſts, who acquired this name in the ſixteenth century, becauſe moſt of them were natives of Flanders, by way of diſtinction from the WATERLANDIANS. In conſequence of ſome diſſenſions among the *Flemingians*, relating to the treatment of excommunicated perſons, they were divided into two ſects, diſtinguiſhed by the appellations of Flandrians and Frieſlanders, who differed from each other in their manners and diſcipline. Many of theſe in proceſs of time came over to the moderate community of the Waterlandians; and thoſe who remained ſeparate are ſtill known by the name of the old *Flemingians*, or Flandrians; but they are comparatively few in number. Theſe maintain the opinion of Menno, with reſpect to the incarnation of Chriſt, alleging, that his body was produced by the creating power of the Holy Ghoſt, and not derived from his mother Mary.

FLEMISH, or the FLEMISH *tongue*, is that which we otherwiſe call Low Dutch, to diſtinguiſh it from the German, whereof it is a corruption, and a kind of dialect.

The *Flemiſh* is the language uſed throughout the provinces of the Netherlands. It differs conſiderably from the Walloon, which is a corrupt French.

There are ſeveral *Flemiſh* tranſlations of the Bible. In the year 1618, it was decreed by the ſynod of Dort, that a new *Flemiſh* verſion ſhould be made of the whole Scriptures; becauſe the old tranſlation, which had been taken from that of Luther, was full of faults. Accordingly, ſeveral perſons, learned in the Greek and Hebrew languages, undertook the work; which was publiſhed with notes in 1637. This Bible is highly valued by the reformed in Holland, &c. though M. Simon cenſures it as being far from the perfection of a juſt tranſlation.

FLEMISH *bricks*. See BRICKS.

FLESH, *Caro*, in *Anatomy*, a ſimilar fibrous part of an animal body, ſoft and bloody; being that whereof moſt of the other parts are compoſed, and whereby they are connected together.

Fleſh is properly underſtood of ſuch parts of the body where the blood-veſſels are ſo ſmall, as only to retain blood enough to preſerve their colour red.

The ancients accounted five different kinds of *fleſh*: the firſt *muſcular*, *fibrous*, or *fiſtular*; as the ſubſtance of the heart, and other muſcles; the ſecond *parenchymous*, as that of the lungs, liver, and ſpleen; the third *viſcerous*, as the *fleſh* of the ſtomach and inteſtines; the fourth *glandulous*, as that of the breaſts, pancreas, tonſils, &c. and the fifth *ſpurious*, as that of the gums, glans of the penis, the lips, &c.

The moderns admit only of one kind of *fleſh*; viz. the muſcular, conſiſting of little tubes and veſſels, with blood therein; ſo that *fleſhy* and muſcular parts of the body with them are the ſame thing.

Sometimes, however, they apply the term to the glands; which they call, by way of diſtinction, *glandulous fleſh*.

As to the parenchymas, they are now found to be quite other things than the ancients imagined. The lungs are only an aſſemblage of membranous veſicles, inflated with air; the liver a collection of glands, wherein the bile is ſeparated; the ſpleen, a heap of veſicles, full of blood; and the kidneys, like the liver, a maſs of glands for ſeparating of the urine.

FLESH is alſo uſed, in *Theology*, in ſpeaking of the myſteries of the INCARNATION and euchariſt.

The Word was *made fleſh*, *Verbum* caro *factum eſt*.

The Romaniſts hold, that the bread in the ſacrament of the ſupper is turned into the real *fleſh* of Jeſus Chriſt. See TRANSUBSTANTIATION.

FLESH, *fungus*. See FUNGUS.

FLESH is ſometimes alſo uſed by botaniſts for the ſoft pulpy ſubſtance of any fruit, incloſed between the outer rind or ſkin, and the ſeeds, or ſtone; or for that part of a root, fruit, &c. fit to be eaten.

FLESH-*colour*. See CARNATION.

FLFSHY *roots*. See FIBROSE *roots*.

FLESUS, in *Ichthyology*, a name uſed by ſome authors for the common FLOUNDER; the PASSER *fluviatilis* of moſt writers.

FLET-*milk*, denotes milk that has been ſkimmed, or from which the cream has been taken.

FLEUR-DE-LIS, FLEURETTE', FLEURONNE', and FLEURY, in *Heraldry*. See FLORY.

FLEXIBLE, in *Phyſics*, is applied to bodies that are capable of being bent, or changed from their natural form and direction.

A body is not capable of being inflected or bent, unleſs the whole thereof be at reſt. In bending a body, it conſtitutes, as it were, two levers; and the point it is to be bent in, is a fulcrum: hence, as a moving power, the farther it is from the fulcrum, acquires a greater force; the longer the *flexible* body is, the eaſier it is bent.

FLEXION, in *Anatomy*, &c. is applied to the motion of an arm, or other member, whereby it is bent.

The arm has a motion of *flexion*, and another of extenſion.

The motion of *flexion* is, when the radius and humerus approach each other, and form an angle at the elbows.

FLEXION, in *Geometry*. See FLEXURE.

FLEXOR, in *Anatomy*, a name given to ſeveral muſcles, in reſpect of their action; viz. the bending of the members, or joints, in oppoſition to the extenſors, which open and ſtretch them; among which are the following:

FLEXOR *capitis* is a muſcle of the head, called alſo RECTUS *major anticus*.

FLEXOR *carpi radialis*, called alſo *radiæus internus*, riſes from the inner protuberance of the humerus; and, running along the radius, is inſerted into the upper part of the bone of the metacarpus, which is joined with the fore-finger.

FLEXOR *carpi ulnaris*, called alſo *cubitæus internus*, ariſes tendinous from the inner protuberance of the humerus, and upper part of the ulna, upon which it runs along, till, paſſing under the ligamentum annulare, it is inſerted by a ſhort ſtrong tendon into the fourth bone of the firſt row of the carpus. See *Tab. Anat. (Myol.) fig.* 2. *n.* 24.

Both theſe muſcles bend the wriſt.

FLEXOR *digitorum pedis acceſſorius*, a flat and pretty long fleſhy muſcle, ſituated obliquely under the ſole of the foot, and from its ſituation and figure, formerly called *caro plantæ pedis quadrata*.

It is fixed poſteriorly by one fleſhy portion, in the lower ſide of the os calcis, and in the anterior tuberoſity on that ſide, and by the other in the ligament which joins this bone to the aſtragalus. From thence the two other portions run obliquely to the middle of the ſole of the foot, and there unite in a flat, long, and irregularly ſquare muſcular maſs, which is fixed to the outer edge of the faſciculus of tendons of the *flexor longus*, to which it ſerves as a *frænum* in that place.

FLEXOR *pollicis pedis brevis* ariſes from the middle of the cuneiform bone. It is ſhort, thick, and fleſhy, ſeemingly two; and, running over the termination of the peronæus, has a double inſertion into the oſſa ſeſamoidea.

FLEXOR *pollicis pedis longus*. This is a muſcle of the toe; it is derived from the back part of the fibula, with a double order of fibres, and runs tendinous under the inner ankle, and through the channel in the inner part of the bone of the heel, to its inſertion at the extremity of the great toe, on the under ſide.

FLEXOR *profundus*, in *Anatomy*, a name given by Cowper and ſome other writers to the muſcle of the foot, called alſo the PERFORANS *pedis*, and the perodactylæus by Riolan, and ſome others.

FLEXOR *primi internodii digitorum pedis*. See LUMBRICALES *pedis*.

FLEXOR *ſecundi internodii digitorum manus*. See PERFORATUS *manus*.

FLEXOR *tertii internodii digitorum manus*. See PERFORANS *manus*.

FLEXOR *tertii internodii digitorum pedis*. See PERFORANS *pedis*.

FLEXORES *primi internodii digitorum manus*, are muſcles of the fingers, called alſo *lumbricales manus*. See LUMBRICALES.

FLEXORES *pollicis manus*, are two muſcles ſerving to bend the thumb.

The firſt, called *flexor tertii internodii*, &c. ariſes from the internal protuberance of the humerus, and part of the radius, by different orders of fibres, and, paſſing under the ligamentum annulare, is inſerted into the third bone of the thumb. The ſecond, called *flexor ſecundi internodii*, &c. ariſes from the bones of the carpus, and annular ligament; and is inſerted into the ſecond bone of the thumb.

FLEXORES *ſecundi internodii digitorum pedis*. See PERFORATUS *pedis*.

FLEXURE, or FLEXION, in *Geometry*, is uſed to ſignify, that a curve is both concave and convex, with reſpect to a given right line, or a fixed point. And the point which

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which limits the concavity and convexity, is called the POINT *of contrary flexure*. See RETROGRADATION *of curves*.

As to the method of finding the points of contrary *flexure*, see INFLECTION.

FLIDETHRIFT, or more truly SLIDETHRIFT, is the game we now call *ſhovel-board*. It is otherwiſe called *ſhove-groat*, and is mentioned in the ſtatute 33 Hen. VIII. cap. 9.

FLIE, or FLY, that part of the mariner's compaſs, on which the thirty-two winds are drawn, and over which the needle is placed, and faſtened underneath.

FLIGHT, the act of a bird in FLYING; or the manner, duration, &c. thereof.

The FEATHERS of birds are admirably contrived and fitted for the eaſe and conveniency of *flight*.

Almoſt every kind of bird has its particular *flight*: the eagle's *flight* is the higheſt; the *flight* of the ſparrow-hawk and vulture are noble, and are fit for high enterprize and combat. The *flight* of ſome birds is low, weak, tranſient, and, as they call it, *terra à terra*; the *flight* of the partridge and pheaſant is but of ſhort continuance; that of the dove is laboured; that of the ſparrow, undulatory, &c.

The augurs pretended to foretel future events from the *flight* of birds.

FLIGHT. In melting the lead-ore in the works at Mendip, there is a ſubſtance which flies away in the ſmoke, which they call the *flight*.

They find it ſweetiſh upon their lips, if their faces happen to be in the way of the ſmoke, which they avoid as much as poſſible. This, falling on the graſs, kills cattle that feed thereon; and, being gathered, and carried home, kills rats and mice in their houſes; that which falls on the ſand, they gather, and melt upon a flag-hearth, into ſhot, and ſheet-lead.

FLIGHT, *capon's*, in ſome *Cuſtoms*, is a compaſs of ground, ſuch as a capon might *fly* over, due to the eldeſt born of ſeveral brothers, in making partition of the father's effects with them, when there is no principal manor in a lordſhip. It is uſually eſtimated by a bow-ſhot.

FLIGHT *of a ſtair-caſe*. See STAIR-*caſe*.

FLIGHT, in *Heraldry*. See VOL.

FLING, in the *Manege*, is the fiery and obſtinate action of an unruly horſe.

To fling like a cow, is to raiſe only one leg, and give a blow with it.

To fling or kick with the hind legs. See YERKING.

FLINGING, among *Bowlers*. See BOWLING.

FLINT, *ſilex*, in *Natural Hiſtory*, the name of a genus of ſemipellucid ſtones, the matter of which is a cryſtal, debaſed by an admixture of a peculiar and appropriated earth, which is of a blackiſh grey; always free from veins, but, according to the different quantity and diſpoſition of the earth in its compoſition, ſubject to clouds of a darker or paler colour, and naturally inveſted with a thin whitiſh cruſt.

Naturaliſts, in general, have accounted various ſpecies of *flint*, but erroneouſly; nature has eſtabliſhed it into a genus of itſelf, and allowed no other ſpecies than one, which is ever compoſed of the ſame matter, and differs only in the proportions of its admixture. When cryſtalline matter is debaſed by earths of other colours, or clouded and veined, it ceaſes to be *flint*, and becomes the pebble, the agate, or the onyx; and for want of attending to this diſtinction, many have deſcribed theſe variouſly-coloured bodies twice over: one under the name of *coloured flints*, and a ſecond time under that of *Engliſh agates*, &c.

The characters of genuine *flint* are, that it is a ſtone of an extremely fine and even texture; of a very uncertain ſurface, ſometimes rough, ſometimes ſmooth; of a colour always, in ſome degree, between blackiſh and whitiſh, unleſs accidentally tinged, as all other foſſils are ſubject to be; very readily giving fire with ſteel; not fermenting with acids. Hill's Hiſt. of Foſſils, p. 508.

Flints are generally found in beds of chalk and ſand, but never forming entire ſtrata of rock, as jaſper does. By long expoſure to air and ſun, they ſeem to decay, to loſe their luſtre, and their firmneſs of texture, and to be changed into a white calcareous earth or chalk; and on this account they are almoſt always found covered with a white chalky cruſt. *Flint* belongs to the claſs of vitrifiable EARTHS, becauſe it is uſed in one of the principal ingredients of making GLASS.

The ſparks of fire which are produced by ſtriking *flint* againſt ſteel, are of the number of thoſe things which cuſtom has made familiar to us, but by which we might find much matter of inquiry, if we would give way to reaſon on the ſubject.

The ſtriking fire in this manner has probably been as old as the knowledge of ſteel; and ſince the microſcope has been familiar among us, it has been diſcovered, firſt by Mr. Hook, (See Micrograph. 1665 p. 44.) that theſe ſparks are ſo many ſpherical balls of iron detached by the blow from the maſs, and rendered by the heat a ſort of ſcoriæ. Kemp de Kenvyck, a very ingenious chemiſt, propoſed it as a problem worthy the attempts of the curious to ſolve, and propoſed the whole in theſe words; when a *flint* and ſteel are ſtruck together, if the ſparks are received upon a white paper, they are found to be round maſſes, which examined by the microſcope, are found to be melted and ſcorified or vitrified iron, which will no longer anſwer to the magnet: it is therefore demanded, 1. Which of the two inſtruments contributes moſt to this change in the iron? 2. What ſubſtance it is, that is employed to this purpoſe? 3. In what manner the operation is performed; and 4. Why if iron be uſed inſtead of ſteel, the ſparks are very few, or none, when with ſteel they are ſo many? Theſe queſtions have appeared almoſt unanſwerable, becauſe people ſcarce knew how to conceive, that iron which requires ſo long continued, and ſo violent a fire to put it in fuſion, could by means only of a ſlight blow, be not only melted, but deſtroyed as it were. The moſt eminent perſons of the time declined engaging in the attempt, and Mr. Muſchenbroek, from whom a ſolution was expected by many, at length referred the whole to Mr. Reaumur, who had ſome time before publiſhed a treatiſe on iron and ſteel, and was therefore judged to have moſt conſidered the metal in both thoſe ſtates.

This gentleman accepted the taſk, and attempted the ſolution of the problem by reſolving theſe queſtions. 1. By what means the iron is in this act converted into ſcoriæ? 2. By what methods it can be ſo deſtroyed? 3. How it comes not only to be reduced to ſcoriæ, but to be in a ſtate of fuſion, and truly rendered liquid, and 4. Why iron gives leſs as well as fewer ſparks on colliſion with *flint* than ſteel does? The nature of iron is well enough known for us to be aſſured that it contains a large portion of inflammable matter, and that it is never ductile, but while it has a quantity of that inflammable matter in it; and that when that is wholly taken from it, it becomes friable, and is reduced to a ſort of ſcoriæ, analagous to common vitrified matters.

What much conduces to the explication of the given problem, is, that this inflammable matter contained in iron is very eaſily ſeparated when iron is heated in an open fire; which is evidently ſeen, in that it is impoſſible to heat a bar of iron in a ſmith's forge, ſo much as to make it ready for working or joining with another bar, without reducing its whole ſurface to ſcoriæ, or a friable matter which is all thrown off from the bar by the blows of the hammer.

The ſmaller and thinner a piece of iron is, the more eaſily is it reduced to ſcoriæ, and it is eaſy to conceive from hence, that in pieces extremely ſmall, there requires no more than the once thoroughly heating them to reduce the whole to ſcoriæ; and it is eaſily proved by experiment, that the flame of a candle being applied to a fine ſmall piece of filings of ſteel, will ſoon make it red hot; and that if it be then ſuffered to cool and laid on a white paper, it will be found much to reſemble the ſparks thrown off by *flint* and ſteel, and will be reduced to ſcoriæ and be friable under the nail, like a piece of charcoal.

It appears then, that there requires but an inſtant of time to give a red heat to a ſmall particle of iron; and alſo that when that heat has been given, the particle muſt have loſt that inflammable matter which cauſed its ductility, and conſequently muſt be reduced to ſcoriæ; and hence it appears not wonderful, that the very ſmall piece or particle of ſteel which is ſtruck off by the *flint*, ſhould be diveſted of its inflammable matter, and with it of its ductility, by being kept red hot in the open air, only ſo long as it was in falling from the ſteel to the paper that is placed to receive it. The extreme ſmallneſs of the particle gives power for ſo ſhort a heat to deſtroy its inflammable matter, in which its ductility conſiſts; and therefore to reduce it to a matter no longer ductile, that is, into ſcoriæ; and we find that if a parcel of fine ſteel-filings be dropt through the flame of a lamp driven into an horizontal direction by the blaſt of a blow-pipe, they will in the inſtant of their paſſing through that flame, ſparkle and become ignited; and if they are received on a white paper placed underneath, the ſmalleſt particles will be found round and friable, reduced to ſcoriæ, no way differing from the little globules of ſcorified ſteel, which are ſtruck off from the *flint* and ſteel in giving fire by their colliſion.

When we have occaſion to melt larger parcels of ſteel or iron, we are obliged to have recourſe to ſuch ſubſtances to mix with them as will replace with increaſe that inflammable matter which the fire drives off: the ſubſtances of

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this kind are common ſulphur, orpiment, arſenic, and the like; and by means of theſe, it is ſoon made to run like lead.

Mr. Reaumur having given theſe hints for explaining the occaſion of iron's being found ſcorified by the ſhort heat it receives from the colliſion of *flint* and ſteel, proceeds to account for the reaſon why iron yields fewer ſparks with *flint* than ſteel does.

On this occaſion he obſerves, that he accidentally had diſcovered a new phoſphorus of iron, in giving the proceſs of which, great light would be thrown into this ſubject: the method of making it was this, having melted ſome antimony in a crucible, he threw in, at ſeveral times, twice the quantity of iron reduced into thin ſcales; the whole ſoon melted together, and became one fluid maſs; when this had been caſt into a mould and was become cold, it afforded a long train of ſparks on being filed with a common coarſe file. The ſparks were much larger than thoſe produced by a colliſion of *flint* and ſteel, and the larger of them ſet fire to the paper placed to receive them; but upon examination, theſe were all found to be melted in the manner of the ſparkling particles ſtruck off from ſteel, not only burnt, but melted, and that more perfectly than the others from the common colliſion with *flint*. If after all this, it be aſked, why ſteel yields much more numerous ſparkles than iron? the anſwer is plain, that the difference of hardneſs alone is ſufficient to occaſion it; but granting even that ſteel and iron were of equal hardneſs, ſteel has the ſame advantage of iron in this reſpect, that the before-mentioned mixture of iron with antimony has over plain iron, in that it contains much more of the inflammable matter than the iron does, and this inflammable matter is alſo more equally diſtributed through all its ſurface.

It may alſo be judged, that the *flint* not only contributes by its hardneſs to the ſending off the ſparks, but alſo by its ſulphur; what the blow diſlodges from it of this kind, and puts in violent motion, probably having no ſmall effect both in the fuſion and ſcorification of the metal. That all *flints* contain a large quantity of ſulphur is plain, from the ſulphureous ſmell they afford on being ſtruck together; and the ſparks which are produced by ſtriking iron againſt iron are probably affected in the ſame manner, by the ſulphur of the metal diſlodged from the adjoining parts by the blow.

One great proof of the ſparks being melted and rendered globular by means of the ſulphur of the *flint* is, that ſparks may be ſtruck from ſteel, in the ſame manner by glaſs as by *flint*, but in leſs quantity; theſe having been received on a paper, were examined by Mr. Reaumur, and were found to be ſcoriæ, of an irregular figure, having never been melted, and therefore never reduced to the globular ſhape of the others. In regard to the great change wrought in iron by this operation, or its being, according to the words of Kemp, deſtroyed, no longer retaining its great character of being attracted by the loadſtone, Mr. Reaumur willing to try the experiment before he reaſoned upon it, found this aſſertion not to be a fact, or at leaſt not a general one.

All the ſeveral kinds of ſparks which he mentions, thoſe produced by the common colliſion of *flint* and ſteel, thoſe by dropping ſteel filings through the flame of a lamp, and even thoſe from the filing of the antimoniated iron, all as readily anſwering to the loadſtone as common filings of iron; ſo that if this caſe ſometimes happen, and iron be liable thus to be deſtroyed, it is however no general fact, but a very rare and extraordinary one. Memoires Acad. Scienc. Par. 1736.

FLINTS, in the *Glaſs-trade*. The way of preparing *flints* for the niceſt operations in the glaſs-trade is this. Chooſe the hardeſt *flints*, ſuch as are black and will reſiſt the file, and will grow white when calcined in the fire. Cleanſe theſe of the white cruſt that adheres to them, then calcine them in a ſtrong fire, and throw them while red-hot into cold water; waſh off the aſhes that may adhere to them, and powder them in an iron-mortar, and ſift them through a very fine ſieve; pour upon this powder ſome weak aqua fortis, or the phlegm of aqua fortis, to diſſolve and take up any particles of iron it may have got from the mortar; ſtir this mixture ſeveral times, then let it reſt, and in the morning pour off the liquor, and waſh the powder ſeveral times with hot water, and afterwards dry it for uſe. You will thus have a powder for making the pureſt glaſs as perfectly fine and faultneſs, as if you had uſed rock-cryſtal itſelf. Cramer's Art of Aſſaying Metals, p. 438.

The waſhing off the ferrugineous particles with aqua fortis is not neceſſary, when the glaſs intended to be made is to be tinged with iron afterwards; but when meant to be a pure white, this is the method that will ſecure ſucceſs.

FLINT, *breaking of*. — The art of cutting or rather breaking *flint* ſtones into uniform figures, was by ſome ſuppoſed to be one of the arts now loſt. That it was known formerly appears from the ancient Bridewell at Norwich, from the gate of the Auſtin-friars at Canterbury, that of St. John's abbey at Colcheſter, and the gate that formerly ſtood near White-hall, Weſtminſter.

But that the art is not loſt, and that the French know it, appears from the platform on the top of the royal obſervatory at Paris, which, inſtead of being leaded, is paved with *flint*, in the manner here mentioned. But we know not that this art is any where deſcribed. Phil. Tranſ. N°. 477. p. 521, and Note ibid.

FLINTS, *oil* or *liquor of*, a name given by ſome to a preparation made of four ounces of *flints* calcined and powdered and mixed with twelve ounces of ſalt of tartar; theſe being melted together in a large crucible by a ſtrong fire, run into a glaſs, which quickly and ſtrongly attracts moiſture from the air; and is entirely ſoluble in water, except a very ſmall portion of earthy matter: this glaſs being afterwards powdered and ſet in a cellar, runs into an oil per deliquium; with this and the calx of any metal is prepared one of the *metallic* VEGETATIONS. If any acid be added to the liquor of *flints* ſo as to ſaturate the alkali, the *flint* which was kept diſſolved in water by means of this alkali will be now precipitated in the ſtate of a fine earth, which earth is entirely ſoluble by acids.

FLINT *walls*. See WALL.

FLIP, a ſort of ſailors drink, made of malt liquor, brandy, and ſugar, mixed.

FLITTER-*Mouſe*, in *Zoology*. See BAT.

FLIX *weed*, in *Botany*; a ſpecies of *water* CRESSES, which grows in uncultivated places, and by the ſide of foot-ways in many parts of England: it flowers in June, and the ſeeds, which ripen in Auguſt, are greatly recommended by ſome for the gravel and retention of urine.

FLOAT, or FLEET. See FLOTA, and FLEET.

FLOAT *of a fiſhing line*, &c. See FISHING-*float*.

FLOAT, ſometimes called *Catamaran*, alſo denotes a certain quantity of pieces of timber joined together with rafters athwart, thrown into a river, to be conveyed down the ſtream; and even ſometimes to carry burdens down a river with the ſtream. The invention of *floats* is of great uſe; it is ſaid to have been firſt put in execution at Paris, in the year 1618.

FLOAT-*boards*, thoſe boards fixed to *water*-WHEELS of underſhot mills, ſerving to receive the impulſe of the ſtream, whereby the wheel is carried round.

It is a diſadvantage to have too great a number of *float-boards*; becauſe when they are all ſtruck by the water in the beſt manner that it can be brought to act againſt them, the ſum of all theſe impulſes will only be equal to the impulſe made againſt one *float-board* at right angles, by all the water coming out of the pin-ſtock, through the opening, ſo as to take place on the *float-board*. The beſt rule in this caſe is, to have juſt ſo many, that each of them may come out of the water as ſoon as poſſible, after it has received and acted with its full impulſe; or, which comes to the ſame thing, when the ſucceeding one is in a perpendicular direction to the ſurface of the water. As to the length of theſe *float-boards*, it may be regulated according to the breadth of the ſtream. See Deſaguliers, vol. ii. p. 425.

FLOAT *Graſs*, in *Botany*. See GRASS.

FLOATAGES. See FLOTAGES.

FLOATING-*bridge*, a bridge conſiſting of ſeveral boats covered with planks; which ought to be ſo ſolidly framed, as to bear both horſes and cannon. See BRIDGE.

FLOATING-*iſlands*. See ISLANDS.

FLOATING-*veſſels*. See BOAT, VESSEL, &c.

FLOATING, in *Huſbandry*, is the drowning or watering of meadows.

FLOCK-*Paper*. See PAPER.

FLOOD, a DELUGE or inundation of waters.

FLOOD is alſo uſed in ſpeaking of the TIDE.

When the water is at loweſt, it is called *flood*; when riſing, *young*, or *old flood*; when at higheſt, *high flood*; when beginning to fall, *ebb-water*.

FLOOD-*mark*, the mark which the ſea makes on the ſhore, at flowing water, and the higheſt tide: it is alſo called *high-water mark*.

FLOOD *Sand*. See SAND.

FLOOK *of an anchor*. See ANCHOR.

FLOOKING, in *Mining*, a term uſed to expreſs a peculiarity in the load of a MINE. The load or quantity of ore is frequently intercepted in its courſe, by the croſſing of a vein of earth or ſtone, or ſome different metallic ſubſtance; in which caſe the load is moved to one ſide, and this tranſient part of the land is called a *flooking*.

FLOOR, in *Building*, the underſide of a room, or that part we walk on.

Floors are of divers ſorts; ſome of earth, ſome of brick, others of ſtone, others of boards, &c.

Carpenters, by the word *floor*, underſtand as well the frame work of timber, as the boarding over it.

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For brick and *ſtone* FLOORS, ſee PAVEMENT.

For boarded FLOORS, it is obſervable, that the carpenters never *floor* their rooms with boards, till the carcaſe is ſet up, and alſo incloſed with walls, leſt the weather ſhould injure the *flooring*. Yet they generally rough-plane their boards for the *flooring*, before they begin any thing elſe about the building, that they may ſet them by to dry and ſeaſon, which is done in the moſt careful manner. The beſt wood for *flooring* is the fine yellow deal well ſeaſoned, which, when well laid, will keep its colour for a long while; whereas the white ſort becomes black by often waſhing, and looks very bad The joints of the boards are commonly made plain, ſo as to touch each other only; but, when the ſtuff is not quite dry, and the boards ſhrink, the water runs through them, whenever the floor is waſhed, and injures the cieling underneath. For this reaſon they are made with feather edges, ſo as to cover each other about half an inch, and ſometimes they are made with grooves and tenons; and ſometimes the joints are made with dove-tails; in which caſe the lower edge is nailed down and the next drove into it, ſo that the nails are concealed. The manner of meaſuring *floors* is by ſquares of 10 feet on each ſide, ſo that taking the length and breadth and multiplying them together and cutting off 2 decimals, the content of a *floor* in ſquare will be given. Thus 18 by 16 gives 288 or 2 ſquares and 88 decimal parts.

FLOORS, *earthen*, are commonly made of loam, and ſometimes, eſpecially to make malt on, of lime, and brook-ſand, and gun-duſt, or anvil-duſt from the forge.

Ox-blood and fine clay, tempered together, Sir Hugh Plat ſays, make the fineſt *floor* in the world.

The mannner of making earthen *floors* for plain country habitations is as follows. Take two thirds of lime, and one of coal aſhes well ſifted, with a ſmall quantity of loam clay; mix the whole together, and temper it well with water, making it up into a heap: let it lie a week or ten days and then temper it over again. After this, heap it up for three or four days, and repeat the tempering very high, till it become ſmooth, yielding, tough, and gluey. The ground being then levelled, lay the *floor* therewith about $2\frac{1}{2}$ or 3 inches thick, making it ſmooth with a trowel: the hotter the ſeaſon is the better; and when it is thoroughly dried, it will make the beſt *floor* for houſes, eſpecially malt houſes.

If any one would have their *floors* look better, let them take lime made of rag-ſtones, well tempered with whites of eggs, covering the *floor* about $\frac{1}{2}$ an inch thick with it, before the under *flooring* is too dry. If this be well done, and thoroughly dried, it will look when rubbed with a little oil, as tranſparent as metal or glaſs. In elegant houſes *floors* of this nature are made of ſtucco or of plaiſter of Paris beaten and ſifted, and mixed with other ingredients.

FLOOR *of a ſhip*, ſtrictly taken, is only ſo much of her bottom as ſhe reſts on, when aground.

Such ſhips as have long, and withal broad *floors*, lie on the ground with moſt ſecurity, and are not apt to feel, or tilt on one ſide; whereas others, which are narrow in the *floor*, or, in the ſea-phraſe, *cranked by the ground*, cannot be grounded without danger of being overturned.

FLOOR-*Timbers*, in a *ſhip*, are thoſe parts of a ſhip's timbers which are placed immediately acroſs the keel, and upon which the bottom of the ſhip is framed; to theſe the upper parts of the timbers are united, being only a continuation of *floor*-timbers upwards.

FLORAL *leaf*. See LEAF.

FLORALES *ludi*, or FLORAL *games*, in *antiquity* were games held in honour of Flora, the goddeſs of flowers.

They were celebrated with ſhameful debaucheries. The moſt licentious diſcourſes were not enough, but the courteſans were called together by the ſound of a trumpet, and made their appearance naked, and entertained the people with indecent ſhews and poſtures: the comedians appeared after the ſame manner on the ſtage. Val. Maximus relates, that Cato being once preſent in the theatre on this occaſion, the people were aſhamed to aſk for ſuch immodeſt repreſentations in his preſence; till Cato, appriſed of the reſervedneſs and reſpect with which he inſpired them, withdrew, that the people might not be diſappointed of their accuſtomed diverſion.

There were divers other ſorts of ſhews exhibibited on this occaſion; and, if we may believe Suetonius in Galba, c. vi. and Vopiſcus in Carinus, theſe princes preſented elephants dancing on ropes on theſe occaſions.

The *ludi Florales* according to Pliny, lib. xviii. c. 29. were inſtituted by order of an oracle of the Sibyls, on the 28th of April; not in the year of Rome IDXVI. as we commonly read it in the ancient editions of that author; nor in IDXIV. as F. Hardouin has corrected it, but, as Voſſius reads it, in 513. Though they were not regularly held every year, till after 580. They were chiefly held in the night-time, in the Patrician-ſtreet: ſome will have it there was a circus for the purpoſe, on the hill called Hortulorum.

The goddeſs Flora is by ſome held to be the ſame with the Chloris of the Greeks. Others maintain, that this Flora was a famous courteſan at Rome, who, having enriched herſelf by proſtitution, made the people of Rome her heirs, on condition that they ſhould celebrate the anniverſary of her birth-day, by the games and feaſts above mentioned. Some time afterwards, the ſenate, judging ſuch a foundation unworthy the majeſty of the Roman people, to ennoble the ceremony, converted Flora into a goddeſs, whom they ſuppoſed to preſide over flowers; and ſo made it a part of religion to render her propitious, that it might be well with their gardens, vineyards, &c. This is the common account: but Voſſius de Idolol. lib. i. c. 12. can by no means allow the goddeſs Flora to have been the courteſan above mentioned: he will rather have her a Sabine deity, and thinks her worſhip might have commenced under Romulus. His reaſon is, that Varro, in his fourth book of the Latin tongue, ranks Flora among the deities, to whom Tatius, king of the Sabines, offered up vows, before he joined battle with the Romans. Add, that from another paſſage in Varro it appears, that there were prieſts of Flora, with ſacrifices, &c. as early as the times of Romulus and Numa.

FLORAL *games*. There is alſo a kind of *Floral games* obſerved at this day in France; firſt inſtituted in 1324.

The deſign and eſtabliſhment is owing to ſeven perſons of condition, lovers of poetry, who about All-ſaints-day, in 1323, ſent a circular letter to all the Provençal poets, called Troubadours, to meet at Thouloufe on May-day following, there to rehearſe their poems; promiſing a prize of a violet of gold to the perſon whoſe piece ſhould be judged the beſt.

The capitouls found the deſign ſo good, that it was afterwards reſolved, at a council of the city, to continue it at the city-charge; which is ſtill done in a manner that does honour to the place.

In 1325, a chancellor and ſecretary of the new academy were choſen; and the ſeven inſtitutors took the quality of maintainers thereof. Two other prizes were afterwards added to the violet; *viz.* an eglantine for the ſecond prize, and a panſy for the third. It was alſo decreed, that the perſon who bore away the firſt prize, might demand to be made bachelor: and that whoever bore away all three, ſhould be created doctor in the *gay ſcience*, that is, in poetry.

There is a regiſter of theſe games kept at Thouloufe, which gives this account of their origin; though others repreſent the matter differently. It was an ancient cuſtom, they ſay, for the poets of Provence to meet yearly at Thouloufe, to confer together, rehearſe their verſes, and receive a prize allotted to the beſt performance. This held till about the year 1540, when a lady of quality left the beſt part of her fortune to eternize the cuſtom, and bear the expence of prizes; the number of which ſhe increaſed, ordering an eglantine, a panſy, a violet, and a pink: the three firſt, a cubit high; and worth fifteen piſtoles a-piece.

The ceremony begins on May-day, with a ſolemn maſs, muſic, &c. The corporation attend; and poems are rehearſed every day: the third day a magnificent treat is given by the magiſtracy, &c. and that day the prizes are adjudged. The three prizes are the rewards of three different kinds of compoſitions; *viz.* a poem, an eclogue, and an ode.

FLORALIA, in *Antiquity*, a general name for the feaſts, games, and other ceremonies, held in honour of the goddeſs Flora.

FLORES *argenti*, in *Natural Hiſtory*, a name given by ſome to the earth called by the generality of authors LAC *lunæ*. It has both theſe names from its being ſuppoſed to partake of the nature of ſilver.

FLORES *martiales*, a name given to a preparation of the nature of what was formerly called ens veneris. Theſe flowers are thus prepared: take of waſhed colcothar, or green vitriol, or of iron filings, one pound; of ſal ammoniac, two pounds; mix them, and ſublime them in a retort, and mixing again the bottom with the flowers, renew the ſublimation till the flowers acquire a beautiful yellow colour. To the reſidue may be added half a pound of freſh ſal ammoniac, and the ſublimation repeated, and the ſame proceſs may be continued as long as the flowers ariſe duly coloured. Pemberton's Lond. Diſp. p. 215.

FLORET, *Floſculus*, in *Botany*, is a little tube expanded at the top uſually into five ſegments, and ſitting upon the embryo of a ſingle ſeed: from the inner part of the *floret* ariſe five ſtamina, which, uniting together, form a ſheath; from the embryo of the ſeed ariſes a ſtyle, which paſſes through the ſheath, to which it is connected; and is terminated

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minated by a bifid ſtigma, which is generally reflexed. Theſe are hermaphrodite.

FLORET, *ſemi*, is tubulous at the baſe, and afterwards expanded in the form of a tongue: theſe generally form the rays of compound flowers, and are female.

FLORID *ſtyle*, is that enriched and heightened with figures and flowers of rhetoric. See STYLE.

Longinus uſes the terms *florid* and *affected* ſtyle indifferently, and lays them down as quite contrary to the true ſublime.

FLORILEGIUM, FLORILEGE, a name the Latins have given to what the Greeks call ανθολογιον, ANTHOLOGY; viz. a collection of choice pieces, containing the fineſt and brighteſt things in their kind.

FLORILEGE is alſo particularly uſed for a kind of breviary, in the Eaſtern church, compiled by Arcadius, for the conveniency of the Greek prieſts and monks, who cannot carry with them, in their travels and pilgrimages, all the volumes wherein their office is diſperſed.

The *florilegium* contains the general rubrics, pſalter, canticles, the horologium, and the office of the feriæ, &c.

FLORIN is ſometimes uſed for a coin, or real money; and ſometimes for an imaginary money, or money of account.

FLORIN, as a coin, is of diverſe values, according to the diverſe metals, and diverſe countries where it is ſtruck. Pieces under this denomination were anciently very frequent in commerce; at preſent they are leſs common, though there were abundance of them ſtruck in Holland, of Engliſh ſilver, during the war, which was terminated by the treaty of Ryſwick. In all appearance they took their name from the place where they were firſt ſtruck, viz. the city of Florence. Their æra is about the year 1251; though others aſcribe the name to a fleur-de-lis, which was ſtruck on one ſide.

Villani obſerves, that there were gold *florins* in the year 1067, from which time the names FRANK or *florin* became applied to the gold coins, which till that time had been called *ſolidi*, *ſhillings*. See COIN.

FLORIN, as a *money of account*, is uſed by the Italian, Dutch, and German merchants and bankers, in keeping their books, and making up their accounts. But this *florin* is very diverſe, and admits of different diviſions. See COIN.

FLORIN, or FLORENCE, was alſo a gold coin, ſtruck in England in the eighteenth year of Edward III. of the value of ſix ſhillings.

Camden ſays, it was ſo called, becauſe made by Florentines. Fabian obſerves, the *florins* were not of ſo fine gold as the nobles and half-nobles of that prince.

But what is moſt obſervable is, that Fabian calls the *florin* a penny, value 6*s*. 8*d*. the half *florin*, an halfpenny, value 3*s*. 4*d*. the quarter *florin*, a farthing, value 1*s*. 8*d*. Theſe words we often meet with in old hiſtories and accounts, applied to ſeveral coins, as royals, angels, &c. where we are therefore only to underſtand by *penny* or *denarius* the whole, by *obolus* the half, and by *quadrans* the fourth part, or farthing.

By indenture of the mint, in 18 Edw. III. every pound weight of old ſtandard gold was to be coined into fifty *florences*, or *florins*, to be current at ſix ſhillings a-piece; all which made in tale fifteen pounds; or into a proportionable number of half or quarter *florins*.

FLORINIANI, or FLORIANI, a ſect of heretics, of the ſecond century, denominated from its author Florinus, or Florianus, a prieſt of the Roman church, depoſed along with Blaſtus, for his errors.

Florinus had been a diſciple of St. Polycarp, along with Irenæus. He made God the author of evil; or rather aſſerted, that the things forbidden by God are not evil, but of his own appointing. In which he followed the errors of Valentinus, and joined himſelf with the Carpocratians.

They had alſo other names given them. Philaſtrius ſays, they were the ſame with the *Carpophorians*. He adds, that they were alſo called *ſoldiers*, *milites*, *quia de militaribus fuerunt*. St. Irenæus calls them *Gnoſtics*; St. Epiphanius, *Phibionites*; and Theodoret, *Borborites*, on account of the impurities of their lives. Others call them *Zaccheans*; others *Coddians*, &c. though for what particular reaſons, it is not eaſy to ſay, nor perhaps would it be worth while to inquire.

FLORIST, a perſon curious or ſkilled in flowers; their kinds, names, characters, culture, &c.

It is alſo applied to an author who writes what is called the flora of any particular place, that is, a catalogue of the plants and trees which are found ſpontaneouſly growing there. The Flora Laponica of Linnæus, and Flora Virginia of Gronovius, are works of this kind; and theſe authors, as the authors of thoſe works, are properly called *floriſtæ*.

FLORUS, in *Zoology*, a name by which Aldrovand and ſome other authors have called the bird commonly known with us by the name of the WHINCHAT, a kind of the OENANTHE or fallow-finch.

FLORY, FLOWRY, FLEURY, FLORETTE', FLEUR-DE-LISSE', &c. terms in *Heraldry*, uſed when the outlines of any ordinary are drawn as if trimmed with, or in the form of flowers, as lilies, fleurs-de-lis, &c.

Thus, he bears a croſs *flory*, &c. See *Tab. Heraldry*, *fig.* 26.

FLOS, the *flower* of a plant. It is to be obſerved that the ancients ſometimes called the ſtamina or threads in the center of flowers, the *flos*, and not the petals, which we uſually call ſo. Without underſtanding this, it is not poſſible to underſtand many paſſages in their writings. We find in Aurelian, the roſe called a yellow flower ſtanding in a purple huſk; it is plain by this, that he meant the threads in the middle of that flower, which are of a fine yellow, and are very numerous, by the word flower; and he calls the fine purple petals, which we eſteem the flower, only the huſk of the flower. In this ſenſe, Virgil is explained to mean the common baum by the name amello; he ſays it has a yellow flower, and purple leaves at the bottom, and they ſuppoſe that he meant the ſtamina or threads, which in the baum are yellow, by the name flower; and the calyx or cup of the flower, which is a purple, by this expreſſion of leaves at the bottom. The ancients in general do not ſeem determined as to what they would have underſtood by the word *flos*. In the narciſſus, Pliny calls the cup that yellow part which occupies the center, and the whitiſh leaves that ſurround it, the flower. Pliny has been cenſured for calling this part of the flower the cup; but he does not by this mean to confound it with the green leaves in the generality of plants which ſurround the flower; he only calls it thus in reſemblance to the cups out of which they drank in their feſtivals.

FLOS *æris*. See ÆS.

FLOS *ambarvalis*, in *Botany*, a name given by ſome to the polygala or MILKWORT.

FLOS *argenti*. See FLORES *argenti*.

FLOS *Aſiæ*, in *Natural Hiſtory*, a name given by Swenkfield, and ſome other writers, to that ſalt which is found on the ſurface of the earth in ſome part of Aſia in form of an effloreſcence, and is called the *Smyrna ſoap earth*. This ſalt is evidently the ſame with the nitre of the ancients. It will ferment with any acid, in the manner of our pot-aſh, or other fixed ſalts, made by fire; and with oil or any fatty ſubſtance, boils into a ſoap. Euelius gives us a great many different places for its production, from which he diſtinguiſhes it into ſeveral kinds; all theſe lie in the eaſtern parts of the world; but to theſe Wormius adds, that it is found in New Spain. It is always eaſy to be known, however, in whatſoever place it is found, being a native alcali ſalt, perforated like a ſponge, and of a lixivial taſte. Its principles ſeem to be a marine and an urinous ſalt.

That it contains a marine ſalt ſeems manifeſt from this, that it has the ſame taſte in ſolution, or nearly ſo, with marine ſalt; that the particles of it when coagulating in the evaporated water in which they were diſſolved, firſt riſe to the top or ſurface, as thoſe of common ſalt do, and that it is always of a ſpongy texture, or full of holes, which is always the caſe with thoſe things in which the common ſalt makes a part, its natural concretions being hollow pyramids. Its containing an urinous ſalt is plain, from its producing with ſalt of tartar the ſame ſort of ſpirit that ſal ammoniac does, when mixed with that fixed ſalt.

FLOS *cæli*, the *flower of the heavens*, a name given by the alchemiſts to the NOSTOCH, which often appearing after rain, was ſuppoſed to fall from heaven. See FLOS *terræ*.

FLOS *martialis*. See FLORES *martiales*.

FLOS *ſalis*. The flower of ſalt flows down with the Nile, and is alſo found on the ſurface of ſome lakes. It is to be choſen of the colour of ſaffron, ſomewhat of a rank ſmell like garum, of a biting taſte, and of a fattiſh ſubſtance. What is coloured with minium, or is grumous, is to be rejected: beſide, what is pure and genuine is not to be diſſolved but in oil; whereas what is adulterated is partly diſſoluble in water.

It is effectual againſt malignant and phagedenic ulcers; nomæ in the pudenda, and purulences in the ears; it alſo cures dimneſs of ſight, and removes ſpecks and albugos from the eyes. It is mixed with plaſters and ointments, as alſo with oil of roſes, for the ſake of the colour it communicates to them. Taken inwardly, in wine or water, it provokes ſweat, diſturbs the belly, and incommodes the ſtomach. It is alſo an ingredient in acopa and ſmegmata, for extenuating the hair. In general it is of an acrimonious and pyrotic quality, as are all ſalts themſelves. Dioſcor. lib. v. cap. 129.

FLOS *terræ*, *flower of the earth*, a name given by ſome of the

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the chemical authors to the NOSTOCH, a remarkable plant, which reſembles the common green oyſter-weed, but that it is thicker and more like a jelly. It ſuddenly appears on gravel walks and gardens, after rain; and the alchemiſts, who knew not what to think of its origin, ſuppoſed it to contain an univerſal ſpirit, capable of turning metals into gold. It is a very ſingular plant, being no way fixed to the ground, nor having any roots, but imbibing its nutritious juices from the humidity of the air, as the ſea-plants do theirs from the ſea-water.

FLOS *tinctorius*, in *Botany*, a name given by Fuchſius, and many others, to the geniſtella tinctoria, or DYER's *weed*, called alſo lutea herba, and lutum by the Latins, and alcomenium, cymene, and thapſos, by the Greeks.

FLOSCULOUS, in *Botany*, a term uſed by Mr. Tournefort, and others, to expreſs ſuch flowers of plants as are compoſed each of a great number of other ſmaller flowers placed cloſe to one another, and encloſed in the ſame common cup; each of theſe ſmaller flowers conſiſts of one petal, which is ſlender and hollow, and wider than the bottom, and uſually divided into many ſegments, which ſometimes are diſpoſed in the form of a ſtar. Each of theſe flowers ſtands upon an embryo, or young fruit, from which there grows a capillament, which reaches beyond the flowers. Theſe embryos are lodged in the bottom of the cup, which is called by authors the thalamus of the flower, and finally become ſeeds winged with down, or ſometimes without that, and ſometimes are armed with prickles. Of this ſort are the flowers of thiſtles, knapweed, &c. See *Tab.* IX. *of Botany, Claſs* 12.

FLOTA, or FLOTTA, *fleet*; a name the Spaniards give particularly to the ſhips which they ſend annually from Cadiz, to the port of Vera Cruz, to fetch thence the merchandizes gathered in Mexico for Spain. It conſiſts of the captains, admiral, and patach, or pinnace, which go on the king's account; and about ſixteen ſhips, from four hundred to a thouſand tons, belonging to particular perſons. They ſet out from Cadiz about the month of Auguſt, and are eighteen or twenty months before they return.

Thoſe ſent to fetch the commodities prepared in Peru, are called galleons.

The name *flotilla* is given to a number of ſhips, which get before the reſt in their return, and give information of the departure and cargo of the *flota* and galleons.

FLOTAGES, all ſuch things as are floating on the top of the ſea, or great rivers, a word chiefly uſed in the commiſſions of water-bailiffs.

FLOTSON, FLOTZAM, or FLOATSAM, a term ſignifying any goods loſt by ſhipwreck, and ſwimming on the top of the water; which, with *jetſon* and *lagon*, and *ſhares*, are given the lord high admiral, by his letters patent.

Jetſon is what is caſt out of the ſhip, being in danger of a wreck, and beaten to the ſhore by the water; or caſt on ſhore by the ſeamen. *Lagon*, or *lagan*, is that which lies in the bottom of the ſea. *Shares* are goods due to ſeveral perſons by proportion.

FLOUNDER, in *Ichthyology*, the Engliſh name of the fiſh called by the generality of authors paſſer fluviatilis, and fleſus. According to the new ſyſtem of Artedi, this is a ſpecies of the PLEURONECTES.

It is diſtinguiſhed from other fiſh of that genus by a row of ſharp ſmall ſpines, that ſurround its upper ſides, and are placed juſt at the junction of the fins with the body; another row marks the ſide-line, and runs half-way down the back. The colour of the upper part of the body is a pale brown, ſometimes marked with a few obſcure ſpots of dirty yellow; the belly is white. The *flounder* inhabits every part of the Britiſh ſea, and even frequents our rivers at a great diſtance from the ſalt-waters. It never grows large in our rivers, but is reckoned ſweeter than thoſe that live in the ſea. See FISHING.

FLOUR, the meal of any grain, but more particularly of wheat; ground and ſifted for the purpoſes of food.

The grain itſelf is not only ſubject to be eaten by inſects in that ſtate, but when ground into *flour*, it gives birth to another race of deſtroyers, who eat it unmercifully, and increaſe ſo faſt in it, that it is not long before they wholly deſtroy the ſubſtance. The fineſt *flour* is moſt liable to breed them, eſpecially when ſtale or ill prepared; in this caſe, if it be examined in a good light, it will be perceived to be in a continual motion; and on a nicer inſpection, there will be found in it a great number of little animals of the colour of the *flour*, and very nimble. If a little of this *flour* be laid on the plate of the double microſcope, the inſects are very diſtinctly ſeen in great numbers, very briſk and lively, continually crawling over one another's backs, and playing a thouſand antic tricks together; whether for diverſion or ſearch of food, it is not to be eaſily determined. Theſe animals are of an oblong ſlender form, their heads are furniſhed with a kind of trunk, or oblong hollow tube, by means of which they take in their food, and their body is compoſed of ſeveral rings. They do vaſt miſchief among the magazines of *flour* laid up for armies and other public uſes; when they have once taken poſſeſſion of a parcel of this valuable commodity, it is impoſſible to drive them out; and they increaſe ſo faſt, that the only method of preventing the total loſs of the parcel, is to make it up into bread as ſoon as can be. The way to prevent their breeding in the *flour* is to preſerve it from damp; nothing gets more injury by being put up damp than *flour*, and yet nothing is ſo often put up ſo. It ſhould be always carefully and thoroughly dried before it is put up, and the barrels alſo dried into which it is to be put; then if they are kept in a room tolerably warm and dry, they will preſerve it well. Too dry a place never does any hurt, though one too moiſt always ſpoils it. See MEAL.

FLOWER, in *Botany*. Though no part of plants are more known than their *flowers*, yet the diſtinction given by different authors of the word are extremely various, and are very neceſſary to be explained, in order to the underſtanding of their works. See FLOS.

Jungius defines it to be the moſt tender part of a plant, remarkable for its colour or form, or for both, and cohering with the fruit. But this author acknowleges, that there are ſeveral plants, whoſe *flowers* are produced remote from the fruit, and therefore not comprehended in his definition. Mr. Ray ſays, in very vague terms, that the *flowers* cohere for the moſt part with the rudiments of the fruit. Tournefort defines it to be a part of a plant very often remarkable for its peculiar colours, for the moſt part adhering to the young fruit, to which it ſeems to afford the firſt nouriſhment, in order to explicate its moſt tender parts. But this is a more indeterminate definition than the former, from its looſe mode of expreſſion. Pontedera defines it to be a part of a plant, unlike the reſt in form and nature. If the *flower* has a tube, it adheres to, or is fixed very near to the embryo, to the uſe of which it is ſubſervient; but if the *flower* has no tube, then its baſe does not adhere to the embryo. This is ſcarce intelligible, except to the expert botaniſt, and may be made to comprehend ſome parts of plants by no means to be underſtood by the name *flower*. Juſſieu defines it to be compoſed of chives, and a piſtillum, and to be of uſe in the generation of the plant; but this is too imperfect, as there are many plants in which the piſtillum is found at a great diſtance from the chives, and many *flowers* which have no piſtillum, and many others which have no chives. Vaillant ſays, that *flowers* are the organs which conſtitute the different ſexes of plants, which are ſometimes found without any covering; and the petals, which moſt of them have, are no way eſſential to their uſe, but are merely intended as covers for them; but yet as theſe coats or coverings are the moſt conſpicuous and moſt beautiful parts of the *flower*, theſe are to be called *flowers*, whatever be their form, ſtructure, or colour; and whether they contain the organs of both ſexes in each individual, or only one, or even ſome part depending on one of them, provided they are not of the ſame figure with the leaves of the plant.

The ſhorteſt and moſt expreſs definition, however, ſeems to be Martyn's; which is, that *flowers* are the organs of generation of both ſexes, adhering to a common placenta, together with their common covering; or of either ſex ſeparately with its proper coverings, if it have any.

The parts of *flowers* are, 1. The ovary, which is the rudiment of the fruit, and is therefore properly the female organ of generation. 2. The ſtyle, which is a body accompanying the ovary, either ariſing from the top of it, or ſtanding as an axis in the middle, with the embryos of the ſeeds round it. 3. The ſummits, called alſo apices and antheræ, which are thoſe bodies that contain the prolific powder, analogous to the male ſperm in animals, and generally hung upon ſlender threads, which are called the chives. 4. The petals, commonly called the *flower* leaves, which are thoſe tender fine coloured leaves which are generally the moſt conſpicuous part of a *flower*. 5. The empalement or calyx, which is formed of thoſe tender leaves which cover the outer parts of the *flower*. Theſe *flowers*, according to the number of their leaves or petals, are called monopetalous, or one-leaved; dipetalous, or two-leaved, and ſo on.

The ſtructure of the different *flowers* is very various; but Dr. Grew has obſerved, that the far greater number of them have the empalement, the foliation, and the attire of chives, &c. Mr. Ray accounts that every perfect *flower* has the petals, ſtamina or chives, apices or ſummits, and the ſtyle or piſtil; and ſuch as want any of theſe parts he calls imperfect *flowers*. The greater num-

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ber of plants have a *flower* cup, which is of a firmer ſtructure than their leaves, and ſerves for their ſupport.

Flowers are diſtinguiſhed into three kinds, the male, the female, and the hermaphrodite. The male *flowers* are thoſe which have the ſtamina, but bear no fruit; the female are ſuch as contain the piſtillum; this piſtil is ſucceeded by the fruit, and theſe are therefore called the fruitful or knitting *flowers*; and the hermaphrodite are ſuch as have in them the organs of both ſexes in each individual, and of this ſort are the generality of *flowers*, particularly the lily, tulip, daffodil, roſemary, ſage, &c. See FRUCTIFICATION.

The ſtructure of parts is much the ſame in thoſe where the ſexes are divided: the difference between them conſiſts in this, that the ſtamina and apices, i. e. the male parts, in theſe, are ſeparated from the piſtils; being ſometimes on the ſame ſtalk, and ſometimes on different ones.

Among the plants which bear both male and female parts on the ſame plant, but at a diſtance from each other, are reckoned the cucumber, melon, gourd, Turky-wheat, turnſol, walnut, oak, beech, fir, alder, cypreſs, cedar, juniper, mulberry, plantain, &c.

Thoſe in which the male and female parts of the *flowers* are borne on different plants, the willow, poplar, hemp, mercury, ſpinage, nettles, and hops. Miller.

Mr. Ray divides *flowers* into *perfect* and *imperfect*.

FLOWERS, *perfect*, he accounts all ſuch as have the petala, though they ſhould want the ſtamina; but this is a very erroneous opinion. Theſe he ſubdivides into *ſimple*, which are thoſe not compoſed of other ſmaller ones, and which uſually have but one ſingle ſtyle; and *compounded*, which conſiſt of many floſculi, all making but one *flower*.

FLOWERS, *ſimple*, are either *monopetalous*, which have the body of the *flower* all of one entire leaf, though ſometimes cut, or divided, a little way, into many ſeeming petala, or leaves; as the borrage, bugloſs, &c. or,

FLOWERS, *polypetalous*, thoſe which have diſtinct petala, and thoſe falling off ſingly, and not altogether, as the ſeeming petala of the monopetalous *flowers* always do.

Both theſe are farther divided into *uniform* and *difform flowers*.

The former have their right and left-hand parts, and the forward and backward parts all alike; but the difform have no ſuch regularity: ſuch are the *flowers* of ſage, dead-nettle, &c.

FLOWERS, *monopetalous difform*, are likewiſe farther divided into

FLOWERS, *ſemiſiſtular*, thoſe whoſe upper part reſembles a pipe, cut off obliquely; as in the *ariſtolochia*.

FLOWERS, *labiate*, thoſe either with one lip only, as in the *acanthium* and *ſcordium*; or with two lips, as in the far greater part of the labiate *flowers*.

In theſe the upper lip is ſometimes turned upwards, and ſo turns the convex part downwards, as in the chamæciſſus, &c. but moſt uſually the upper lip is convex above, and turns the hollow part down to its fellow below, and ſo repreſents a kind of helmet, or monk's hood; whence theſe are frequently called *galeate*, *cucullate*, and *galericulate flowers*.

Such are the *flowers* of the *lamium*, and moſt of the verticillate plants.

Sometimes alſo the *labium* is entire, and ſometimes jagged or divided.

FLOWERS, *corniculate*. Theſe are ſuch hollow *flowers* as have on their hinder part a kind of ſpur, or little horn; as in the *linaria*, *delphinum*, &c. and the *corniculum*, or *calcar*, is always impervious at the tip or point.

FLOWERS, *compound*, called alſo *compoſite*, and *aggregate flowers*, are ſuch as conſiſt of many little *flowers*, concurring to make up one whole one; each of which has its ſtyle, ſtamina, and adhering ſeed, but all are contained within one and the ſame calyx, or perianthium.

This *compound flower* diſtinguiſhes a large genus of plants, which Mr. Ray divides thus. Herbs having *compounded* or *aggregated flowers*, are,

1. Such as have a *plain-leaved flower* naturally, and for the moſt part full; and having their whole body milky (yielding a milky juice on cutting them); and theſe have their ſeeds,

Firſtly, pappous, or winged; that is, having a little lanugo adhering to each ſeed, by which the wind can eaſily carry it from place to place: ſuch are the *lactuca*, *tragopogon*, *ſcorzonera*, *dens leonis*, *hieracium*, and the *piloſella*.

Secondly, ſuch as have a ſolid ſeed, without any pappus or down upon them; as the *eryngium luteum*, *cichorium*, *lampſana*.

2. Such as have a *diſcous flower*; i. e. one compoſed of many ſhort, thick, compaſſed *floſculi* (which ſome, by miſtake, call *ſtamina*) ſet together, ſo as to make one flat, or hollowiſh ſuperficies; and theſe are alſo either ſuch as have their ſeeds,

Firſtly, pappous, as the *tuſſilago*, *petaſites*, *carlina*, *helenium*, *doronicum*, *conyza*, *aſter*, *virga aurea*, *jacobæa*, *ſtæchas citrina*, *jacea*, *ſenecio*, *eupatorium Avicennæ*, *cacalia vulgaris*, *gnaphalium maritimum*, and *monſpelienſe*.

Secondly, ſuch whoſe ſeeds are ſolid, and not pappous; as the corymbiferous herbs.

Their diſk is ſometimes radiated, when there is a row of petala ſtanding round in the diſk, like the points of a ſtar; as in the *matricaria*, *chamæmelum*, &c.

And ſometimes naked, having no ſuch radiating leaves round the limb of its diſk; as in the *tanacetum*.

They are likewiſe diſtinguiſhed into *planifolious*, and *fiſtular*.

FLOWERS, *planifolious*, are thoſe which are compoſed of plain *flowers*, ſet together in circular rows, round the center, and whoſe face is uſually indented, notched, uneven, and jagged; as the *hierachia*, *ſonchi*, &c.

FLOWERS, *fiſtular*, are thoſe which are compounded of many long, hollow, little *flowers*, like pipes, all divided into large jags at the ends.

FLOWERS, *imperfect*, are ſuch as want the petala, and are called likewiſe *ſtamineous*, *apetalous*, and *capillaceous flowers*.

Thoſe which hang pendulous by fine threads, like the iuli, are by Tournefort called *amentaceous*; we call them *cats-tails*. Theſe are Mr. Ray's principal diſtinctions of *flowers*; but other botaniſts furniſh other diviſions and denominations of them; and Mr. Tournefort, in particular, has formed the various claſſes of plants according to the diſpoſition and ſtructure of the *flower*. See *Tab.* VIII. IX. and X. of *Botany*. See BOTANY, and FRUCTIFICATION.

FLOWERS, *amentaceous*. See AMENTACEOUS, and *Tab.* X. *of Botany*, *Claſs* 19.

FLOWERS, *anomalous* or *irregular*, are either monopetalous or polypetalous. The irregular monopetalous *flower* is that in which the petal is divided into unequal ſegments. Theſe are called by Linnæus ringent *flowers*. An irregular polypetalous *flower* is that in which the petals do not agree in figure and poſition. See *Tab.* VIII. *Claſs* 3. and *Tab.* IX. *Claſs* 11.

FLOWERS, *apetalous*. See APETALOUS, and *Tab.* X. *Claſs* 15 and 18.

FLOWERS, *campaniform*, are compoſed of one leaf, and formed into the ſhape of a bell, but with ſome differences in the figure, which conſtitute four ſubordinate ſpecies. 1. The *bell-flower*, ſimply ſo called, which approaches to no other figure but that expreſſed by the name. 2. The tubular narrow kind, which is always conſiderably long. 3. The expanded kind, which opens very wide at the extremity, and repreſents in ſome degree a diſh or baſon. And, 4. The globular *bell-flower*, the mouth of which is narrower and ſmaller than the belly. Tourn. Inſt. p. 76. See *Tab.* VIII. *Claſs* 1.

FLOWERS, *caryophylleous*. See CARYOPHYLLEOUS, and *Tab.* IX. *Claſs* 8.

FLOWERS, *cruciform*, or thoſe conſiſting of four petala, or leaves, diſpoſed in form of a croſs.

Some of theſe *flowers* have a cup, others have not: thoſe which have cups, uſually have them compoſed of four leaves, and placed in the ſame order and direction with thoſe of the *flower*. Of this claſs of plants are the cabbage, rocket, wall-*flower*, &c. Tourn. Inſt. p. 210. See *Tab.* VIII. *of Botany*, *Claſs* 5.

FLOWERS, *cucurbitaceous*. See CUCURBITACEOUS.

FLOWER, *diſcous*. See DISCOUS.

FLOWERS, *floſculous*. See FLOSCULOUS, and *Tab.* IX. *Claſs* 12.

FLOWERS, *headed*, are thoſe that are compoſed of florets and ſemiflorets, collected into a roundiſh head, and incloſed in one common ſcaly empalement.

FLOWERS, *infundibuliform*, are ſuch as reſemble the figure of a funnel, i. e. are broad and ample at top, and contracted into a neck at bottom: ſuch is that of the bear's ear, or auricula. See *Tab.* VIII. *of Botany*, *Claſs* 2.

FLOWERS, *labiated*. See LABIATED *flowers*, and *Tab.* VIII. *of Botany*, *Claſs* 4.

FLOWERS, *leguminous*, are thoſe of leguminous plants. Theſe bear ſome reſemblance to a flying butterfly; for which reaſon they are alſo called *papilionaceous flowers*.

FLOWRS, *liliaceous*. See LILIACEOUS, and *Tab.* IX. *of Botany*, *Claſs* 9.

FLOWERS, *luxuriant*, are *flowers* ſo called, when ſome of the parts of fructification are augmented in number, and others thereby excluded; and theſe are again ſubdivided into *multiplicate flowers*, when by the increaſe of the corolla only a part of the ſtamina is excluded; *full flowers*, when the corolla is ſo far multiplied as to exclude all the ſtamina; and *proliferous flowers*, when one grows out of another; and this happens two ways; either from the center, when the piſtil ſhoots up into another *flower*, ſtanding on a ſingle peduncle; and from the ſide, when many pedunculate *flowers* are produced out of one common calyx.

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FLOWERS, *monopetalous*. See MONOPETALOUS, and *Tab.* VIII. *of Botany*, *Claſs* 1, 2, 3, and 4. and *Tab.* X. *Claſs* 20.

FLOWERS, *mutilate*, are the reverſe of the *luxuriant*. Linnæus confines the term to thoſe *flowers* that want the corolla, though they ought to be furniſhed with it; and this defect he aſcribes chiefly to the want of ſufficient heat.

FLOWERS, *papilionaceous*, reſemble a butterfly with its wings elevated, and conſiſt of four parts, whereof the uppermoſt is called *vexillum*, or ſtandard; and the loweſt *carina*, as reſembling the bottom or keel of a boat: thoſe between the two are called *lateral* leaves, or *alæ*.

From the bottom of the calyx ariſes a piſtil, which is encompaſſed with a ſheath, or cover, fringed with ſtamina. This piſtil always becomes the fruit, and is uſually called the *pod*; in Latin, *ſiliqua*. See *Tab.* IX. *Claſs* 10. and *Tab.* X. *Claſs* 22.

FLOWERS, *radiated*. See RADIATED, and *Tab.* X. *Claſs* 14.

FLOWERS, *roſaceous*. See ROSACEOUS, and *Tab.* IX. *Claſs* 6. and *Tab.* X. *Claſs* 21.

FLOWERS, *ſemifloſculous*. See SEMIFLOSCULOUS, and *Tab.* IX. *Claſs* 13.

FLOWERS, *ſtamineous*, are ſuch as have no petala, but conſiſt wholly of ſtamina or threads, with apices at top. See STAMINEOUS, and *Tab.* X. *Claſs* 15.

FLOWERS, *verticillate*, or *whorled*, are thoſe ranged, as it were, in ſtories, rings, or rays, along the ſtalks, at the baſe of the leaves: ſuch are thoſe of horehound, clary, &c.

FLOWERS, *umbelliform*, are thoſe with ſeveral leaves diſpoſed in manner of a roſe; and whoſe calyx eſſentially becomes a fruit of two ſeeds, joined, before they come to maturity; but afterwards eaſily ſeparated again.

They have this denomination, becauſe they are generally ſuſtained by a number of pedicles, which, proceeding from the ſame center, are branched all around, like the ſticks of an umbrella. See *Tab.* IX. *Claſs* 7.

Of this kind are the *flowers* of fennel, angelica, &c.

FLOWERS, *colours of*. It is generally agreed among the chemiſts, that all colours ariſe from ſulphurs, and that they differ according to the different admixtures of ſalts with theſe ſulphurs. Perhaps on theſe principles, it may be poſſible to form ſome rational conjectures in regard to the origin of colours in the *flowers* of plants. We know very well that the *flowers* of all plants abound in an eſſential oil or ſulphur, to which, according to this doctrine, their colours may be rationally ſuppoſed to be owing; and though this oil ſhould be proved to be the very ſame ſubſtance in all, yet their variety of colours may be accounted for from it, ſince we find that one and the ſame oil, the eſſential oil of thyme, according to Mr. Geoffroy's experiments, may be turned to all the colours that we find in the different *flowers* of plants, from white to deep black, with all the ſhades of red, yellow, purple, blue, and green, by mixing it with different ſubſtances; and by the ſame laws, the eſſential oil of plants, while contained in their *flowers*, may by the different mixtures they meet with, give them all their beautiful variety of colours. See *Eſſential* OILS.

We know that the infuſions of *flowers*, and of other parts of plants, become red on being mixed with acids, and green on being mixed with alkalies; and there is no reaſon to doubt, but that it is the ſulphureous part of the vegetable in theſe infuſions which thus changes colours on theſe mixtures. This, however, ought to be proved poſſible, before it is allowed in argument.

This proof is given in the change of colours before mentioned, which are produced in oils merely by the admixture of different ſalts; and as all the colours in theſe are the regular reſult of certain combinations, there is great reaſon to believe, that in thoſe plants whoſe *flowers* give the ſame colours, there may be the ſame combinations. The principal colours of plants, and their ſeveral parts, are green, yellow, red, purple, blue, white, black, and tranſparent whitiſhneſs; all the others are produced by different combinations of theſe. The green, which is the common colour of the leaves of plants, is probably the effect of an oil rarefied in that part of the plant, and there mixed with the fixed and volatile ſalts of the ſap, which remain entangled by the earthy particles after moſt of the aqueous humidity is evaporated, and by that means become in a ſtate to act upon the oil. A clear proof of this is, that if the leaves are covered up in ſuch a manner, that the aqueous humidity of the ſap cannot evaporate itſelf, the oil and ſalts cannot act upon one another as they naturally would, but becoming diffuſed among ſo great a quantity of water, loſe the colour they would otherwiſe have obtained together, and become whitiſh or tranſparent. This is ſeen in the obvious inſtance of ſuccory and celery, the leaves of both which plants, though naturally green, become white by being covered up with earth by the gardener.

The leaves both of plants and trees uſually turn red in autumn, or on the attack of the firſt froſts; the reaſon of which is, that the ſeveral canals of the ſap being conſtringed by the cold, the juices are detained in the veſſels of the leaves, or at leaſt its circulation is greatly interrupted; and being detained there, it naturally grows ſour, the acidity of this altered juice deſtroying the green colour produced by the alkaline ſalts. The ſap brings on a red colour, in the very ſame manner that an eſſential oil made green by a mixture of oil of tartar, is again changed to red, by adding to it a proper quantity of diſtilled vinegar. Where we find in our common experiments the acids of the mineral kingdom turning the infuſions of *flowers* red, it ſeems by the analogy of theſe experiments to be only owing to their deſtroying the blue, brown, or other colour, which the alkaline ſalts of the plant had made with its eſſential oil.

All the ſhades and degrees of yellow and ſaffron colour in the *flowers* of plants, ſeem wholly owing to a mixture of an acid in their juices, with their eſſential oil; as the oil of thyme, which itſelf has very little colour, is made to paſs through all theſe ſhades of colours, only by digeſting it with diſtilled vinegar. From the digeſting the volatile alkalies, ſuch as ſpirit of ſal ammoniac and urine, with the ſame oil, it appears that all the ſhades of red, from the paleſt fleſh-colour, to purple, and even to the violet blue, are only owing to the different admixtures of an alkaline volatile ſalt of the urinous kind, mixed in different manners with their eſſential oil.

Black, which is a very uncommon colour in *flowers*, and which in them ought to be regarded only as a very deep violet, ſeems the effect of an addition of an acid juice to their oil, already turned purple or violet colour by a volatile alkali.

All the ſhades of blue and purple ſeem alſo, by the analogy of the ſame experiments, to be only the effects of mixtures of alkalies of the fixed and volatile kind, with the oils of plants; ſince theſe colours are all produced in thoſe experiments, by mixing the ſpirit of ſal ammoniac, and the oil of tartar with oil of thyme.

The bright green of ſome *flowers* ſeems alſo to be produced by the ſame ſalts, only acting on oils more rarefied. For the oil of thyme, of a purple violet colour, diluted with rectified ſpirit of wine, being united with oil of tartar, becomes green. Mem. Acad. Par. 1707.

Boccone is of opinion, that in many plants the colour of the *flower* is wholly owing to the colour of the juices of the root. This he inſtances in the greater celandine, whoſe roots and *flowers* are of the ſame yellow colour. The barberry in like manner, he obſerves, has both its roots and *flowers* yellow. The dentillaria has its roots and *flowers* both of a pale red, and the acacia indica Aldini, and many other plants, he ſays, are inſtances of this. The reaſon that he aſſigns for this is, that the more fixed parts wherein this colour conſiſts, preſerve the ſame tincture, without being at all altered by ſo long a circulation as that from the root to the *flower*; and he adds another very remarkable obſervation, which is, that in all theſe plants and trees, whoſe roots and *flowers* are of the ſame colour, the juices are more fixed; and therefore, that theſe are more fit for dying than any other coloured woods or plants. Vide Boccone, Muſ. de Plant.

Dr. Lewis, in his notes on Neumann's Chemiſtry, has many curious obſervations on the colours of *flowers*. There are few of them which are durable in themſelves, or that can be made durable by art. The only permanent colour is yellow. The red, the blue, and the intermediate ſhades of purple, crimſon, violet, &c. are very periſhable. Many *flowers* loſe their colours on being dried, and eſpecially if they are dried in a ſhady and not warm place. The colours of all of them periſh by keeping even in the cloſeſt veſſels; the more haſtily they are dried, and the more perfectly they are ſecured from air, ſo much the longer do they retain their beauty. The colouring matter of *flowers* extracted and applied to other bodies is ſtill more periſhable.

The colour of many blue *flowers* is extracted by infuſion in water; but from others, water acquires only a purpliſh hue. Of thoſe which have been tried, not one gives a blue colour to ſpirit of wine; ſome give no colour, and ſome give a reddiſh colour. The expreſſed juice of theſe *flowers* is generally blue. The blue juices and infuſions are rendered red by all acids; and the moſt florid red is given to them by marine acid. The *flowers* alſo, by maceration, impart a red colour to acid liquors. Alkalies fixed and volatile, and lime-water, change theſe blue colours to green. And thoſe infuſions or juices which have nothing of the colour of the *flower*, ſuffer the ſame changes from the addition of acid and alkaline liquors. Even when the *flowers* have been kept till their colours are

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are loſt, their infuſions acquire a red colour from acids, and a green colour from alkalies, but in a leſs degree than when the *flowers* were freſh. The red colour produced by acids is ſcarcely more durable than the original blue; applied upon other bodies, and expoſed to air, it gradually degenerates into a faint purple, and at laſt diſappears, without leaving a ſtain behind. The green produced by alkalies changes to a yellow, which does not fade ſo ſoon. The green made by lime-water is more permanent and beautiful. Green lakes, prepared from blue *flowers* by means of lime-water, have been uſed by painters. The *flowers* of *cyanus* have been much commended for affording elegant and blue pigments. But Dr. Lewis has not been able to extract from them any blue colour. They retain their colour, when haſtily dried, longer than other blue *flowers*, but do not communicate their original colour to any menſtruum.

Red *flowers* readily communicate their colour to water; and thoſe of a full red colour give to a rectified ſpirit alſo a deep red tincture, brighter, though ſomewhat paler, than the watery infuſion. But the lighter red *flowers*, and thoſe which are purpliſh, impart little colour to pure ſpirit. The colours of infuſions of theſe *flowers* are ſuppoſed to be heightened by acids, and to be rendered green by alkalies. But this is not univerſal. For amongſt thoſe examined by Dr. Lewis, the roſe colours and purpliſh red were changed by acids nearly as blue *flowers* are; but the full deep reds were not. The deep infuſion of red poppies was turned by alkalies not to a green, but to a duſky purple.

Yellow *flowers* communicate to water and to ſpirit of wine durable yellow colours, not alterable but in degree by acids or by alkalies; the former only rendering them paler; and the latter, as alſo alum, rendering them deeper. Wool, or ſilk, impregnated with a ſolution of alum and of tartar, receives, on being boiled with the watery infuſion or decoction, a durable yellow dye. A durable yellow lake is prepared by precipitating with alum an infuſion of yellow *flowers* made in an alkaline ley. In ſome of the orange-coloured *flowers* the yellow matter ſeems to be of the ſame kind as that of the pure yellow *flowers*; but the red matter ſeems to be different from that of the pure red *flowers*. The yellow matter is extracted from theſe *flowers* by water; and the remaining red matter is extracted by ſpirit of wine, or by a weak ſolution of fixed alkali in water. Such are the ſaffron-coloured *flowers* of *carthamus*. Theſe *flowers*, after the yellow matter has been extracted by water, are ſaid to give a red tincture to ley, from which a deep red fecula ſubſides, called *ſafflower*, *Spaniſh red*, and *China-lake*. This pigment gives a beautiful red colour to ſpirit of wine, but none to water. The yellow farina or fine duſt, reſting on the tips of the ſtamina of *flowers*, gives a fine bright yellow colour to ſpirit of wine, and a duller yellow colour to water. The colours of both the watery and ſpirituous tinctures were heightened by alkalies, rendered red by acids, and again reſtored to a yellow by adding an alkali. This is the only known inſtance of the yellow colour of a vegetable being rendered red by acids. White *flowers*, or their expreſſed juices, impart a green colour to alkaline leys, but have not been obſerved by Dr. Lewis to give a red colour to acids. The white *flowers* of the common wild *convolvulus* give a deep yellow or orange colour to water, which is affected by acids, by alkalies, and by alum, as the infuſions of yellow *flowers* are. The white *flowers* of *xeranthemum* give a beautiful yellow colour to water acidulated with ſpirit of nitre. See Neumann's Chem. by Dr. Lewis, p. 430. 432.

FLOWERS, in *Gardening*, are diſtinguiſhed into *early*, or *ſpring-flowers*, which flouriſh in the months of March, April, and May. Of this claſs are the anemonies, daffodils, hyacinths, tulips, jonquils, cowſlips, primroſes, &c. Summer *flowers*, which open in June, July, and Auguſt; as pinks, gilly-flowers, lilies, daiſies, campanulas, poppies, ſun-flowers, &c. Autumnal, or late *flowers*, denote thoſe of September and October; as the oculus Chriſti, Indian pinks and roſes, panſy, flower-gentle, &c. Of theſe *flowers*, thoſe which ſubſiſt all the year, we mean in the ſtem, or root at leaſt, are called *perennials*. And thoſe which are to be planted or ſowed afreſh every year, according to the ſeaſon, are called *annual*.

FLOWERS, *preſervation of*. The method of preſerving *flowers* in their beauty through the whole year has been diligently ſought after by many people; ſome have attempted it, by gathering them when dry, and not too much opened, and burying them in dry ſand; but this, though it preſerves their figure well, yet takes off from the livelineſs of their colour.

The primroſe and cow-ſlip kind are very eminent inſtances of the change of colours in the *flowers* of dried ſpecimens; for thoſe of this claſs of plants eaſily dry in their natural ſhape, but they not only loſe their yellow, which might be expected naturally enough, but they acquire a fine deep green, much ſuperior to that of the leaves in their moſt perfect ſtate. The *flowers* of all the violet kind loſe their noble blue, and become of a dead white, ſo that in dried ſpecimens there is no difference between the blue flowered violet and the white flowered kinds.

Muntingius gives a method, which he ſays is preferable to all others; this is as follows: gather roſes or other *flowers* when they are not yet thoroughly open, in the middle of a dry day; put them into a good earthen veſſel glazed within; fill the veſſel up to the top with them; and when full, ſprinkle them over with ſome good French wine, with a little ſalt in it; then ſet them by in a cellar, tying the mouth of the pot carefully down. After this, they may be taken out at pleaſure, and on ſetting them in the ſun, or within the reach of the fire, they will open as if on the tree, and not only the colour, but the ſmell will be preſerved.

Sir Robert Southwell has communicated to the world a method of drying plants, by which all *flowers* are preſerved in their natural ſhape, and many in their proper colours. To this purpoſe two plates of iron are to be prepared of the ſize of a large half ſheet of paper, or larger, for particular occaſions; theſe plates muſt be made ſo thick as not to have any power of bending, and there muſt be a hole made near every corner for the receiving a ſcrew to faſten them cloſe together.

When theſe plates are prepared, lay in readineſs ſeveral ſheets of paper, and then gather the plants with their *flowers*, when they are quite perfect; let this always be done in the middle of a dry day, and then lay the plant and its *flower* on one of the ſheets of paper doubled in half, ſpreading out all the leaves and petals as nicely as can be. If the ſtalk be thick, it muſt be pared or cut in half, ſo that it may lye flat; and if it be woody, it may be peeled, and only the bark left; when the plant is thus expanded, lay round about it ſome looſe leaves and petals of the *flower*, which may ſerve to complete any part that may prove deficient; when all is thus prepared, lay ſeveral ſheets of paper over the plant, and as many under it; then put the whole into the iron plates, laying the papers ſmoothly on one, and laying the other evenly over them; then ſcrew them cloſe, and put them into an oven after the bread is drawn, and let them lie there two hours; after this make a mixture of equal parts of aqua fortis and common brandy; ſhake theſe well together; and when the *flowers* are taken out of the preſſure of the plates, rub them lightly over with a camel's hair pencil dipped in this liquor; then lay them upon freſh brown paper, and covering them with ſome other ſheets, preſs them between this and other papers with a handkerchief, till the wet of theſe liquors is dried wholly away. When the plant is thus far prepared, take the quantity of a nutmeg of gum dragon, put this into a pint of fair water cold, and let it ſtand four and twenty hours; it will in this time be wholly diſſolved; then dip a fine hair pencil in this liquor, and with it daub over the backſides of the leaves, and lay them carefully down on a half ſheet of white paper fairly expanded, and preſs them with ſome more papers over theſe. When the gum-water is fixed, let the preſſure and papers be removed, and the whole work is finiſhed. The leaves retain their verdure in this caſe, and the *flowers* uſually keep their natural colours. Some care muſt be taken, that the heat of the oven be not too great. When the *flowers* are thick and bulky, ſome art may be uſed to pare off their backs, and diſpoſe the petals in a due order; and after this, if any of them are wanting, their places may be ſupplied with ſome of the ſupernumerary ones dried on purpoſe; and if any one of them be only faded, it will be prudent to take them away, and lay down others in their ſtead; the leaves may be alſo diſpoſed and mended in the ſame manner. Another way of keeping both *flowers* and fruit the whole year without ſpoiling, is delivered by the ſame author in the following manner: take ſalt-petre, one pound; bole-armenic, two pounds; clean common ſand three pounds; mix all well together, then gather fruit of any kind, that is not full ripe, with the ſtalk to each; put theſe in one by one into a wide-mouthed glaſs, laying them in good order; tie over the top with an oil-cloth, and carry the glaſs into a dry cellar, and ſet the whole upon a bed of this prepared matter of four inches thick in a box; fill up the remainder of the box with the ſame preparation, and let it be four inches thick over the top of the glaſs and round all its ſides. *Flowers* are to be preſerved in the ſame ſort of glaſſes in the ſame manner, and they may be taken up after a whole year as plump and as fair as when buried.

FLOWERS, in *Antiquity*. We find *flowers* in great requeſt at the entertainments of the ancients, being provided by the

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the maſter of the feaſt, and brought in before the ſecond courſe; or, as ſome are of opinion, at the beginning of the entertainment. They not only adorned their heads, necks, and breaſts, with *flowers*, but often beſtrewed the beds whereon they lay, and all parts of the room with them. But the head was chiefly regarded. Potter, Archæol. Græc. tom. ii. p. 383. See GARLAND.

Flowers were likewiſe uſed in the bedecking of tombs. Potter, Archæol. Græc. lib. iv. cap. 7. tom. ii. p. 232, ſeq. See BURIAL.

FLOWER, in *Architecture*, according to Vitruvius, is a repreſentation of ſome imaginary *flower*, by way of crowning, or finiſhing, on the top of a dome, &c. See *Tab. Architecture, fig.* 12.

In lieu of this the moderns commonly uſe a vaſe, ball, or the like.

FLOWER-DE-LUCE, FLEUR-DE-LIS, in *Heraldry*, is a bearing anciently of great dignity; being reputed the nobleſt of all *flowers*, and as ſuch having been in all ages the charge of the royal eſcutcheon of the kings of France; though time has made the bearing thereof more vulgar.

In ſome coats it is borne ſingle; in others triple; in others it is ſemée, ſeeded all over the eſcutcheon.

FLOWER *of the capital* is an ornament of ſculpture, in form of a roſe, in the middle of the ſweep of the Corinthian abacus.

In that of the Compoſite, it is not a roſe, nor any real, but an imaginary kind of *flower*.

FLOWERS, in *Chemiſtry*, are the fineſt and moſt ſubtle parts of dry bodies, raiſed by fire, into the veſſel's head, and aludels; and adhering to them, in form of a fine powder, or duſt. Such are the *flowers* of ſulphur, benjamin, &c.

FLOWERS *of antimony*. See ANTIMONY.

FLOWERS, *argentine*, of *regulus of antimony*, are made by putting the regulus into an unvarniſhed earthen pot, placed in a furnace, ſo that its bottom may be red-hot, while its upper part ſhall be much colder. The pot is to be covered with a lid, without luting it, and heat is to be applied for an hour or more. When the pot is cold, its internal ſurface, and the remaining part of the regulus, are found covered with white *flowers*, in form of beautiful, tranſparent, and ſhining needles, which are to be gathered with a feather. After this, a ſecond ſublimation may be commenced, and managed in the ſame manner; and the whole regulus may be changed into *flowers*. Theſe *flowers* appear to be nothing elſe than the earth of regulus of antimony deprived of almoſt all its phlogiſton. They are neither emetic nor purgative; they are ſoluble in aqua regia.

FLOWERS *of arſenic, white*, are made, as all other *flowers* are, by ſubliming ARSENIC; from which they do not differ in their nature and properties.

FLOWERS *of benjamin*, or *benzoin*, are made by putting a quantity of this reſin into a varniſhed earthen pan, and covering it with another inverted pan of ſtone-ware; and let the edges of theſe pans be made to fit well to each other, and be well luted together with paper dipped in paſte. Put the earthen pan containing the benzoin on a gentle fire, and with that the ſublimation is performed; when the veſſels are cool and unluted, the *flowers* are to be ſwept off with a feather. For the properties and medicinal uſes of theſe *flowers*, ſee BENZOIN.

FLOWERS *of biſmuth*. See BISMUTH.

FLOWERS *of cobalt*. See COBALT.

FLOWERS *of copper* have been prepared by ſubliming ſal ammoniacum with the caput mortuum of blue vitriol. See COPPER.

FLOWERS, *martial*. See FLORES *martiales*.

FLOWERS *of ſal ammoniac* are nothing more than ſal ammoniac ſublimed; and the ſublimation is facilitated by generally mixing with it an equal part of decrepitated common ſalt. See *Sal* AMMONIAC.

FLOWERS *of ſulphur*, or *brimſtone*, are the vapours of melted brimſtone conveyed from an iron pot (in which it is kept boiling) through a proper flew, into a cloſe room or oven, where this vapour condenſes into *flowers*. See SULPHUR.

FLOWER *of wheat, rye*, and other *pulſe*. See FARINA and FLOUR.

FLOWERS *of zinc*. See CADMIA and ZINC.

FLOWERS, in the *Animal Oeconomy*, denote women's monthly purgations, or MENSES.

Nicod derives the word in this ſenſe from *fluere*, q. d. *fluors*. Others will have the name occaſioned hence, that women do not conceive till they have had their *flowers*; ſo that theſe are a ſort of forerunners of their fruit.

FLOWERS, in *Rhetoric*, are FIGURES, or ornaments of diſcourſe, by the Latins called *floſculi*.

FLOWER-*fence, Barbadoes*. See BARBADOES *flower-fence*.

FLOWER-*fence, baſtard*. See ADENANTHERA.

FLOWER *of Briſtol*. See CAMPION.

FLOWER-*de-luce*, in *Botany*. See IRIS.

FLOWER, *eternal*, or *everlaſting*. See ETERNAL *flower*, and CUD-*weed*.

FLOWER, *four o'clock*. See MIRABILIS.

FLOWER, *gentle*. See AMARANTH.

FLOWER, *ſide-ſaddle*. See *Hollow-leaved Sea*-LAVENDER.

FLOWER, *ſky*. See CINERARIA.

FLOWER, *ſultan*. See BLUE-*bottle*, and CENTAURY.

FLOWER, *ſun*. See SUN-*flower*.

FLOWER, *trumpet*. See TRUMPET.

FLOWER, *wind*. See ANEMONE.

FLOWER *of oſteocolla*, a name given by the people employed in finding the OSTEOCOLLA to a ſort of white marley matter, which they uſually find on the ſurface of the ground in the places where the oſteocolla lies underneath. It ſeems very nearly allied to the nature of the oſteocolla itſelf, and uſually has under it ſome of that blackiſh matter reſembling rotten wood, which the oſteocolla itſelf is formed upon, and which fills up thoſe hollows we find in moſt of the pieces, while the whole is in the ground. This rotten vegetable matter has much the reſemblance of the roots or branches of trees, and is called by the common people the root of the oſteocolla or hammoſtei radix. Phil. Tranſ. N° 39.

FLOWER-*root worm*, in *Natural Hiſtory*, a peculiar ſpecies of fly-worm, which makes its habitation only in the bulbous roots of *flowers*. The roots of the narciſſus at the time they are taken up out of the earth toward the end of autumn, very frequently are found to contain each a ſingle worm, which eats and deſtroys them. Sometimes one root is found to contain two of them; but this is but rarely the caſe. The roots which have them may eaſily be known, by having each a round hole in ſome part, at which the deſtroyer has entered while it was ſmall, and which probably ſerves it now in its larger ſtate for reſpiration of the freer air. The interior part of theſe bulbs is always found rotted and deſtroyed, and the worm is found in theſe, lying in a brown ſort of dirt made by its own liquid excrements, mixed among the fragments of the coats of the root which it has deſtroyed. Reaumur's Hiſt. Inſect. vol. iv. p. 499.

Theſe worms undergo all their changes in a ſhell made of their own ſkin, which is of the ſame egg-faſhioned ſhape with that of the blue fleſh fly, but conſiderably larger, and of a greyiſh colour. But this is not all its difference from thoſe ſhells; for on its anterior and ſuperior part it has two horns of the ſame kind with the four of the ſhells of the rat-tailed worms; and ſeeming to ſerve to the ſame purpoſes, and to convey the air neceſſary for the life of the creature, into its corcelet; the old ſtigmata, which ſerved the creature in its worm-ſtate, being now obliterated, and ſomething neceſſarily wanted in their place. After having undergone all the neceſſary changes, the ſhells are burſt open, in the month of April, and let out the fly they contained.

This has ſo much the appearance of an humble-bee, that at firſt ſight it is ſcarce to be diſtinguiſhed from it. It is covered with black, yellow, and reddiſh hairs, as the ſmaller kinds of the common humble bees are; but its antennæ, which are of the battledore faſhion, prove plain enough, that it is really no bee, even before one can determine with certainty that it has only two wings.

FLOWERAGE, a collection of flowers of ſeveral kinds ſet together in huſks, and hung up with ſtrings.

FLOWERED, in the *Manufactures*. A ſtuff, or cloth, is ſaid to be *flowered, flouriſhed, ſprigged*, or *figured*, when there are repreſentations of *flowers*, either natural, or imaginary, wrought thereon.

There are ſtuffs *flowered* of almoſt all kinds of matter: *flowers* of gold, ſilver, ſilk, wool, thread, cotton, &c. Stuffs and cloths are uſually denominated from the ground, whereon the *flowers* are raiſed.

Thus, there are *flowered* velvets, taffaties, damaſks, ſattins, mohairs, dimities, &c.

Thoſe *flowered* with gold and ſilver are more uſually called BROCADES.

The flowers are uſually wrought at the ſame time with the cloth, or ground. The threads of the warp are raiſed and lowered by means of packthreads paſſed through them in mounting the loom; and the manufacturer, ſhooting his warp, or matter of the flowers, whether gold, ſilver, ſilk, or the like, between the threads thus raiſed, forms the FLOWERS.

It is very curious to ſee them mount a loom; or, as they call it, *read a deſign*, to be repreſented on a ſtuff; but it is next to impoſſible to deſcribe it; yet we have endeavoured to give ſome idea thereof under DESIGN.

FLOWERING *of bulbous plants*. Theſe plants will grow and *flower* in water alone without any earth, and make a very elegant appearance. We daily ſee this practiſed in ſingle roots, but there is a method of doing it with ſeveral together, as follows: take a common ſmall garden-

pot,

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pot, ſtop the hole at the bottom with a cork, and lute in the cork with putty that no water can get through; then fit a board to the top of the pot, and bore ſix or ſeven holes in it, at equal diſtances, to place the bulbs in, and as many ſmaller holes near them to receive ſticks, which will ſerve to tie up the *flowers*. Then fill up the pot with water to the board, and place tulips, jonquils, narciſſuſes and the like plants in the root upon the holes, ſo that the bottom of the roots may touch the water; thus will they all *flower* early in the ſeaſon, and be much more beautiful than any pot of gathered *flowers*, and will laſt many weeks in their full perfection. After the ſeaſon of *flowering* is over, the roots will gradually ſhrink through the holes of the board, and get looſe into the water, but inſtead of becoming ſpoiled there, they will ſoon increaſe in ſize, ſo as not to be capable of coming back, and will produce ſeveral off-ſets. It is natural to try from this the conſequence of keeping the roots under water during the whole time of their blowing, and in this manner they have been found to ſucceed very well, and *flower* even ſtronger and more beautifully than when in the ground. They may thus alſo, with proper care in the degree of heat in the room, be kept *flowering* from before Chriſtmas, till March or April. It is not eaſy in this laſt manner to manage the keeping the boards under water, for which reaſon it is better to procure ſome ſheet lead of about four pounds to the foot, and cut this to the ſize of the mouth of the pot; in this there ſhould be bored holes for the bulbs, and other holes for the ſticks; and in order to keep the ſticks quite firm, it is proper to have another plate of lead ſhaped to the bottom of the pot, with holes in it, anſwering thoſe in the upper plate made for the ſticks. The ſticks will by this means be kept always perfectly ſteady, and the roots being kept under water by the upper plate of lead, will *flower* in the moſt vigorous and beautiful manner imaginable.

Notches in the ſide of each lead, will give eaſy paſſage to the water, that if there ſhould be any foulneſs or ſediment in it, on ſhaking it a little, it may all run through, and freſh water be put in its place; but this ſhifting the water need not be done more than once or twice in a winter, as there may be occaſion from the foulneſs; and when this is done, the ſides of the veſſel ſhould be cleaned with a painter's bruſh, and rinſed out again, and the bulbs themſelves waſhed, by pouring water on them at a little diſtance: and if any duſt or foul matter be at any time obſerved ſwimming on the ſurface, the method is to fill up the veſſel, and let it run over: this will carry off that light foulneſs, and the water may afterwards be poured away to the proper ſtandard.

It may be more agreeable to ſome to uſe glaſs jars, in this laſt method with the lead, inſtead of earthen pots. The bulbs ſucceed full as well in theſe; and there is this advantage, that the progreſs of the roots is ſeen all the while, and they are managed better as to the ſupply of water.

By repeated experiments in this way on dried bulbs, and on thoſe taken freſh out of the ground, the former have been found to ſucceed the beſt; for thoſe taken freſh out of the ground being full of moiſture, will not ſo ſoon upon changing their element be nouriſhed fully by a new one; and the fibres which they had ſtruck in the ground always rot when put into the water, and new ones muſt be formed in their places, ſo that it requires more time for them to come to *flowering*. The bulbs themſelves will not rot in this manner, but they will never be ſo ſtrong as thoſe which were put into the water dry, which gradually fill themſelves with moiſture from it, and regularly plump up. The beſt method of managing the whole proceſs is this: place the bulbs at firſt only on the ſurface of the water; for thus they will ſtrike out their fibres moſt ſtrongly. When they have ſtood thus ſix weeks, pour in the water ſo high as to cover them entirely, and keep them at this ſtandard till they have done *flowering*.

Sometimes the roots will become mouldy in ſeveral parts while they ſtand above the water, and the cleaning them of it is to no purpoſe; for it will eat and ſpread the farther, and frequently eat through two or three of their coats. In this caſe, they muſt be immediately covered with water, and the mould will be ſtopped, and they will become ſound, and flower as well as thoſe which never had any ſuch diſtemperature. If the roots are ſuffered to remain in water all the year, they will not decay, but will flower again at their proper ſeaſon, and that as vigorouſly as thoſe which are taken out and dried. The old fibres of theſe roots never rot till they are ready to puſh out new ones. It is found by experience, that the hyacinth, and many other plants, grow to a greater perfection thus in water, than when in the ground. There is a peculiar ſpecies of hyacinth, called Keyſer's jewel; this never, or however very rarely, produces ſeed-veſſels in the common way of *flowering* in the ground, but it will often produce ſome pods when blown in water.

Mr. Miller has intimated, in the Philoſophical Tranſactions, that bulbs ſet in glaſſes grow weaker, and ſhould be renewed with freſh ones every other year; but it is found that when they are managed in this manner, and kept under water, at the time of taking them up, they are as large, and ſome of them larger and ſtronger than when planted; and if theſe be dried at a proper ſeaſon, they will flower year after year as well as freſh ones.

The ſmaller SEEDS may alſo be raiſed in this manner, by the help of wool to ſupport them.

No plant tranſplanted out of earth into water will thrive kindly; but any plant, whether raiſed from the root or ſeed in water, may be tranſplanted to the earth, and will ſucceed very well. It may be poſſible, therefore, from this method of raiſing plants in water, to come at a better way than is uſually practiſed of raiſing ſome roots in the earth which are ſubject to rot there; ſuch as anemonies, ranunculuſes, and hyacinths. A bulb dropped by chance upon the ground will ſtrike out both ſtronger and more numerous fibres, than thoſe which are planted in the uſual way on the ground. On this principle it may be proper to take out the earth of the bed where the bulbs are to ſtand at the time of planting them, to ſuch a depth as they are to be placed under it, when ſet for *flowering*. The bulbs are then to be ſet in their places on the ſurface of this low ground, and to ſtand there till they have ſhot out their fibres and their head, then the earth is to be added over them by degrees, till they are covered as high above the head as they are in the uſual way of planting them; thus they would be preſerved from the danger of rotting, and their fibres would be much ſtronger, and conſequently they would draw more nouriſhment, and flower better than in the common way.

At the time of planting the bulbs, they muſt be carefully cleaned from any foulneſs at the bottom, by ſcraping them clean with the point of a knife, till the ſound part of the bulb appears; clean them likewiſe from any looſe ſkins, and even take off their brown ſkin, till they appear white; otherwiſe this brown ſkin will tinge the water, and the growth will not ſucceed ſo well.

There is yet another way of cauſing flowers to blow early in pots of earth in this manner. Diſſolve crude ſal ammoniac in water, in ſuch proportion, as that a piece of the bigneſs of a walnut may be diſſolved in every quart; then prepare ſome pots of a proper ſize filled with good garden mould. Sow the annual flowers, and ſet the roots of the perennial ones, ſuch as tulips, &c. in theſe pots at Michaelmas; continue the enſuing ſeaſon to water them with this ſolution of the ſalt, and keep them in a warm room; by this means they will be in full flower about Chriſtmas, and will continue through January and February.

FLOWING, or FLOWN-*ſheets*, in *Sea-Language*, denote the poſition of the ſheets, or lower corners of the principal ſails, when they are looſened to the wind, ſo as to receive it into their cavities in a direction more uſually perpendicular than when they are cloſe-hawled, but more obliquely than when the veſſel is ſailing before the wind. This poſition of the ſheets takes place when the wind croſſes the line of her courſe nearly at right angles.

FLOX, in the *Colour Trade*, a very well cleaned wool uſed to abſorb the colours of cochineal, &c. It is prepared in this manner: infuſe a pound of the fineſt ſheerings of woollen cloth in cold water for one day; then take them up, and preſs them well together, to waſh off the unctuoſity the wool naturally has. This is the ſimple *flox*, which when impregnated with a ſolution of alum, is called alumed *flox*. This is done in the following manner: take four ounces of roach-alum, and two ounces of crude tartar, both in fine powder; put them into an earthen veſſel with three quarts of water, ſet it over the fire, and when it begins to boil, then put in the *flox*; let the liquor now boil half an hour over a gentle fire, then take it off, and when all is perfectly cooled, waſh the *flox* with fair water, letting them ſtand in it two hours, then preſs them in the hand, and let them dry.

FLUDER, or *Sea*-FLUDDER, in *Zoology*, the name of a water-fowl of the colymbus or diver-kind, deſcribed by Geſner, and ſome other authors, under the name of the colymbus maximus, or largeſt diver. It is nearly of the ſize of a gooſe, and moves but very ſlowly on the water, and much worſe either on land, or in the air, being but little able either to walk or fly. Its beak is long, and its legs very ſhort; it makes a very ſhrill noiſe, and is remarkable for diving to vaſt depths. Its feet are webbed, its back is of a greyiſh colour, and its belly white. It ſeems much to approach to the northern colymbus, called the lumme, and perhaps differs only in colour, which may be an accidental variety, as is common in birds. Ray's Ornithol. p. 260.

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FLUELLIN, *Elatine*, in *Botany*. See ELATINE.

FLUENT, or *flowing quantity*, in the *Doctrine of Fluxions*, that quantity (whether line, ſurface, ſolid, &c.) which is continually increaſing, or decreaſing.

Thoſe *fluents*, which are generated in the ſame time, or in equal times, or which begin together and end together, are called contemporary *fluents*, and their fluxions are called contemporary fluxions; and if two or more of theſe contemporary *fluents* are always equal, or in any invariable ratio to each other, their contemporary fluxions will likewiſe be equal, or in the ſame proportion, and *vice verſâ*. See FLUXION.

Mr. Maclaurin, in his Treatiſe of Fluxions, has made ſeveral inquiries into *fluents*, reducible to the rectification of the ellipſis and hyperbola. M. D'Alambert has purſued the ſame ſubject, and carried it farther, in Mem. de l'Acad. de Berlin. tom. ii. p. 200.

FLUIDITY, in *Phyſics*, that ſtate or affection of bodies, which denominates or renders them *fluid*.

Fluidity ſtands in direct oppoſition to *firmneſs*, or *ſolidity*.

Fluidity is diſtinguiſhed from *liquidity* or *humidity*, in that the idea of the firſt is abſolute, and the property contained in the thing itſelf; whereas that of the latter is relative, and implies wetting, or adhering; i. e. ſomewhat that gives us the ſenſation of wetneſs, or moiſture, and which would have no exiſtence but for our ſenſes.

Thus, melted metals, air, æther, and even ſmoke, and flame itſelf, are *fluid* bodies, but not liquid ones; their parts being actually dry, and not leaving any ſenſe of moiſture.

The nature and cauſes of *fluidity* have been variouſly aſſigned.

The Gaſſendiſts, and ancient Corpuſcularians, require only three conditions as neceſſary thereto; viz. a ſmallneſs and ſmoothneſs of the particles of the body; vacuities interſperſed between them; and a ſpherical figure. Thus the Epicurean poet, Lucretius:

Illa autem debent ex lævibus atque rotundis
Eſſe magis, fluido quæ corpore liquida conſtant.

The Carteſians, and after them Dr. Hook, Mr. Boyle, &c. beſide the circumſtances above mentioned, require a various, perpetual, inteſtine motion of the particles of the bodies, as that which principally contributes to *fluidity*.

Fluidity then, according to theſe philoſophers, conſiſts in this, that the parts of the body, being very fine, and ſmall, are ſo diſpoſed by motion, or figure, as that they can eaſily ſlide over one another's ſurfaces all manner of ways; and that they be in conſtant, various, ſeparate agitation to and fro; and that they only touch one another in ſome few parts of their ſurfaces. Mr. Boyle, in his *hiſtory of fluidity*, mentions three conditions principally required to *fluidity*, viz.

1. The minuteneſs of parts: thus, in effect, we find that fire, by dividing metals into fine, ſmall parts, renders them fluid; and that acid menſtruums diſſolve and render them fluid after the like manner; and that fire turns the hard body of common ſalt almoſt wholly into a liquor, by diſtillation: not but that the figure of the particles may have a conſiderable ſhare in *fluidity*.

Thus mercury, whoſe parts are doubtleſs much groſſer than thoſe of oil and water, is yet more fluid than either of them: and thus oil, by the action of fire, may be converted into a conſiſtent ſubſtance like butter.

2. A number of vacuities interſperſed between the corpuſcles, to give room for the ſeveral particles to move among themſelves.

3. A motion and agitation of the corpuſcles; either from ſome principle of mobility within themſelves, or from ſome extraneous agent, penetrating and entering the pores, moving variouſly among them, and communicating to them a part of its motion.

That this laſt is the qualification chiefly required in *fluidity*, he argues from divers obſervations and experiments. Thus, a little dry powder of alabaſter, or plaiſter of Paris, finely ſifted, being put in a veſſel over the fire, ſoon begins to boil like water; exhibiting all the motions and phænomena of a boiling liquor. It will tumble variouſly in great waves like that; will bear ſtirring with a ſtick or ladle like that, without reſiſting; nay, if ſtrongly ſtirred near the ſide of the veſſel, its waves will apparently daſh againſt them: yet it is all the while a dry, parched powder.

The like is obſerved in ſand; a diſh of which being ſet on a drum-head, briſkly beaten by the ſticks, or on the upper ſtone of a mill, it in all reſpects emulates the properties of a fluid body. A heavy body, e. gr. will immediately ſink in it to the bottom, and a light one emerge to the top. Each grain of ſand has a conſtant vibratory and dancing motion; and if a hole be made in the ſide of the diſh, the ſand will ſpin out like water.

That the parts of fluids are in continual motion, the Carteſians bring divers conſiderations to prove: as, 1. The tranſmutation of ſolids into fluids, e. gr. ice into water, and vice verſa; the chief difference between the body in thoſe two ſtates conſiſting in this, that the parts, being fixed and at reſt in the one, reſiſt the touch; whereas in the other, being already in motion, they give way to the ſlighteſt impulſe.

2. The effects of fluids, which commonly proceed from motion: ſuch are the inſinuation of fluids among the pores of bodies; the ſoftening and diſſolving hard bodies; the actions of corroſive menſtruums, &c. Add, that no ſolid can be brought to a ſtate of *fluidity*, without the intervention of ſome moving, or moveable body, as fire, air, or water.

Air, the ſame gentlemen hold to be the firſt ſpring of theſe cauſes of *fluidity*, it being this that gives motion to fire and water, though itſelf receives its motion and action from the æther, or ſubtle medium.

Boerhaave pleads ſtrenuouſly for fire's being the firſt mover, and the cauſe of all *fluidity* in other bodies, as air, water, &c. Without this, he ſhews that the atmoſphere itſelf would fix into one ſolid maſs. See FIRE and HEAT.

Sir I. Newton ſets aſide this theory of the cauſe of *fluidity*, and ſubſtitutes a new one, the great principle of attraction. The corpuſcular ſyſtem, with all the improvements of Deſcartes, and Mr. Boyle, did not ſufficiently account for the primary condition, requiſite to conſtitute a body fluid, viz. the various inteſtine motion and agitation of its particles. But this motion is naturally enough accounted for, by ſuppoſing it a primary law of nature, that as all the particles of matter attract each other when within a certain diſtance; ſo at all greater diſtances, they fly from, and avoid one another. For then, though their common gravity, together with the preſſure of other bodies upon them, may keep them together in a maſs, yet their continual endeavour to avoid one another ſingly, and the adventitious impulſes of heat, and light, or other external cauſes, may make the particles of fluids continually move round about one another, and ſo produce this quality.

There is a difficulty, indeed, in accounting, why the particles of fluids always keep at ſuch a diſtance from one another, as not to come within the ſphere of one another's attraction. The fabric and conſtitution of that fluid body, water, is amazing; that a body ſo very rare, and which has a vaſt over-proportion of pores, or interſperſed vacuity, to ſolid matter, ſhould yet be perfectly incompreſſible by the greateſt force, as philoſophers very generally and for a long time have imagined, (ſee COMPRESSION;) and yet this fluid is eaſily reducible into that firm, tranſparent, friable body, which we call ice, by being only expoſed to a certain degree of cold.

One would think, that though the particles of water cannot come near enough to attract each other, yet the intervening frigorific matter doth, by being mingled per minima, ſtrongly attract them, and is itſelf likewiſe ſtrongly attracted by them, and ſo wedges or fixes all the maſs into a firm ſolid body; which ſolid body loſes its ſolidity again, when by heat the vinculum is ſolved, and the frigorific particles are disjoined from thoſe of the water, and are forced to fly out of it. And thus may the fumes of lead perhaps fix quickſilver.

When a firm ſolid body, ſuch as metal, is by heat reduced into a fluid, the particles of fire disjoin and ſeparate its conſtituent parts, which their mutual attraction cauſed before to cohere, and keep them at ſuch a diſtance from one another, as that they are out of the ſphere of each other's attraction, as long as that violent motion laſts; and when by their lightneſs and activity they are flown off, unleſs they be renewed by a continual ſupply, the component particles of the metal finally come near enough again to feel one another's attractions.

As, therefore, the cauſe of coheſion of the parts of ſolid bodies appears to be their mutual attraction, ſo the chief cauſe of *fluidity* ſeems to be a contrary motion, impreſſed on the particles of fluids; by which they avoid and fly one another, as ſoon as they come at, and as long as they keep at ſuch a diſtance from each other.

It is obſerved alſo in all fluids, that the direction of their preſſure againſt the veſſels which contain them, is in lines, perpendicular to the ſides of ſuch veſſels; which property, being the neceſſary reſult of the particles of any fluid's being ſpherical, ſhews that the parts of all fluids are ſo, or of a figure very nearly approaching thereto.

FLUIDS are bodies, whoſe particles are but weakly connected; their mutual coheſion being in great meaſure prevented by ſome external cauſe.

In this ſenſe a *fluid* ſtands oppoſed to a ſolid.

Sir I. Newton defines a *fluid* body, to be that whoſe parts yield to the ſmalleſt force impreſſed, and by yielding are eaſily moved among each other.

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That the particles whereof fluids conſiſt, are of the ſame nature, and have the ſame properties, with the particles of ſolids, is evident, from the converſion of liquids and ſolids into each other, e. gr. of water into ice, of metals into fluors, &c. Nor can it be reaſonably doubted, that the component parts of all bodies are the ſame, viz. hard, ſolid, impenetrable, moveable corpuſcles.

We obſerve therefore, with Dr. Clark, that if the parts of a body either do not touch each other, or eaſily ſlide over one another; and are of ſuch a magnitude, as that they may be eaſily agitated by heat, and the heat be ſufficiently great to agitate them, though it may perhaps be leſs than ſuffices to prevent water from freezing; or, even, though the parts be not actually moved, yet, if they be ſmall, ſmooth, ſlippery, and of ſuch a figure and magnitude as diſpoſes them to move, and give way, that body is *fluid*.

And yet the particles of ſuch *fluid* bodies do, in ſome meaſure, cohere; as is evident hence, that mercury, when well purged of air, will be ſuſtained in the barometer, to the height of 60 or 70 inches; that water will aſcend in capillary tubes even in vacuo; and that the drops of liquor in vacuo run into a ſpherical form; as adhering by ſome mutual coheſion like that between poliſhed marble planes. Add, that theſe *fluid* bodies, if they conſiſt of particles that are eaſily entangled within each other, as oil; or if they be capable of being ſtiffened by cold, and joined by the interpoſition of little cunei, or wedges, as water; they are eaſily rendered hard: but if their particles be ſuch as can neither be entangled, as air; nor ſtiffened by cold, as quickſilver; then they never grow hard and fixed.

FLUIDS are called either *natural*, as water, and mercury; or *animal*, as blood, milk, bile, lymph, urine, &c. or *factitious*, as wines, ſpirits, oils, &c. See each under its proper article.

The doctrine and laws of *fluids* are of the greateſt extent in philoſophy. The preſſure and gravitation of bodies in *fluids*, and the action of the *fluids* immerged in them, make the ſubject of HYDROSTATICS.

FLUIDS, *hydroſtatical laws of.* I. The upper parts of all *fluids*, as water, &c. do preſs upon the lower; or, as ſome philoſophers ſtate it, all *fluids* do gravitate in *proprio loco*.

The contrary of this was a principle in the ſchool-philoſophy; and two facts have been commonly urged in ſupport of it. A bucket full of water is lighter in the water than out of it, nor does it weigh more when full in the water, than when empty out of it; therefore, it has been concluded, that the water in the bucket, becauſe it is within water, its own element, does not gravitate: and divers who deſcend to conſiderable depths, it has been ſaid, feel no ſenſible preſſure under water; though at the depth of thirty-two feet, the additional preſſure they ſuſtain is not leſs than twenty thouſand avoirdupois pounds: for, ſuppoſing the ſurface of the body to contain only ten ſquare feet, and a cubic foot of water to weigh one thouſand avoirdupois ounces, 32×10 feet, or 16×20 feet of water will weigh 16×20000 avoirdupois ounces, or twenty thouſand pounds. However, in this caſe, the uniformity of the preſſure, the increaſed elaſticity and reſiſtance of the compreſſed internal air, and the firm texture of the membranes, &c. may prevent their complaining of any ſenſible pain; though there have been many inſtances to the contrary, in which the difference of the preſſure has produced very injurious effects. See DIVING.

As to the former fact, it is eaſily explained by the theory of *ſpecific* GRAVITY. The bucket of water weighs in water, but does not overweigh; becauſe the ſurrounding parts of water endeavour to deſcend as well as the bucket, and with equal force, and therefore do not permit it to deſcend. Thus, according to an obſervation of Dr. Deſaguliers, if two pound weights were hung at the two arms of a balance, no one will ſay, that neither weighs, becauſe it does not outweigh the other. Deſag. Exp. Phil. vol. ii. p. 96.

Beſides, it is evident, that, in any *fluid*, the weight of the whole is equal to the weight of all its parts; and if any part be taken from the whole, the weight of the whole will be diminiſhed by the weight of that part; and if any part be added to the whole, the weight of the whole will be increaſed by the weight of the part which was added; and, therefore, it is reaſonable to conclude, that the weight of the whole is compoſed of the weights of the ſeveral parts, and that the parts do, therefore, gravitate in the whole, or in *proprio loco*. Cotes's Hyd. and Pneum. Lectures, p. 7. But the certainty of ſuch preſſure is now demonſtrated by a thouſand experiments: it will be ſufficient to inſtance one or two.

Immerge a tube, open at both ends, and half filled with oil of turpentine, in a veſſel of water, the upper end of the tube being ſtopped with the finger: if now the upper ſurface of the oil lie as low as that of the water, the oil, upon removing the finger, will not run out at the lower end of the tube; nay, and if the tube be thruſt a little lower, the water will riſe up in it, and bear the oil above it: but if the upper ſurface of the oil be conſiderably higher than that of the water, the oil will drop out of the tube. Whence it follows, that the column of oil in one caſe preſſes or gravitates leſs on the plane imagined to paſs under its lower ſurface, than a column of water; and in the other caſe, more.

Or thus; a phial, with as much ſhot in it as will make it ſink, cloſe ſhut, being immerged in water, and ſuſpended by a horſe-hair to the beam of a balance, with a weight at the other end exactly counterpoiſing it; upon unſtopping the phial, and letting it fill with water, it will preponderate, and bear down the end of the balance, without having any communication with the external air. And if the phial had been firſt weighed in air, it will be found, that the weights neceſſary for reſtoring its equilibrium in water, anſwer exactly to the additional weight of the phial, when it is again weighed in air with the water in it: ſo that water weighs in water juſt as much as in air.

Theſe two experiments abundantly prove the propoſition, that the upper parts of *fluids* do really preſs or gravitate on the lower. See *Specific* GRAVITY.

From this gravity it follows, that the ſurfaces of ſtagnant *fluids* are plain, and parallel to the horizon; or rather, that they are ſegments of a ſphere concentrical with the earth, becauſe they all gravitate towards the center of the EARTH.

For, as the particles are ſuppoſed to yield to any force impreſſed, they will be moved by the action of gravity, till ſuch time as none of them can deſcend any lower. And this ſituation once attained, the *fluid* muſt remain at reſt, unleſs put in motion by ſome foreign cauſe; inaſmuch as none of the particles can now move without aſcending, contrary to their natural tendency.

II. If a body be immerged in a *fluid*, either wholly, or in part, its lower ſurface will be preſſed upwards by the water underneath it: and the preſſure of *fluids* upwards is equal to the preſſure downwards at the ſame depth.

The truth of this propoſition is evident from the experiment above mentioned; where the oil of turpentine was ſuſpended, and made to mount up in the tube, by the preſſure of the water upwards on its lower parts. Thus alſo, if the open end of a narrow-bored tube be dipped into quickſilver, whilſt the other end is ſtopped with the finger, and the tube be lifted up, a ſhort column of quickſilver will be ſuſpended in the lower end, which column, when dipped into water deeper than about fourteen times its own length, will be preſſed upwards, after the finger is removed from the orifice.

This upward preſſure of *fluids* may be evinced by cauſing a piece of lead, &c. to ſwim in water; which may be done by immerging it to a proper depth, and keeping the water from getting above it. Let CD, *Tab.* II. *Hydraulics*, *fig.* 10. be a glaſs tube open at both ends, and EFG, a flat piece of lead half an inch thick, exactly fitted to the lower end of the tube, having its upper ſurface covered with wet leather, ſo as to hinder the entrance of the water contained in the outer veſſel. Let this leaden plate be held cloſe to the tube, by pulling the ſtring or wire IHL upward at L with one hand, whilſt the tube is held in the other by the upper end C. In this ſituation, let the tube be immerſed in water in the glaſs-veſſel AB, to the depth of ſix inches below the ſurface of the water at K; and then, the leaden plate EFG will be plunged to the depth of ſomewhat more than eleven times its own thickneſs: holding the tube at that depth, you may let go the wire or thread at L; and the lead will not fall from the tube, but will be kept to it by the upward preſſure of the water below it, occaſioned by the height of the water at K above the level of the lead. For, as lead is 11.33 times as heavy as its bulk of water, and in this experiment is immerſed to a depth ſomewhat more than 11.33 times its thickneſs, and no water getting into the tube between it and the lead, the column of water EabcG, below the lead, is preſſed upward againſt it by the water KDEGL, all round the tube; which water, being a little more than 11.33 times as high as the lead is thick, is ſufficient to balance and ſupport the lead at the depth KE. If a little water be poured into the tube upon the lead, it will increaſe the weight upon the column of water under the lead, and cauſe the lead to fall from the tube to the bottom of the glaſs veſſel, where it will lie in the ſituation bd: or, if the tube be raiſed a little in the water, the lead will fall by its own weight, which will then be too great for the preſſure of the water round

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round the tube on the column of water below it. If the plate were braſs inſtead of lead, it ought to be immerſed under water at leaſt eight times its thickneſs, in order to be ſupported by the water; becauſe braſs is about eight times ſpecifically heavier than water. A plate of pure gold would require near twenty times its thickneſs of water: and this led Mr. Boyle to propoſe one of his hydroſtatical paradoxes in theſe words, viz. That a ſolid body, as ponderous as any yet known, though near the top of the water, it will ſink by its own weight, yet immerſed in water, at a greater depth than that of twenty times its thickneſs, will not ſink, if its deſcent be not aſſiſted by the weight of the incumbent water. Paradox. 11. Statics. Boyle's Works, abr. by Shaw, vol. ii. p. 311.

As we have now ſeen that the heavieſt body may be made to ſwim in water, the lighteſt wood may be made to lie at the bottom of water or mercury. Thus, let two pieces of wood be planed quite flat, ſo that no water may get between them when they are put together; let one of them, b d, be cemented to the bottom of the veſſel A B, *fig.* 10. and the other be laid flat and cloſe upon it, and held down with a ſtick, whilſt water is poured into the veſſel; then remove the ſtick, and the upper piece of wood will not riſe from the lower one: for, as the upper one is preſſed down both by its own weight and the weight of water over it, whilſt the contrary preſſure of the water is kept off by the wood under it, it will lie as ſtill as the heavieſt body: but if it be raiſed at the edge, ſo that the water may get under it, it will immediately be preſſed upwards; and as it is lighter than its bulk of water, it will riſe and float on the ſurface of the water. See Ferguſon's Lectures, 4to. p. 68. and Cotes's Hyd. Lect. 2. See HYDROSTATIC *Bellows*, and Art. xi. in the ſequel.

The law or quantity of this preſſure is this; that a body immerged in a *fluid*, loſes juſt ſo much of the weight it would have in air, as ſo much of the *fluid* as is equal to it in bulk, if weighed in the air, would amount to.

This preſſure of *fluids* on the lower parts of an immerſed body, is farther confirmed, by attending to the reaſon why bodies ſpecifically lighter than *fluids* aſcend therein. The effect is owing to this, that there is a greater preſſure or weight on every other part of the plane or ſurface of the *fluid* imagined to paſs under the lower ſurface of the body, than there is on that whereon the emerging body inſiſts. Conſequently, to produce an equilibrium in the *fluid*, the parts immediately under the riſing body, being preſſed by the reſt every way, do continually force it upwards.

In effect, the emerging body is continually preſſed on by two columns of water, one bearing againſt its upper, and the other againſt its lower parts: the length of both which columns being to be accounted from the top of the water, that which preſſes on the lower part will be the longer, by the thickneſs of the aſcending body, and conſequently will overbalance it by the weight of as much water as will fill the ſpace that body takes up.

Hence, 1. We are furniſhed with one reaſon, why very minute corpuſcles, either heavier or lighter than the liquor they are mingled with, will be ſuſtained therein a good while, without either emerging to the top, or precipitating to the bottom; the difference between the two columns of the *fluid* being here inconſiderable.

Hence, 2. If a body A be ſpecifically lighter than B, an equal portion of the *fluid* in which it is immerged, it will riſe with a force proportionable to the exceſs of gravity of B above A: and if A be ſpecifically heavier than B, it gravitates and deſcends with the exceſs only of its weight above that of B.

Hence, 3. We have a ſolution of the phenomenon of two poliſhed marbles or other planes adhering ſo ſtrongly together; becauſe the atmoſphere preſſes or gravitates with its whole weight on the under ſurface and ſides of the lower marble, but cannot do ſo at all on its upper ſurface, which is cloſely contiguous to the upper and ſuſpended marble.

III. The preſſure of the upper parts of a *fluid* on the lower exerts itſelf every way, and every way equally, laterally, horizontally, and obliquely, as well as perpendicularly.

For, as the parts of a *fluid* yield to any impreſſion, and are eaſily moved, it is impoſſible any drop ſhould remain in its place, if, while it is preſſed by the ſuperincumbent *fluid*, it be not equally preſſed on every ſide.

The ſame is confirmed from experiments: for ſeveral tubes of divers forms, ſtrait, curved, angular, &c. being immerſed in the ſame *fluid*, though the apertures, through which the *fluid* enters, be differently poſited to the ſurface or plane, ſome being perpendicular, others parallel, and others variouſly declined; yet will the *fluid* riſe to an equal height in them all. See SYPHON.

Hence, 1. All the particles of *fluids* being thus equally preſſed on all ſides, it is argued, that they muſt be at reſt, and not in continual motion, as has been uſually ſuppoſed.

Hence, 2. alſo, A body, being immerſed in a *fluid*, ſuſtains a lateral preſſure from the *fluid*; which is alſo increaſed as the body is placed deeper beneath the ſurface of the *fluid*.

IV. In tubes that have a communication with each other, whatever their magnitude be, whether equal, or unequal; and whatever their form, whether ſtrait, angular, or crooked; ſtill, *fluids* riſe in them to the ſame height.

V. If a *fluid* riſe to the ſame altitude in two tubes that communicate with each other, the *fluid* in one tube is a balance, or equal in weight, to that in the other.

If the tubes be of equal diameters, the columns of the *fluid*, having the ſame baſe and altitude, are equal, and conſequently their gravities equal; ſo that they preſs and gravitate againſt each other with equal force.

This is demonſtrated from mechanics. E. gr. Let the baſe of GI, *Tab.* II. *Hydraulics*, *fig.* 11. be ſuppoſed quadruple the baſe of HK; and let the *fluid* deſcend in the greater tube the ſpace of an inch, as from L to O; it will then riſe in the other the ſpace of four inches, as from M to N. Wherefore the velocity wherewith the *fluid* moves in the tube HK, is to that wherewith it moves in GI, as the baſe of the tube GI to the baſe of the other, HK. But the altitude of the *fluid* being ſuppoſed the ſame in both tubes, the quantity of the *fluid* in the tube GI will be to that in the other tube HK, as the baſe of the tube GI to the baſe of the other HK. Conſequently, the momentum of the *fluid* in the tube GI is to that in the tube HK, as the product of the baſe of the tube GI into the baſe of the other HK, to the factum of the tube HK into the baſe of the other GI. Wherefore, the products being equal, the momenta muſt be equal.

The ſame is eaſily demonſtrated where one of the tubes is inclined, and the other perpendicular, &c.

Hence in tubes that communicate, the *fluid* will preponderate in that where its altitude is the greateſt.

VI. In communicating tubes, *fluids* of different ſpecific gravities will equiponderate, if their altitudes be in the ratio of their ſpecific gravities.

Hence we have a way of finding the ſpecific gravities of *fluids*, viz. by pouring one *fluid* into one of the communicating tubes, as A B (*fig.* 12.) and another into the other tube CD; and meaſuring the altitudes GB and HD, at which they ſtand when balanced.

For the ſpecific gravity of the *fluid* in A B is to that in DC, as DH to BG. If the *fluids* employed in this experiment be apt to mix, it may be proper to fill the horizontal tube B D with mercury, to prevent the mixture.

Hence, ſince the DENSITIES of *fluids* are as their ſpecific gravities, the denſities will likewiſe be as the altitudes of the *fluids* DH and BG; ſo that we have hence likewiſe a method of determining the denſities of *fluids*.

VII. The bottoms and ſides of veſſels are preſſed in the ſame manner, and by the ſame laws, as the liquids contained in them.

And hence, as action and re-action are equal, the *fluids* themſelves ſuſtain an equal preſſure from the bottoms and ſides. And as the preſſion of *fluids* is equal every way, the bottom and ſides are preſſed as much as the neighbouring parts of the *fluids*; and conſequently this action increaſes in proportion to the height of the *fluid*, and is equal every way at the ſame depth; as depending altogether on the height, and not at all on the quantity of the *fluid*.

VIII. In perpendicular veſſels of equal baſes, the preſſure of *fluids* on the bottoms is in the ratio of their altitudes.

This is evident, becauſe, the veſſels being perpendicular, the bottoms are horizontal: conſequently the tendency of *fluids* by the action of gravity will be in lines perpendicular to the bottom, ſo that they will preſs with all their weight; the bottoms therefore are preſſed in the ratio of the gravities. But the gravities are as the bulks, and the bulks here are as the altitudes; therefore the preſſures on the bottoms are as the altitudes.

IX. In perpendicular veſſels of unequal baſes, the preſſure on the bottoms is in a ratio compounded of the baſes, and altitudes.

From the preceding demonſtration it appears, that the bottoms are preſſed in the ratio of the gravities: and the gravities of *fluids* are as their bulks; and their bulks in a ratio compounded of the baſes and altitudes. Conſequently, &c.

X. If an inclined veſſel ABCD, *fig.* 13. have the ſame baſe and altitude with a perpendicular one, BEFG, the bottoms of each will be equally preſſed.

For, in the inclined veſſel ABCD, the bottom CD is preſſed in the direction BD. But the force of gravity in the direction BD is to the abſolute gravity, as BE to BD.

Conſe-

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Conſequently, the bottom CD is preſſed in the ſame manner, as if it had been preſſed perpendicularly by the *fluid* under the altitude BE. Therefore, the bottoms of the perpendicular and inclined veſſels are equally preſſed.

XI. *Fluids* preſs upon ſubject bodies, according to their perpendicular altitude, and not according to their latitude, or breadth.

Or, as others ſtate it, thus: if a veſſel be taper, or unequally big at top and bottom, yet the bottom will be preſſed after the ſame manner as if the veſſel were cylindrical, and the top and bottom equal.

Or thus: the preſſure ſuſtained by the bottom of a veſſel, whatever the figure of the veſſel be, is ever equal to the weight of a column of the *fluid*, whoſe baſe is the bottom itſelf, and height, the vertical diſtance of the upper ſurface of the water from the bottom.

Or, yet more explicitly, thus: if there be two tubes or veſſels, having the ſame heights, and baſes, both filled with water; but one of them made ſo tapering upwards, that it ſhall contain but twenty ounces of water; whereas the other, widening upwards, holds two hundred ounces; yet the bottoms of the two tubes ſhall ſuſtain an equal preſſure of water, viz. each of them that of the weight of two hundred ounces.

This is a noble paradox in hydroſtatics, firſt diſcovered by M. Paſchal, and which it is well worth the clearing, and inſiſting on. It is found unexceptionably true from abundant experiments; and it may even be demonſtrated and accounted for on principles of mechanics.

Suppoſe, e. g. the bottom of a veſſel CD (*fig.* 14.) leſs than its top AB; ſince the *fluid* preſſes the bottom CD, which we ſuppoſe horizontal, in a perpendicular direction, EC, none but that part within the cylinder ECDF can preſs upon it, the natural tendency and preſſure of the reſt being taken off by the ſides.

Again, ſuppoſing the bottom CD (*fig.* 15.) much bigger than the top FG; or even, for the eaſier demonſtration, ſuppoſe a tube FE fixed in a cylinder ABCD; and ſuppoſe the bottom CD raiſed to L; that the *fluid* may be moved through the interval DL; then will it have riſen through the altitude GL, which is to DL as the baſe CD to that of GF. The velocity therefore of the *fluid* FE is to its velocity in the veſſel AD as the baſe CD to the baſe FG.

Hence we have the momentum wherewith the *fluid* in the tube tends downwards, by multiplying the baſe of the cylinder CD into its altitude CH.

Conſequently, the bottom CD is preſſed with the ſame force, as it would be preſſed by the cylinder HCDI.

To confirm and illuſtrate this doctrine of the preſſure of *fluids* in the ratio of the baſe and altitude, provide a metallic veſſel ACDB (*fig.* 15.) ſo contrived, as that the bottom CD may be moveable, and to that end fitted in the cavity of the veſſel with a rim of wet leather, to ſlide freely without letting any water paſs. For this purpoſe it would be moſt adviſeable, that the moveable bottom ſhould have a groove round its edge, and that it be put into a bladder, tied cloſe round it in the groove by a ſtrong waxen thread; and the bladder may be made to come up like a purſe within the veſſel, and put over the top of it at A and B all round, and then the lid of the veſſel preſſed on it: ſo that when water is poured through a hole in the lid, it would lie upon the bottom CD, and be contained within the bladder. Then, through holes in the top, AB, apply ſucceſſively ſeveral tubes of equal altitudes, but of different diameters. Laſtly, faſtening a ſtring or wire to the beam of a balance, and fixing the other end by a little ring K to the moveable bottom, put weights in the other ſcale, till they be ſufficient to raiſe the bottom CD: then will you not only find, that the ſame weight is required, what diameter or magnitude ſoever the tube be of; but even, that the weight which will raiſe the bottom when preſſed by the ſmalleſt tube, will raiſe it when preſſed by the whole cylinder HCDI.

Suppoſe the veſſel ABCD to hold about a pound of water, and that the moveable bottom, wire, and hook, are of equal weight with an empty ſcale M. When this ſcale is pulled down, the bottom CD will be drawn up within the box, and that motion will cauſe the water to riſe in the glaſs tube ELFG. If one pound be put into the ſcale, the bottom will be moved a little, and the water will juſt appear at the lower end of the tube at *a*. Another pound will cauſe it to riſe from *a* to *b*, juſt twice as high above the bottom as it was when at *a*; the preſſure on the bottom being equal to two pounds, the counterbalancing weight in the ſcale M. A third pound will raiſe it to *c*, a fourth to *d*, &c. the diſtances *ab*, *bc*, *cd*, &c. being taken equal to each other and to the depth of the veſſel. If another tube, as *f*, be put into a hole made in the top of the veſſel, and the veſſel be filled with water; and, then, if water be poured in at the top of the tube FGEL, it will riſe in the tube *f* to the ſame height as it does in the other tube: from hence it is evident, that the upward preſſure of the water, riſing in the tube *f*, is equal to the downward preſſure in the other tube FGEL: the caſe would be the ſame, whatever be the number of tubes; and the moveable bottom would ſuſtain the weight of the water in all the tubes, beſides the weight of all the water in the veſſel: and if all the holes to which theſe tubes (FGEL excepted) were fixed be ſtopped up, each part, thus ſtopped, will be preſſed upward with a force equal to the weight of water in each tube: and, conſequently, the whole upward preſſure againſt the top of the veſſel, ariſing from the weight or downward preſſure of the water in the tube FGEL, will be equal to the weight of a column of water of the ſame height with that in the tube, and of the ſame thickneſs as the width of the inſide of the box or of the moveable bottom; and this upward preſſure againſt the top will reach downward with equal force againſt the bottom.

If the diameter of the moveable bottom be three inches, therefore, and the diameter of the bore of the tube a quarter of an inch, their ſquares will be nine inches and one ſixteenth of an inch; and therefore the whole area of the bottom will be a hundred and forty-four times as great as that of the area of the bottom or top of the tube; ſo that if the moveable bottom be raiſed one inch, the water would be raiſed to the top of a tube a hundred and forty-four inches, or twelve feet in height. The veſſel muſt be open below the moveable bottom to let in the air; otherwiſe the preſſure of the atmoſphere upon it, ſuppoſing its diameter three inches, would require a counterbalance of a hundred and eight pounds in the ſcale M before the bottom would begin to move. See HYDROSTATIC *Bellows*.

XII. From the preceding articles, we may eaſily deduce a method of eſtimating the quantity of preſſure of *fluids* on any given ſurface. Let *abcd* (*fig.* 16.) repreſent a cubical veſſel full of water; the ſide *ac* will, therefore, repreſent a ſquare; and the meaſure of the preſſure on every phyſical point of *ac* will be the altitude of the water above that point; thus, the preſſure on *l* is meaſured by *al*, on *m* by *am*, &c. and the preſſure on the whole line will be meaſured by the ſum of as many altitudes *al*, *am*, &c. as there are points in the line *ac*. Erect perpendiculars *lo*, *mp*, &c. reſpectively equal to *al*, *am*, &c. and the ſum of theſe perpendiculars will be the meaſure of the whole preſſure on the line *ac*: but the ſum of theſe is equal to the area of the triangle *acd*; and this is as the ſquare of its altitude *ac*. When *ac* repreſents a ſquare, the triangle *acd* muſt repreſent a priſm, having the ſaid triangle for its baſe, and the ſide of the ſquare for its altitude: the weight of that priſm of water is, therefore, equal to the preſſure made againſt the ſquare, or ſide of the cube; which, as the priſm is half the cube, is equal to half the weight of the whole water contained in the veſſel; and as each ſide bears the ſame degree of preſſure, all the four ſides ſuſtain four times half the weight, or twice the whole weight of the water: and, becauſe the bottom ſuſtains a preſſure equal to the whole weight of the water, the bottom and ſides of a cubical veſſel taken together ſuſtain a preſſure from the water contained in it equal to thrice its weight. The ſame obſervations may be eaſily applied to planes that are oblique to the horizon; and we may conclude univerſally, that the preſſure upon any plane, of whatever figure and ſituation, is equivalent to the weight of a ſolid of water, formed by erecting perpendiculars upon every point of the plane propoſed, equal to the reſpective diſtances of thoſe points from the upper ſurface of the water: or, the preſſure on any ſurface is equal to the ſum of all the products which are made by multiplying every indefinitely ſmall part of the ſurface into its diſtance from the top of the water. To find the ſum of all theſe products, or a body of water equal to that ſum, is, in moſt caſes, a difficult problem: Stevinus has attempted the ſolution of it in few inſtances, confining himſelf to regular plane ſurfaces. Mr. Cotes has laid down the following univerſal and expeditious rule: the preſſure on any ſurface is equal to the weight of a body of water whoſe magnitude is found by multiplying the ſurface propoſed into the depth of its center of gravity under water; and the preſſure on any number of ſurfaces of different bodies, however differently ſituated, is equal to the weight of a body of water whoſe magnitude is found by multiplying the ſum of all thoſe ſurfaces into the depth of their common center of gravity under water. The demonſtration of this rule depends on the following theorem, viz. that the ſum of the products, ariſing from multiplying every indefinitely ſmall part of any ſurface, or number of ſurfaces, reſpectively, into its perpendicular diſtance from any propoſed plane, will be equal to the product of the whole ſurface or number of ſurfaces multiplied into the perpendicular diſtance of the center

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of gravity of any ſingle ſurface, or of the common center of gravity of the whole number of ſurfaces from the ſame plane. Thus, let a, b, c, d, (*fig.* 17.) repreſent weights, hanging at their centers of gravity a, b, c, d, by the lines ao, bo, co, do, fixed to a horizontal plane o, o; o, o; and let z be the common center of gravity of all the weights, and zo its perpendicular diſtance from the ſaid plane. Let x be the common center of gravity of a and b, and to xo, drawn parallel to the reſt, let am and bn be perpendicular. In the ſimilar triangles mxa and nxb, $mx : nx :: (xa : xb ::) b : a$. See CENTER *of Gravity*. Therefore $a \times mx = b \times nx$, i. e. $a \times \overline{mo - xo} = b \times \overline{xo - no}$, and, conſequently, $a \times mo + b \times no = \overline{a+b} \times xo$. In the common center of gravity of a and b ſuſpend a weight $x = a+b$, and a weight $y = x+c$ in the common center of gravity of x and c, and a weight $z = y+d$, in the common center of gravity of y and d. Then z is the common center of gravity of a, b, c, d. And we have (as above) $a \times ao + b \times bo = x \times xo$, and $x \times xo + c \times co = y \times yo$, and $y \times yo + d \times do = z \times zo$: conſequently $a \times ao + b \times bo + c \times co + d \times do = z \times z\,o = \overline{a+b+c+d} \times zo$. And this will be the caſe, if the ſuſpended lines ao, &c. be perpendicular to any plane, though not parallel to the horizon. Now taking the upper ſurface of water for that plane to which we refer the indefinitely ſmall parts of the ſurface which is expoſed to the preſſure we are concerned with; ſince it has been already ſhewn, that the preſſure upon the whole is equivalent to the weight of a body of water which is equal in magnitude to the ſum of all the products, made by multiplying every little part by its diſtance from the upper plane of the water; and that this ſum of products is exactly equal to the product of the whole ſurface or number of ſurfaces multiplied into the diſtance of the center of gravity from the upper plane of the water; it will follow, that the ſame product is the meaſure of a magnitude of water, whoſe weight is equivalent to the preſſure required. See Cotes's Hydroſt. Lect. 3.

For the laws of the preſſure and gravitation in FLUIDS ſpecifically heavier, or lighter, than the bodies immerged, ſee GRAVITY, *Specific*.

For the laws of the reſiſtance of FLUIDS, or the retardation of ſolid bodies moving in *fluids*, ſee RESISTANCE.

For the aſcent of FLUIDS in capillary tubes, or between glaſs planes, ſee ASCENT and CAPILLARY *Tubes*.

The motions of *fluids*, and particularly water, do alſo make the ſubject of hydraulics.

FLUIDS, *Hydraulic Laws of*. I. The velocity of a *fluid*, as water, moved by the preſſure of a ſuperincumbent *fluid*, as air, is equal at equal depths, and unequal at unequal ones.

For the preſſure being equal at equal depths, the velocity ariſing thence muſt be ſo to; and vice verſa: yet the velocity does not follow the ſame proportion as the depth, notwithſtanding that the preſſure, whence the velocity ariſes, does increaſe in the proportion of the depth. But here the quantity of the matter is concerned: and the quantity of motion, which is compounded of the ratio of the velocity and quantity of matter, is increaſed in equal times as the ſquares of the velocities.

II. The velocity of a *fluid* ariſing from the preſſure of a ſuperincumbent *fluid*, at any depth, is the ſame as that which a body would acquire in falling from a height equal to the depth; as is demonſtrated both from mechanics and experiments. See DESCENT.

III. If two tubes of equal diameters, full of any *fluid*, be placed in any poſition, either erect, or inclined; provided they be of the ſame altitude, they will diſcharge equal quantities of the *fluid* in equal times.

That tubes, every way equal, ſhould, under the ſame circumſtances, empty themſelves equally, is evident; and that the bottom of a perpendicular tube is preſſed with the ſame force as that of an inclined one, when their altitudes are equal, has already been ſhewn. Whence it eaſily follows, that they muſt yield equal quantities of water, &c.

IV. If two tubes of equal altitudes, but of unequal apertures, be kept conſtantly full of water, the quantities of water they yield in the ſame time, will be as the diameters; and this, whether they be erect, or any way inclined.

Hence, if the apertures be circular, the quantities of water emptied in the ſame time, ought to be in a duplicate ratio of the diameters.

But this law, Mariotte obſerves, is not perfectly agreeable to experiment. If one diameter be double the other, the water flowing out of the leſs is found more than a fourth of what flows out of the greater. But this may have been owing to the ſame accidental irregularities in making the experiments.

Wolfius however aſcribes it principally to this, that the column of water directly over the aperture is ſhorter than that next the ſides or parietes of the veſſel: for the water, in its efflux, forms a kind of cavity over the aperture; that part immediately over it being evacuated firſt, and the other water not running faſt enough from the ſides to ſupply it. Now, this cavity, or diminution of altitude, being greater in the greater tube, than in the leſs; hence the preſſure, or endeavour to paſs out, becomes proportionably leſs in the greater tube, than in the leſs.

V. If the apertures E and F of two tubes AB and CD (*fig.* 18. and 19.) be equal, the quantities of water, diſcharged in the ſame time, will be as the velocities.

VI. If two tubes have equal apertures E and F, and unequal altitudes AB and CD, the quantity of water diſcharged from the greater AB, will be to that diſcharged from CD, in the ſame time, in a ſubduplicate ratio of the altitudes AB and CD.

Hence, 1. The altitudes of waters, AB, and CD, diſcharged through equal apertures E and F, will be in a duplicate ratio of the waters diſcharged in the ſame time. And as the quantities of water are as the velocities, the velocities are likewiſe in a ſubduplicate ratio of their altitudes.

Hence, 2. The ratio of the waters diſcharged by two tubes AB, and CD, together with the altitude of one of them, being given, we have a method of finding the altitude of the other, viz. by finding a fourth proportional to the three given quantities; which proportional, multiplied by itſelf, gives the altitude of CD, required.

Hence, alſo, 3. The ratio of the altitudes of two tubes of equal apertures being given, as alſo the quantity of water diſcharged by one of them, we have a method of determining the quantity the other ſhould diſcharge in the ſame time.

Thus, to the given altitudes, and the ſquare of the quantity of water diſcharged at one aperture, find a fourth proportional. The ſquare root of this will be the quantity of water required.

Suppoſe, e. gr. the height of the tubes as 9 to 25, and the quantity of water diſcharged at one of them, three inches; that diſcharged by the other will be $= \sqrt{\frac{9 \times 25}{9}} = \sqrt{25} = 5$.

VII. If the altitude of two tubes AB and CD be unequal, and the apertures E and F be likewiſe unequal, the quantities of water, diſcharged in the ſame time, will be in a ratio compounded of the ſimple ratio of the apertures, and the ſubduplicate one of the altitudes.

And hence, if the quantities of water diſcharged in the ſame time by two tubes, whoſe apertures and altitudes are unequal, be equal, the apertures are reciprocally as the roots of the altitudes, and the altitudes in a reciprocal ratio of the ſquares of the apertures.

VIII. If the altitudes of two tubes be equal, the water will flow out with equal velocity, however unequal the apertures be.

IX. If the altitudes of two tubes, AB and CD, as alſo their apertures, E and F, be unequal, the velocities of the waters diſcharged are in a ſubduplicate ratio of their altitudes.

And hence, 1. As the velocities of waters flowing out at equal apertures, when the altitudes are unequal, are alſo in a ſubduplicate ratio of the altitudes; and as this ratio is equal, if the altitudes be equal, it appears in the general, that the velocities of waters flowing out of tubes, are in a ſubduplicate ratio of the altitudes.

Hence alſo, 2. The ſquares of the velocities are as the altitudes.

Mariotte found, from repeated experiments, that if a veſſel ABCD have a tube EG fitted to it, there will more water be evacuated through the tube, than there could have been, in the ſame time, through the aperture of the veſſel E without the tube; and that the motion of the *fluid* is accelerated ſo much the more, as the tube EG is the longer.

E. gr. The altitude of a veſſel AC being one foot, that of the tube EG three feet, and the diameter of the aperture three lines, no leſs than $6\frac{1}{2}$ ſeptiers of water were diſcharged in the ſpace of one minute; whereas, upon taking off the tube, only four ſeptiers were diſcharged. Again, when the length of the tube EG was ſix feet, and the diameter of the aperture G an inch, the whole quantity of water ran out in thirty-ſeven ſeconds; but, cutting off half the tube, the veſſel was not evacuated in leſs than forty-five ſeconds; and, taking it quite away, in leſs than ninety-five ſeconds.

X. The altitudes and apertures of two cylinders full of water being the ſame, one of them will diſcharge double the quantity of water diſcharged in the ſame time by the other, if the firſt be kept continually full, while the other runs itſelf empty; for the velocity of the full veſſel will be equable, and that of the other will be continually

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nually retarded. Now, it is demonſtrated, that, if two bodies be impelled by the ſame force, and the one proceeds equably, and the ſecond is equably retarded, by that time they have loſt all their motion, the one has moved double the ſpace of the other.

XI. If two tubes have the ſame altitudes, and equal apertures, the times wherein they will empty themſelves, will be in the ratio of their baſes.

XII. Cylindric and priſmatic veſſels, as ABCD (*fig.* 20.) empty themſelves by this law, that the quantities of water diſcharged in equal times decreaſe, according to the uneven numbers 1, 3, 5, 7, 9, &c. taken backwards.

For the velocity of the deſcending level FG is continually decreaſing in the ſubduplicate ratio of the decreaſing altitudes; but the velocity of a heavy body deſcending, increaſes in the ſubduplicate ratio of the increaſing altitudes. The motion, therefore, of the level FG, in its deſcent from G to B, is the ſame as if it were to deſcend in the inverſe ratio from B to G; but, if it deſcend from B to G, the ſpaces, in equal times, would increaſe, according to the progreſſion of the uneven numbers; conſequently the altitudes of the level FG, in equal times, would decreaſe, according to the ſame progreſſion inverſly taken.

Hence, therefore, the level of water FG deſcends by the ſame law, as, by an equal force impreſſed, it would aſcend through an altitude equal to BG.

From this principle many other particular laws of the motion of *fluids* might be demonſtrated, which, for brevity ſake, we here omit.

To divide a cylindrical veſſel into parts, which ſhall be evacuted in certain parts or diviſions of time, ſee CLEPSYDRA.

XIII. If water, deſcending through a tube HE (*fig.* 21.) ſpout up at the aperture G, whoſe direction is vertical, it will riſe to the ſame altitude GI, at which the level of the water LM, in the veſſel ABCD, does ſtand.

For ſince the water is driven through the aperture G by the force of gravity of the column EK, its velocity will be the ſame as that with which a body, by the ſame force impreſſed, would riſe to the altitude FI: wherefore, ſince the direction of the aperture is vertical, the direction of the water ſpouting through it, will be ſo too; conſequently the water muſt riſe to the height of the level of the water LM in the veſſel.

Indeed, by the experiment, it appears, that the water does not riſe quite ſo high as I: beſides, the aperture G ſhould be ſmaller, as the height of the level of the water is leſs; and even ſmaller when mercury is to be ſpouted than when water. But this is no objection to the truth of the theorem; it only ſhews, that there are certain external impediments, which diminiſh the aſcent. Such are, the reſiſtance of the air, and the friction of the tube, &c. See JET *d'Eau*.

XIV. Water, deſcending through an inclined tube, or a tube bent in any manner, will ſpout up, through a perpendicular aperture, to the height at which the level of the water in the veſſel ſtands.

XV. The lengths or diſtances DE and DF, or IH and IG, (*fig.* 22.) to which water will ſpout either through an inclined, or an horizontal aperture D, are in a ſubduplicate ratio of the altitudes in the veſſel or tube AB and AC.

For ſince water, ſpouted out through the aperture D, endeavours to proceed in the horizontal line DF, and, at the ſame time, by the power of gravity, tends downwards in lines perpendicular to the ſame; nor can the one power hinder the other, inaſmuch as the directions are not contrary; it follows, that the water, by the direction BA, will arrive at the line IG in the ſame time wherein it would have arrived at it, had there been no horizontal impulſe at all. Now, the right lines IH and IG are the ſpaces which the ſame water would have deſcribed in the mean time by the horizontal impetus; but the ſpaces IH and IG, inaſmuch as the motion is uniform, are as the velocities: conſequently the velocities are in a ſubduplicate ratio of the altitudes AB and AC; and therefore the lengths or diſtances, to which the water will ſpout in apertures either horizontal or inclined, are in a ſubduplicate ratio of the altitudes.

That the velocities are in the ſubduplicate ratio of the altitudes may be ſhewn by experiment: for, let two pipes, as C and *g*, of equal ſized bores, be fixed into the ſide of the veſſel AB, (*fig.* 23.) and let the pipe *g* be four times as deep below the ſurface of the water at *b*, in the veſſel, as the pipe C is; and whilſt theſe pipes run, let water be conſtantly poured into the veſſel, to keep the ſurface at the ſame height. Then a veſſel holding a pint, applied to the ſpout C, and another containing a quart, at the ſpout *g*, will be filled at the ſame time. The horizontal diſtance, to which a *fluid* will ſpout from an horizontal pipe, in any part of the ſide of an upright veſſel, below the ſurface of the *fluid*, is equal to twice the length of a perpendicular to the ſide of the veſſel, drawn from the mouth of the pipe to a ſemicircle deſcribed upon the altitude of the *fluid*; and, therefore, the *fluid* will ſpout to the greateſt diſtance poſſible from a pipe, whoſe mouth is at the center of the ſemicircle; becauſe a perpendicular to its diameter (ſuppoſed parallel to the ſide of the veſſel) drawn from that point, is the longeſt that can poſſibly be drawn from any part of the diameter to the circumference of the ſemicircle. Thus, if the veſſel AB, *fig.* 23. be full of water, the horizontal pipe D be in the middle of its ſide, and the ſemicircle N *e d c b* be deſcribed on D as a center, with the radius D *g* N, or D *f b*, the perpendicular D *d* to the diameter N D *b*, is the longeſt that can be drawn from any part of the diameter to the circumference N *e d c b*. And if the veſſel be kept full, the jet G will ſpout from the pipe D to the horizontal diſtance NM, which is double the length of the perpendicular D *d*. If two other pipes, as C and E, be fixed into the ſide of the veſſel at equal diſtances above and below the pipe D, the perpendiculars C *c* and E *e*, from theſe pipes to the ſemicircle, will be equal; and the jets F and H, ſpouting from them, will each go to the horizontal diſtance NK, which is double the length of either of the equal perpendiculars C *c* or E *e*. Ferguſon's Lect. p. 70.

Hence, as every body, projected either horizontally or obliquely, in an unreſiſting medium, deſcribes a parabola; water projected either through a vertical or inclined ſpout, will deſcribe a parabola.

Hence we have a way of making a delightful kind of water arbours, or arches, viz. by placing ſeveral inclined tubes in the ſame right line.

On theſe principles are formed various hydraulic engines for the raiſing, &c. of fluids, as pumps, ſyphons, fountains, or jets d'eau, &c. which ſee deſcribed under their proper articles PUMP, SYPHON, FOUNTAIN, SPIRAL SCREW, &c.

For the laws of the motion of FLUIDS, by their own gravity, along open chanels, &c. ſee RIVER, and WAVE, and *Motion* of WATER.

For the laws of preſſure and motion of air, conſidered as a FLUID, ſee AIR, and WIND.

FLUIDS. Animalcules obſerved in *fluids* are of divers kinds; ſome are flat, others eel-like, but the greater part of an oval figure. Lewenhoeck gives a deſcription of a very unuſual ſhaped creature, fixed in a little ſcabbard or ſheath, which was faſtened to ſome of the ſmall green weeds found in ditches full of water. Phil. Tranſ. N° 337, p. 160.

Waters of all kinds, that have ſtood a while expoſed to the air, till they have grown a little putrid, or where putrefaction has been promoted by the admixture of other matters, abound in variety of animalcules, having each their peculiar characters, ſizes, figures, œconomy, and method of life, not to ſay uſes. In a ſmall drop of the diſcoloured ſurface of rain-water, which had ſtood two months in a window, Dr. Harris obſerved four ſorts of animalcules: the clear part of the drop preſented two kinds, both very ſmall; the firſt of the figure of ants-eggs: theſe were in a continual briſk motion. The ſecond more oblong, three times as long as broad, were exceedingly numerous, but their motion ſlow.

In the thick part of the drop there were alſo two ſorts of animalcules. The firſt of the eel-kind, reſembling thoſe in vinegar, but much ſmaller, and with their extremes more ſharp. Theſe would wriggle out into the clear part, and then ſuddenly betake themſelves back again, and hide in the thick and muddy part of the drop, much like common eels in the water. The ſecond ſort reſembled a large maggot, which would contract themſelves into a ſpherical figure, and then ſtretch out again. The end of the tail appeared with a forceps, like that of an ear-wig. They might be plainly perceived to open and ſhut their mouths, from whence air-bubbles were frequently diſcharged. The number of theſe was not above four or five. The ſame four kinds of animalcules he alſo found in many other drops of the ſame corrupted water. Animalcules in *fluids*, are generally found at the top. In the lower parts of the water, Dr. Harris aſſures us he could never find any, unleſs when the liquor had been diſturbed, and the ſurface ſhaken down, and mingled with the lower parts. Dr. Harris examined ſome rain-water that had ſtood uncovered a little while, but had not contracted any thick or diſcoloured ſcum.

And here, where the water was clear, he could not find any animals at all; but a little thin white ſcum, that, like greaſe, began to appear in its ſurface, he found to be a congeries of exceeding ſmall animals of different ſhapes and ſizes, much like thoſe produced by ſteeping barley in water.

Viewing a ſmall drop of the green ſurface of ſome puddle water,

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water, he found it altogether compoſed of animalcules of ſeveral ſhapes and magnitudes; the moſt remarkable, were thoſe which gave the water that green colour, and were oval creatures, whoſe middle parts were of a graſs-green, but each end clear and tranſparent. They could contract and dilate themſelves, tumble over and over many times together, and then ſhoot away like fiſhes. Phil. Tranſ. N° 220, p. 255.

Dr. Harris looked on the ſurface of ſome mineral chalybeate water, which ſtood in a vial unſtopt for about three weeks. In it he ſaw two kinds of animals, one exceeding ſmall, and the other very large, which latter ſort had on the tail ſomething that looked like fins. There were but very few of either ſort. Phil. Tranſ. N° 220, p. 257. ſeqq.

Animalcules in *fluids* are eaſily deſtroyed by only ſeparating them a while from their element. Naturaliſts have even found ſhorter ways. A needle-point dipped in ſpirit of vitriol, and then immerſed into a drop of pepper-water, readily kills all the animalcules, which though before friſking about with great livelineſs and activity, no ſooner come within the influence of the acid particles, than they ſpread themſelves, and tumble down to all appearance dead. The like may be done by a ſolution of ſalt, only with this difference; that by the application of this latter, they ſeem to grow vertiginous, turning round and round, till they fall down. Tincture of ſalt of tartar uſed in the ſame manner kills them ſtill more readily; yet not ſo, but there will be apparent marks of their being ſick firſt and convulſed. Inks deſtroy them as faſt as ſpirit of vitriol, and human blood, by virtue of the ſalt contained in it, produces the ſame effect. Urine, ſack, and ſugar, do all deſtroy them, though not ſo faſt; beſides, that there is ſome diverſity in their figures and appearances, as they receive their deaths from this poiſon, or that. The point of a pin dipped in ſpittle preſently killed all the kinds of animalcules in puddle water, as Dr. Harris ſuppoſes it will other animalcules of this kind. Phil. Tranſ. N° 203, p. 863, ſeq. and No. 220, p. 256.

We find in the waters of our ditches many ſpecies of ſmall animalcules, both of the cruſtaceous and teſtaceous kinds. The legs of the creatures are ſhort, they reſemble thoſe of crabs and lobſters, but are of a much more curious ſtructure; they are leſs than a ſmall flea, but they ſeem all breeders, carrying ſpawn at their tails, or in two ſmall bags, one hanging from each ſide. Theſe bags are often ſeen broken, and the ſpawn is then found to conſiſt of globules very large in proportion to the ſize of the creature. There is another ſort beſide theſe, as beautiful, but much ſmaller than they; this in ſhape more reſembles the ſhrimp, and carries its ſpawn as the ſhrimp does. Theſe kinds both ſeem only to have one eye, and that placed exactly in the middle of their forehead, without the leaſt trace of a dividing line; and they are often ſo tranſparent, that the motion of their bowels, and pulſation of their heart, may be ſeen. Baker's Microſcope, p. 93.

All who are acquainted with the microſcope, know very well, that in water, in which the beſt glaſſes can diſcover no animated particle of matter, after a few grains of pepper, or a ſmall fragment of a plant of almoſt any kind has been ſome time in it, animals full of life and motion are produced, and thoſe ſo numerous as to equal the *fluid* itſelf in quantity.

A ſmall quantity of water taken from any ditch in the ſummer months, is found to be full of little worms, ſeeming in nothing ſo much as ſize to differ from theſe microſcopic animalcules. Nay water, without theſe, expoſed in open veſſels in the ſummer months, will be always found, after a few days, to abound with multitudes of them, viſible to the naked eye, and full of life and motion.

Theſe we know, by their future changes, are the fly-worms of the different ſpecies of gnats, tipulæ, and multitudes of the other fly-ſpecies; and we can eaſily determine, that they have owed their origin only to the eggs of the parent fly there depoſited. Nay, a cloſer obſervation will at any time give ocular proof of this; as the flies may be ſeen laying their eggs there, and thoſe eggs may be followed in all their changes to the fly again. Why then are we to doubt but that the air abounds with other flies and animalcules, as minute as the worms in theſe *fluids?* and that theſe laſt are only the fly-worms of the former, which after a proper time ſpent in that ſtate, will ſuffer changes like thoſe of the larger kinds, and become flies like thoſe to whoſe eggs they owed their origin? Vid. Reaumur, Hiſt. Inſect. vol. iv. p. 431.

The differently medicated liquors, made by the infuſions of different plants, afford a proper matter for the worms of different ſpecies of theſe ſmall flies; and there is no reaſon to doubt but that among theſe ſome are viviparous, others oviparous, and to this may be in a great meaſure owing the different time taken up for the production of the inſects in different *fluids*. Thoſe which are a proper matter for the worms of the viviparous fly, may be ſooneſt found full of them, as probably the liquor is no ſooner in a ſtate to afford them a proper nouriſhment than their parents place them there: whereas thoſe produced from the eggs of the little oviparous flies muſt, after the liquor is in a proper ſtate, and they are depoſited in it, in form of eggs, have a proper time to be hatched before they can appear alive.

It is eaſy to prove that the animals we find in theſe vegetable infuſions were brought thither from ſome other place. It is not leſs eaſy to prove that they could not be in the matter infuſed, any more than in the *fluid* it is infuſed in.

Notwithſtanding the fabulous accounts of ſalamanders, it is now well known, that no animal, large or ſmall, can bear the force of fire for any conſiderable time; and by parity of reaſon we are not to believe, that any inſect, or embryo inſect, in any ſtate, can bear the heat of boiling water for many minutes. To proceed to enquiries on this foundation, if ſeveral tubes filled with water with a ſmall quantity of vegetable matter, ſuch as pepper, oak-bark, truffles, &c. in which, after a time, inſects will be diſcovered by the microſcope; and other-like tubes be filled with ſimple water boiled, with water and pepper boiled together, and with water with the two other ingredients, all ſeparately boiled in it; when all theſe liquors come to a proper time for the obſervation of the microſcope, all, as well thoſe which have been boiled, as thoſe which have not, will be found equally to abound with inſects, and thoſe of the ſame kind in the infuſions of the ſame kind, whether boiled or not boiled.

Thoſe in the infuſions which had ſuſtained a heat capable of deſtroying animal life, muſt therefore not have ſubſiſted either in the water, or in the matters put into it, but muſt have been brought thither, after boiling, and it ſeems by no way ſo probable, as by means of ſome little winged inhabitants of the air depoſiting their eggs or worms in thoſe *fluids*.

It is a natural queſtion on this to aſk, why it is, that while we ſee myriads of the progeny of theſe winged inſects in water, we ſeldom ſee the inſects themſelves? The anſwer is equally eaſy, viz. becauſe we can always place a drop of this water immediately before the focus of the microſcope, and keep it there while we at leiſure examine its contents; but that is not the caſe with regard to the air inhabited by the parent flies of theſe our worms, which is of immenſe extent in proportion to the water proper to nouriſh theſe worms, and conſequently, while the latter are cluſtered together in heaps, the former may be diſperſed and ſcattered. Nor do we want inſtances of this even in the inſects of a larger kind. In many of our gardens we frequently find veſſels of water filled with the gnat-worms, as plentifully in proportion to their ſize, as theſe our *fluids* with animalcules. Every cubic inch of water in theſe veſſels contains many hundreds of theſe animals; yet we ſee many cubic inches of the air in the garden not affording any one of the parent flies. Id. ibid. See ANIMALCULES, EEL, VINEGAR, and PEPPER-*water*.

FLUID, *Cauſtic*. See CAUSTIC-*fluid*.

FLUID, *Senſitive*. See SENSITIVE-*fluid*.

FLUKE, in *Ichthyology*, a word uſed in ſome parts of England as a name for the FLOUNDER.

FLUKE *of an anchor*, that part of it which faſtens in the ground. See ANCHOR.

FLUKEN, in *Natural Hiſtory*, a name given by the miners in Cornwall, and ſome other places, to a ſort of greyiſh ſoft earth, in which there are a great number of ſmall white ſtones of a ſparry nature. They uſually find this mixt ſubſtance near the places where the loads or veins of ore lie, and it ſeems evidently to have been waſhed from among the broken parts of the ſtrata near where the metals lie. It is itſelf a coarſe and often foul earth, and the white ſtones which it contains, are ſometimes ſmall cryſtalline, but opake pebbles, of the nature of thoſe which we find in various ſizes in our ſand and gravel-pits; but more uſually they are ſmall fragments of common ſpar, and are of a plated figure when broken, and ſeem only rounded by the motion of the water, like many ſmall ſtones which are found in the beds of rivers, and on the ſea-ſhores. The ſoft nature of the ſubſtance of which theſe are compoſed makes them eaſily liable to be rubbed into a round figure.

FLUMMERY, a wholeſome ſort of vegetable jelly made of oatmeal.

The manner of preparing it is as follows: put in the proportion of three large handfuls of finely ground oatmeal, to ſteep for twenty-four hours or more, in two quarts of fair water; then pour off the clear water, and put two quarts

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quarts of fresh water to it; strain it through a fine hair-sieve, and boil it till it is as thick as a hasty pudding, stirring it continually while it is boiling that it may be very smooth: some sweeten it with sugar, and add rose or orange-flower water; and then eat it with white or Rhenish wine, cream, or milk.

FLUOR, in *Physic*, &c. denotes a fluid; or, more properly, the state of a body, which was before hard and solid, but is now reduced, by fusion or fire, into a state of fluidity.

Gold and silver will remain a long time in *fluor*, kept to them by the intensest heat, without losing any thing of their weight. See GOLD, FIXITY, &c.

The word *Fluor* is applied to signify the habitual fluidity of any substance, or that property by which a substance cannot be rendered solid, and is employed as an epithet, to distinguish such substances from others of the same kind, but which are habitually solid, or which may be rendered solid.

Thus, acids, which are habitually fluid, as all the mineral and some vegetable acids, are called *fluor* acids, in order to distinguish them from the acid of tartar and acid essential salts, which are naturally concrete. Also volatile alkali treated with quick-lime, or with metallic earths, so that it is always liquid and not crystallized, is called *fluor* volatile alkali, to distinguish it from the concrete and crystallizable volatile alkali. See ACID *Fluor*.

FLUOR is also used, by the modern mineral writers, for such soft, transparent, sparry kinds of mineral concretions, as are frequently found amongst ores and stone, in mines and quarries.

These are of a stony nature, and resemble gems, but are less hard, and are called *metallic fluors* and *spars*.

FLUOR *Albus*, or *Uterinus*, a kind of flux, incident to women, popularly called the *whites*.

It consists in an irregular, disorderly discharge of some corrupt humour from the uterus, near the os internum and the vagina, sometimes white and pale, like whey; sometimes yellow, green, or blackish. At first, it is usually mild, and harmless; but, in time, it grows hot, sharp, and corrosive, and excoriates all the parts it touches. It is attended with a pain in the spina dorsi, a swelling of the feet and eyes, weariness, lumbago, a loss of appetite, loathings, and unaccountable longings, change of complexion, &c.

It generally proceeds from a relaxed habit, arising from indolence, extreme grief, or the immoderate use of coffee, tea, or other weak and watery diet; and sometimes from excessive menstrual discharges, abortions, &c.

The immediate causes of a *fluor albus*, are debility of the vessels from which the menstrual discharge is made, or a retarded circulation of the blood through them. In some languid habits, the *fluor albus* returns periodically, instead of the proper menstrual evacuation, till the patient's constitution is invigorated; and in many instances, it is manifest only during the absence of the menses.

It must be carefully distinguished from an ulcer in the uterus, and a gonorrhœa, which last it greatly resembles.

It happens to all ages, from girls of three years old; and at all times, before, after, or even along with, the menses, and even to women with child.

Those that are most subject to this disorder, are women abounding with serum, those of lax fibres, women at the flower of their age, and girls at the approach of the menses.

Etmuller takes it for a gonorrhœa muliebris, analogous to a non-virulent gonorrhœa in men, flowing out of the glandulæ of the prostates.

What the coryza is in the nostrils; too much weeping in the eyes; and coughing and hawking in the fauces; that, according to Etmuller, is this *fluor* in the uterus.

According to Pitcairn, all the difference between the venereal gonorrhœa, and a *fluor albus*, is, that the humour evacuated in the latter is viscid, and in the former quite thin and serous. The same author adds, that the *fluor albus* can only be cured by medicines proper for the venereal disease.

Astruc distinguishes this disorder into the lymphatic, semilacteous, and lacteous: Dr. Shebbeare says, that the *fluor albus*, the hectic fever, and the diabetes, are of the same general kind, and that they are caused by a defect of vital heat in different circumstances.

Other authors distinguish this disease into two kinds, the benign and the malignant; the first is simple, the other complicated with the venereal disease. The simple *fluor albus*, though called benign in comparison of the other, is yet very difficult to cure, and is always the more so, the longer it has continued upon the person; and very often the common methods by medicine fail, unless the cause and manner of life be changed. But though it is thus difficult of cure, it is of less danger than many other diseases, for many women have had it many years, nay a great part of their lives even to old age, and that without any great hurt. Indeed it very rarely grows to that height as to injure the strength or health, farther than by a paleness of the face, and a tumid look, and a lassitude of the limbs: but if this discharge, when it has been many years habitual to a person, be stopped by any improper methods, it often brings on very terrible complaints. The worst effect of the *fluor albus*, is that, when of long standing, it usually renders women barren; and its principal difficulty of cure is this, that it will often seem to give way to medicines, but return afterwards with all its former violence; nay when people seem ever so perfectly cured of it, it often returns, and the whole method is to be gone through again. The *fluor albus*, while it only attends the flowing of the menstrual discharges, is a thing of no great moment; but when those discharges stop, and this matter becomes more acrid, and is voided in larger quantities, it then becomes a disease that calls for all the art of the physician to remedy it; for, in some persons it brings on finally hectics and wasting of the flesh, and in others cachexies, œdemas, and dropsies.

Method of cure. When this disease happens to a person of a plethoric habit, the first step toward a cure is bleeding in the foot, to discharge part of the load of blood, lest nature should make that an occasion of converting a great part of it into serum, and throwing it upon the uterus for its discharge. After bleeding, an abstersion of the matter of the disease, and a successive evacuation of it are to be attempted, by the more temperate uterine medicines, the gentle emmenagogues and cleansers; such are amber, myrrh, and turpentine. The second of these is to be given, but in moderate doses, and the last succeeds best after boiling, or when mixt with mastic. The digestive salts are also to be given, and nitre in this case often proves a very beneficial medicine. The aperient roots, such as lovage, pimpernel, and the like, are to be given in decoction, and the leaves of baum and southernwood are no ineffectual remedies; and finally the gums are to be added, such as galbanum, ammoniacum, and sagapenum. After these abstergents and preparatory medicines, gentle purges are to be given, and finally such medicines as restore the due tone of the parts; of this nature are the milder chalybeats, and decoctions of the nervous and aromatic herbs, such as rosemary, origanum, serpyllum, and the like. Junker's Consp. Med. p. 472.

The diet of the patient should be solid and nourishing, but easy of digestion: her drink generous, as red port or claret, mixed with Pyrmont, Bristol, or lime-water. Isinglass dissolved in milk, strong broths, and a milk diet, have been of considerable service: tea and coffee should be avoided. The best medicine is the Peruvian bark in substance; and the cold bath is extremely useful. Dr. Cheyne recommends mild mercurials to alter, chalybeats to invigorate, and the bark and cold bathing for completing the cure.

Dr. Morgan thinks the *fluor albus* is the lymph corrupted, and assures us, that the tincture of cantharides, given in a pretty strong decoction of guiacum, has good effects when the distemper is recent, but when it is of long standing and inveterate, recourse must be had to mercurials.

FLUSH *Deck*. See DECK.

FLUSHER, in *Ornithology*, the common name of the lesser BUTCHER-*bird*, called by authors the lanius minor, and the lanius tertius of Aldrovand. Its beak is black, long, and very strong, and a little hooked at the end: the mouth is yellow within, and the tongue jagged. It has several short bristles at the top of the beak. The middle of its back and smaller feathers of its wings are of a reddish brown; its head and rump grey: it has a broad black line on each side of the head, running from the angle of the beak; its belly is white; its throat and breast whitish, with a cast of red. Its wing-feathers are brown and black, and its legs and feet of a deep bluish black. It builds in holly-bushes and such places, and lays six oblong eggs, white at the smaller end, and ornamented with a circle and reddish spots at the other. It is common in Germany and in the northern parts of England. Ray's Ornith. p. 54.

FLUTA, in *Ichthyology*, a name given by Gaza and some authors to the common SPARUS, distinguished by Artedi, by the name of the plain yellowish SPARUS, with a large annular black spot near the tail.

FLUTA is also a name given by Columella to the muræna of Aristotle and the ancient authors in general, as well Greek as Roman. It makes only one species of the muræna, according to Artedi; but being with him a generical name which comprehends all the eel-kind, the serpens marinus and the like, among these. This, which

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was anciently called ſimply the muræna, is diſtinguiſhed by that author under the name of the muræna having no pectoral fins; which being peculiar to this ſpecies, evidently and obviouſly diſtinguiſhes it at firſt ſight from all the reſt.

FLUTE, an inſtrument of muſic, the ſimpleſt of all thoſe of the wind-kind; played, by blowing it with the mouth; and the tones or notes formed and changed by ſtopping or opening holes diſpoſed for that purpoſe all along it. Thoſe in common uſe are either the *flute abec*, i. e. a beaked or common Engliſh *flute*, and the traverſe, Helvetian, or German *flute*, the invention of which is aſcribed by Galileo and Merſenne to the Helvetians: but the antique ſtatue of the piping faun, and a teſſelated pavement of Fortuna Virilis, erected by Sylla at Rome, in which is a repreſentation of a young man playing on a traverſe pipe, with an aperture to receive his breath, ſhew that it is of more ancient original.

The Latins call it *fiſtula*, and ſometimes *tibia*, pipe; from the former of which, ſome derive the the word *flute*: though Borel will have it derived from *fluta*, a lamprey, thus called *a fluitando in fluviis*; in regard the *flute* is long, like the lamprey, and has ſeven holes all along it, like that fiſh. Hawkins's Muſ. p. 128.

The ancient *fiſtulæ*, or *flutes*, were made of reeds; afterwards they were of wood; and at length of metal. But how they were blown, whether as our *flutes*, or hautboys, does not appear.

Monſ. Caſtillon apprehends that they were ſounded by means of a reed; and that there were two ſorts of them, in one of which the reed was viſible, as in our hautboy, but concealed in the other. Berlin. Mem. 1774, vol. v.

It is plain, ſome had holes, which at firſt were but few; but afterwards were increaſed to a greater number; and ſome had none. Some were ſingle pipes, and ſome a combination of ſeveral, particularly Pan's ſyringa, which conſiſted of ſeven reeds, joined together ſideways.

Theſe ſeven reeds had no holes, each giving but one note, in all ſeven diſtinct notes; but at what intervals, is not known: perhaps they were the notes of the natural, or diatonic ſcale.

The German *flute* is different from the common one: it is not put into the mouth, by the end, as the ordinary ones are; the end is ſtopped up with a plug or tampion, but the lower lip is applied to a hole a little way diſtant from it.

It is made equally big every where, and perforated with ſix holes, beſides that of the mouth, and that opened by the key.

FLUTE, or FLUYT, is alſo a kind of long veſſel, with flat ribs, or floor timbers, round behind, and ſwelled in the middle; ſerving chiefly for the carrying of proviſions in fleets, or ſquadrons of ſhips: though it is often uſed in merchandize.

The word *flute*, taken for a ſort of boat, or veſſel, is derived, according to Borel, from the ancient *flotte*, a little boat. In the verbal proceſs of the miracles of St. Catherine of Sweden, in the xiith century, we read, *Unus equum ſuum una cum mercibus magni ponderis introduxit ſuper inſtrumentum de lignis fabricatum, vulgariter dictum* Fluta. Upon which the Bollandiſts obſerve, that in ſome copies it is read *flotta*, an inſtrument called by the Latins *ratis*; and that the word *flutta* or *flotta*, aroſe from *flotten*, or *vlotten*, to float.

FLUTE, in *weaving tapeſtry*. See TAPESTRY.

FLUTES, or FLUTINGS, in *Architecture*, are perpendicular channels, or cavities, cut along the ſhaft of a column, or pilaſter. See *Tab. Archit. fig.* 25, 26.

They are ſuppoſed to have been firſt introduced in imitation of the plaits of womens robes; and are therefore called by the Latins, *ſtriges*, and *rugæ*.

The French call them *cannelures*, as being excavations; and we, *flutes*, or *flutings*, as bearing ſome reſemblance to the muſical inſtrument ſo called.

They are chiefly affected in the Ionic order, in which they had their firſt riſe; though they are alſo uſed in all the richer orders, as the Corinthian and Compoſite; but rarely in the Doric; and ſcarce ever in the Tuſcan.

Their number is uſually twenty-four, though in the Doric it is only twenty.

Each *flute* is hollowed exactly in a quadrant of a circle.

Between the *flutes* are little ſpaces that ſeparate them, called, by Vitruvius, *ſtriæ*, and by us, *liſts*; though in the Doric, the *flutes* are frequently made to join each other, without any intermediate ſpace at all, the liſt being ſharpened off to a thin edge, which forms a part of each *flute*.

In ſome buildings we ſee columns with *flutes* that go winding round the ſhaft, ſpirally; but this is rather looked on as an abuſe.

Vignola determines the depth of the *flutes*, by taking the angle of an equilateral triangle for the centre. Vitruvius deſcribes it from the middle of the ſquare, whoſe ſide is the breadth of the *flute*; which latter method makes them deep. The *flutes*, or *ſtriges*, are frequently filled up with a prominent, or ſwelling ornament, ſometimes plain, in form of a ſtaff, or reed; and ſometimes a little carved, or enriched, in imitation of a rope, or otherwiſe, and therefore called *radentures*, or CABLINGS; and the columns, thus enriched, are called *cabled columns*.

This is moſt frequent in the Corinthian order. The cablings, or fillings up, commence from about one third of the height of the column, reckoning from the baſe; and are continued to the capital: that is, they begin and end with the diminution of the column.

FLUTES, or *Flutings*, are alſo uſed, in *Botany*, to denote the ſtems and fruits of certain plants, which have furrows analogous to thoſe of theſe columns.

FLUVIALIS, in *Botany*, the name given by Vaillant and Micheli to a genus of plants called by Linnæus NAJAS.

FLUVIATILES *cochleæ*, freſh-water *ſhell-fiſh*, a term uſed by naturaliſts, to expreſs thoſe kinds of ſhell-fiſh which never inhabit the ſea, but are found in our ponds, rivers, and ditches. Theſe, though much leſs numerous than the ſpecies of ſea-ſhells, are yet of a greater variety and beauty, than is uſually ſuppoſed. What are known at preſent, may be arranged under their proper heads in the following manner.

Of the univalve kinds we have two ſpecies of patellæ: the one having a beak at the ſummit of the ſhell; the other wanting it, and being ſmooth as the common patellæ or limpets of the ſea.

Of the *limaces* or ſnails we have five ſpecies; of the freſh water *neritæ* we have three kinds; one ſpecies of the *trochus*; three ſpecies of the *turbo*; ſeven ſpecies of the water *buccina*; four ſpecies of the *dolia*, or *conchæ globoſæ*; four ſpecies of the *cornu ammonis*: of the bivalve freſh-water ſhells we have five ſpecies of the *chama* kind; ſix ſpecies of the muſcle kind.

Of the *pecten* kind we have only one ſpecies.

Of the multivalve claſs, there is not one known ſpecies.

The reducing the ſeveral ſpecies to their proper genera is eaſy, from a remembrance of the characters of each genus of the marine ſhells. The limpet is a flat ſhell elevated into a ſort of cone at the ſummit. Of the ſnail kind, if the mouth be round, the ſhell is a true limak; when it is ſemicircular, the ſhell is a nerita; and when it is oval or depreſſed, and the clavicle is long, it is then a trochus. The turbo, or ſcrew-ſhell, is known by its long and ſlender figure. The buccina are long ſhaped, and have a tail, and their mouth is narrow; and the dolia are of a ſomewhat globoſe figure. The cornu ammonis, and the umbilicated ſnail, are often confounded together by thoſe who obſerve their external reſemblance among the freſh water ſhells; but they are in reality ſufficiently different, the cornu ammonis being marked on the outſide with circular ridges, and divided on the inſide into ſeveral ſeparate cells like the common foſſile kinds; whereas the umbilicated ſnail is of an even external ſurface, and has only one cavity within. The ſnail alſo has its mouth placed toward one ſide, the CORNU *ammonis* in the middle: there are other differences, but theſe are ſufficient for the diſtinction. The *chamæ* are known by their roundiſh figure; the muſcles by being oblong; and the *pecten* is known by its ears and its *ſtriæ*. Hiſt. Nat. Eclair. p. 372.

FLUX, FLUXUS, in *Medicine*, an extraordinary iſſue, or evacuation of ſome humour.

Fluxes are various, and variouſly denominated, according to their ſeats, or the humours thus voided; as a *flux* of the belly, uterine *flux*, hepatic *flux*, ſalival *flux*, &c.

The *flux* of the belly is of four kinds, which have each their reſpective denominations, viz. the LIENTERY, or *fluxus lientericus*; the COELIAC, or *fluxus chyloſus*; the DIARRHOEA; and the DYSENTERY, or *bloody flux*.

A wound, or ſcarification acroſs the crown of the head, is uſed in Scotland, to cure *fluxes* and dyſenteries. Philoſoph. Tranſact. N° 312.

The biſhop of Cloyne, in his reflections on tar-water, ſays, he has known a *bloody-flux* of long continuance, after divers medicines had been tried in vain, cured by TAR-*water*. But what he takes to be the moſt ſpeedy and effectual remedy in a *bloody-flux*, is a clyſter of an ounce of common brown roſin, diſſolved over a fire in two ounces of oil, and added to a pint of broth, which not long ſince he had frequent occaſion of trying, when that diſtemper was epidemical. Nor can he ſay, that any to whom he adviſed it, miſcarried.

FLUX, *abortive*, *fluxus abortivus*, is ſometimes uſed, among the ancients, as ſynonymous with abortion or effluxion, viz. where the embryo loſes its hold, and ſlips away. In this ſenſe, the eagle-ſtone is celebrated for ſtopping *abortive* fluxes; for which end it was to be hung to the arm, *ſubnexus ſpem uteri defendit a fluxibus abortivis*. See ÆTITES.

Among

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Among modern phyſicians, *abortive fluxes* are chiefly underſtood of a kind of hæmorrhages, which ſometimes precede, and bring on abortion; at other times, burſt forth in the act of excluſion.

In this ſenſe, a late author defines them a ſpecies of uterine hæmorrhages, happening to married women; when, after a ſtoppage of the menſes, for three or four months ſucceſſively, with a gradual ſwelling of the abdomen, and other ſigns of pregnancy, the blood begins to iſſue from the womb, at firſt ſparingly, like the regular menſes, but afterwards, burſts out with great force, attended with anxieties, fainting fits, and ſometimes with miſcarriage.

The cauſe is a violent ſeparation of the ſecundines from the uterus, which may ariſe from a vehement fit of paſſion, or motion of the body, a fall, fright, or the like. Thunder, lightning, hot liquor, too liberal uſe of deobſtruents, or the navel-ſtring being too ſhort, ſometimes occaſion an *abortive* hæmorrhage.

FLUX *of the mouth*, or ſalival *flux*. See SALIVATION.

The *hepatic* FLUX of the ancients, is, by ſeveral moderns, held a mere name; being, in reality, an hæmorrhoidal *flux*, out of the hæmorrhoidal veins. See HEPATIC *Flux*.

Women are ſubject to three kinds of *fluxes* extraordinary: the firſt, called the MENSES, or *menſtrual flux*, as happening every month; ſometimes *courſes*, as keeping pace with the moon; and ſometimes *flowers*.

The ſecond is after delivery, called LOCHIA.

The third is irregular, and preternatural; and, for want of a better name, called FLUOR *albus*, or the *whites*.

FLUX, in *Hydrography*, a regular, periodical motion of the ſea, happening twice in twenty-four hours; wherein the water is raiſed, and driven violently againſt the ſhores.

The *flux*, or *flow*, is one of the motions of the TIDE: the other, whereby the water ſinks and retires, is called the *reflux*, or *ebb*.

There is alſo a kind of reſt, or ceſſation of about half an hour, between the *flux*, and reflux; during which time the water is at its greateſt height, called *high-water*.

The *flux* is made by the motion of the water of the ſea, from the equator towards the poles; which, in its progreſs, ſtriking againſt the coaſts in its way, and meeting with oppoſition from them, ſwells, and where it can find paſſage, as in flats, rivers, &c. riſes up, and runs into the land.

This motion follows, in ſome meaſure, the courſe of the moon; as it loſes, or comes later every day by about three quarters of an hour; or more preciſely, by forty-eight minutes: and by ſo much is the motion of the moon ſlower than that of the ſun. It is always higheſt and greateſt in full moons, particularly thoſe of the equinoxes. In ſome parts, as at Mount St. Michael, it riſes eighty or ninety feet, though in the open ſea it never riſes above a foot or two; and in ſome places, as about the Morea, there is no *flux* at all. It runs up ſome rivers above a hundred and twenty miles. Up the river Thames it only goes eighty, viz. near to Kingſton in Surry.

Above London-bridge, the water flows four hours, and ebbs eight; and below the bridge, flows five hours, and ebbs ſeven.

FLUXES, in *Metallurgy*, are certain ſaline matters, which cauſe a body otherwiſe not at all, or hardly fuſible by fire, to melt. Fixed alkalis, nitre, borax, tartar, and common ſalt, are the ſaline matters of which *fluxes* are generally compoſed.

The moſt powerful of theſe, are glaſs of lead, and the alkaline and neutral ſalts. Theſe are principally uſed by aſſayers, when they would work minerals in a ſmall quantity; but when large quantities of minerals are to be wrought on, it is ſeldom poſſible to uſe *fluxes* of this kind to any advantage, becauſe of their prices. In theſe caſes, inſtead of theſe expenſive *fluxes*, they uſe ſuch ſtones as are vitrified by a gentle fire, or the ſcoriæ made of the ſame ſtones when melted, which always ſerve their purpoſes much better; for the oftner theſe ſtones have been expoſed to the fire, the more eaſily are they put in fuſion: the reaſon of which ſeems to be, that the alkaline ſalt proceeding from the fuel of the fire, adheres to the ſcoriæ; and theſe added in large quantities to the reſt of the metals in great operations, cauſe the ſaid ores to melt, which are otherwiſe made refractory by the calcarious and incombuſtible ſtones and earths mixed with them.

The melting of gold and ſilver, and of their calxes is greatly promoted by glaſs of lead, alkaline ſalts, &c. but when gold and ſilver in the fuſion itſelf, are to be purged from other metals and ſemimetals, it is proper to uſe nitre only; or if not ſo, nitre muſt be always mixed with the other ſalts; for the ſemimetals and the four leſs perfect metals are deſtroyed by nitre.

In this operation, nitre by its detonation with their ſulphurs is in part alkaliſed, and by the help of a gentle fire, turns their calxes into vitreous and much attenuated ſcoriæ.

From hence, the reaſon is plain, why gold and ſilver, when made brittle, are readily reſtored to their malleability by nitre: for the ſemimetals, and among the metals, lead, and tin, moſt of all communicate this fault to gold and ſilver; but theſe being changed, as before obſerved, by nitre, are then rejected by gold and ſilver in a ſimple fuſion, ſo that they can no longer mix with theſe metals, unleſs they are themſelves firſt again reduced to their metallic ſtate; and there is beſides theſe, no other body that can be mixed with ſilver and gold to render them brittle, unleſs crude charcoal happening to fall into the veſſel, wherein thoſe metals are melted, ſhould impregnate them with ſomething arſenical, there being ſome arſenic contained in coals of this kind; as has been demonſtrated by Stahl and Hoffman.

The leſs perfect metals, and the ſemimetals melt more eaſily by adding ſalts to them, than of themſelves; they always, however, loſe a great deal of their ſubſtance by this means; and this is more particularly the caſe, in regard to copper and iron. To amend this, it is neceſſary to add ſome kind of fat body, which prevents the deſtruction, and even reduces the metals already deſtroyed; and this is the more neceſſary, when the calxes prepared either by burning, or by a detonation with nitre, are to be reduced.

The moſt proper *flux* on theſe occaſions, is that uſually known among metallurgiſts, under the name of the *black flux powder*, and is thus prepared:

Take of common nitre one part, of crude tartar thoroughly dried, two or three parts; make them ſeparately into very fine powder, then grind them well together, and afterwards put them into an earthen pot, narrow at the orifice, not glazed within, and of capacity three times larger than the powder will take up; put this into a gentle fire, and as ſoon as the maſs begins to flame with ſome noiſe, ſhut the orifice of the veſſel with a tile; after the detonation is over, you will find in the veſſel a black oily alkaline ſalt, which is very eaſily fuſible in the fire, and is called the *black flux*: keep it in a dry warm place, and in a veſſel cloſely ſhut, to prevent its growing moiſt.

Tartar being burnt either alone in veſſels cloſely ſhut, or detonated with nitre, is very readily alkalized; and thus retains a conſiderable quantity of the oil which it contains in great abundance, and which is fixed enough to remain with it, after this operation; and for this reaſon it very eaſily becomes a reducing *flux*, which, on account of its alkaline ſalts, diſſolves earths and ſtones, and changes them into an imperfect kind of glaſs by a moderate melting fire; but the oil being of a more fixed nature, ſtill remains concealed therein, and is of great uſe both to preſerve metals from being deſtroyed, and to reduce ſuch as have been deſtroyed already.

If the pot in which this *flux* powder is made be glazed within, and part of the glazing comes off, and mixes with the *flux*, and melts with it, it is again reduced to lead, and may thus diſappoint the artificer; for this cruſt of glazing is given to earthen veſſels by lead or litharge.

Another caution is alſo neceſſary; which is, that all *fluxes* muſt be kept and uſed very dry, for moiſt ſalts foam very much; and when the operations are made in cloſe veſſels, if the fire is quickly increaſed, not being able to get rid of the moiſture, the veſſels will ſplit and break.

Beſides the black, aſſayers are alſo very fond of a white *flux* powder, which is prepared only of equal parts of nitre and tartar detonated in the ſame manner. For in this caſe the oil of the tartar is almoſt entirely conſumed by the abundance of the nitre, and the remaining maſs becomes a whitiſh or aſh-coloured ſalt; which is alſo more powerfully alkaline, and ſharp than the foregoing. This *flux* is very efficacious in the diſſolving of ſtones, and earths; but for want of its oil is of a leſs reductive virtue, and deſtroys the metal, when the fire is continued a little longer than is required.

By crude *flux*, is meant the mixture of nitre and tartar in any proportions, without detonation.

Flux powders are of great ſervice alſo to reduce metals out of their reſpective calxes, and to free them from the ſtones in which they are embodied; but when the refractory calx of iron is to be reduced by a great and long laſting fire, theſe *fluxes* being greatly attenuated, though confined in cloſe veſſels, part from their oily principle, and their alkaline ſalt remaining, begin to corrode and conſume the veſſels, of what matter ſoever they are made, and finally make their way through them and get out. The firſt of theſe accidents is prevented by adding coal duſt, which will never part with its oil, without the help of a free air; and the others by an admixture of common glaſs, made of a due mixture of flints and fixed al-

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kali. For this is ſufficiently fuſible, and readily melts with the *fluxes*, and by its viſcidity, in ſome ſort coagulates, and holds the ſalt of the *flux* together, and prevents it from ſo eaſily corroding the veſſels. Cramer, Art. Aſſ. p. 48, 52.

The great ſecret in making and improving *fluxes* for the ores of metals, is not only to find ſuch ingredients as will be of efficacy to ſeparate the metal already ripened in the ore, but even to maturate and ripen the yet immature part of it in the fire; and ſomething of this kind we apprehend might be effected, as there is great reaſon to believe, that certain *fluxes* will obtain a much larger yield of metals from certain ores than other *fluxes* in common uſe, though eſteemed of the beſt, and perhaps of the deareſt kind: thus clean iron filings will often do more than borax; but as the ſcales and ruſt of iron have commonly been uſed under the name of iron in *fluxes*, few operators know the value of pure iron in that intention, and many advantages are now obtained by mixing one ore with another of the ſame denomination, and with the ſlags or recrements of metals in the way of a *flux*.

The *fluxes* for the ores of metals ſeem in general reducible to two kinds, the vitreous and the ſaline. The vitreous are thoſe which either naturally have a glaſſy form, or readily aſſume one in the fire; the principal of theſe are glaſs of lead, glaſs of antimony, and borax.

By the ſaline *fluxes*, authors generally mean thoſe which are compoſed of ſalts, whether tartar, nitre, fixed alkali, or the like, as the black *flux*, ſandiver, pot-aſhes, and the like. The vitreous *fluxes* ſeem deſtined more immediately to act upon the ſtony or vitreſcible matter, wherewith the ſtubborn ores are frequently mixed, and the ſaline kind to act more immediately upon the matter of the ore itſelf, for the due excluſion or ſeparation of the metal.

The more kindly ores require no *fluxes* at all, and often they contain in themſelves, the neceſſary matter for that *flux*; thus there are copper ores, which being only ground to powder, and put into a common wind furnace, will yield as much pure metal at the firſt operation, as can be produced from them, by all the *fluxes*. Shaw's Lectures, p. 256.

Powder of antimony is a very good *flux* powder. By this alone may you readily melt iron or ſteel in a crucible, with an ordinary charcoal fire.

Some of the cheapeſt and moſt powerful *fluxes* now in uſe are, dried wine-lees, dried cow-dung and horſe-dung, dried river-mud, fuller's-earth, iron filings, common ſalt, potaſh, and ſandiver. Theſe may be uſed in the larger works; as nitre, tartar, borax, ſal armoniac, and mercury ſublimate, in the leſs: as for compound *fluxes*, they are very numerous, almoſt every operator having his particular noſtrum; and it is plain that ſome *fluxes* are better adapted to the ores of ſome metals than others; but certainly a few general ones might be fixed upon, one or other of which would anſwer all the operator's expectations.

The three following preparations are all very general, very powerful, and not expenſive. 1. Take of nitre, prepared by long boiling in lime-water, of ſea-ſalt melted in the fire, of ſandiver, and of dry wine-lees, each one part; glaſs of lead, three parts, and powdered glaſs, eight parts; mix them all well together, and uſe them in an equal weight with ſtubborn ores. 2. For a ſtill ſtronger *flux*, take equal parts of white tartar, common ſalt, and nitre prepared as above; calcine all together to a white powder, and mix with it its own weight of glaſs of lead: of this *flux* add two parts to one part of the moſt ſtubborn ores. 3. For a very powerful ſaline *flux*, take of the ſtrongeſt ſoap-boiler's lees four pounds, of white tartar and common ſalt, melted in the fire, each one pound; boil theſe together, with four gallons of human urine, to a dry ſalt. This *flux* is particularly ſerviceable where ſulphur and cobalt abound, and render the ore very refractory. Shaw's Lectures, p. 257.

FLUXES, in *Enamel-painting*, are uſed for forming the grounds and colours: there are two kinds of ſubſtances which enter the compoſition of enamel *fluxes*, viz. the vitrifiable matters, which conſiſt of ſalts, lead and arſenic, and the correctives of theſe, which are calcined flints, ſand, or ſuch calcareous matter, which give body and firmneſs to the fluxing compoſition, without diſcolouring or changing the proper fluxing qualities, unleſs by diminiſhing in a degree their vitrefactive power. The moſt active *flux* among ſalts is borax; the next is lead; arſenic, joined with ſome other body already vitrified and hereby fixed, is the next powerful *flux*; and the ſeveral kinds of ſalts ſucceed, of which ſea ſalt poſſeſſes the greateſt fluxing power. Though theſe are not ſtrong enough by themſelves, yet, as they are colourleſs they are neceſſary to be compounded with lead, or ſubſtituted for it, with the aid of borax, for purpoſes, in which the *flux* muſt be wholly deſtitute of colour. *Fluxes* of all kinds are prepared by levigating the ingredients of which they conſiſt on a porphyry ſtone, with a mullar of the ſame matter or of flint; or in a mortar of agate or flint, with an agate peſtle: or, for the ſake of expedition, a mortar and peſtle of the common green glaſs may be previouſly uſed. This levigated matter muſt be then put into melting pots, and placed in a furnace, where the heat is nearly that of a ſtrong culinary fire; and when the vitrification is perfect, which may be known by the matter's being tranſparent and free from air-bubbles, it muſt be poured out on an iron plate free from ruſt, and when cold, powdered and kept for uſe. See ENAMEL.

FLUXES, in the *Manufacture of Glaſs*, are red-lead, pearl-aſhes, nitre, ſea-ſalt, borax, arſenic, the *ſcoriæ* of forges, commonly called clinkers, and wood-aſhes. See GLASS.

FLUXION, in *Medicine*, a ſudden collection of morbid matter in any part of the body.

Fluxions ariſe either from the weakneſs, flaccidity, and inactivity of the part affected, which does not diſperſe, protrude, or expel, the humours naturally received into it; or from the derivation of ſome extraordinary quantity of peccant matter from ſome other part.

This latter is properly called DEFLUXION, and, by the ancients, *attraction*.

A *fluxion*, or *defluxion*, on the trachea and lungs, is called a CATARRH.

FLUXION, in the *Newtonian analyſis*, denotes the velocity with which a flowing quantity is increaſed by its generative motion: by which it ſtands contradiſtinguiſhed from *fluent* or the *flowing* quantity, which is gradually, and indefinitely increaſing, after the manner of a ſpace which a body in motion deſcribes.

Or, a *fluxion* may be more accurately defined, as, the magnitude by which any flowing quantity *would be* uniformly increaſed in a given portion of time, with the generating celerity at any propoſed poſition, or inſtant, ſuppoſing it from thence to continue invariable.

Thus, if the point *m* move from A, and generate the right line A*m*, *Tab.* II. *Geometry*, *fig.* 29. and the celerity at R be ſuch as would be ſufficient, ſuppoſing it to continue uniform from that point, to deſcribe the line R*r* in the given time; then R*r* repreſents the *fluxion* of the variable line A*m* in that poſition. The rectangle AS, *fig.* 30. may be conceived to be generated by the parallel motion of the invariable line *m n* between AF and BG; and ſince R*r* is the *fluxion* of A*m*, the rectangle R*r s* S will be the ſpace which would be uniformly deſcribed by *m n*, whilſt A*m* would be uniformly encreaſed by *m r*, and it is, therefore, the *fluxion* of the generated rectangle ABSR. Farther, if the curvilineal ſpace A*m n*, *fig.* 31. be generated by the parallel motion of *m n*, conſidered as variable, and R*r* be the *fluxion* of A*m*, the rectangle R*r s* S would be uniformly generated with the celerity, with which it begins to be generated, and with which the ſpace A*m n* is increaſed in the poſition R*s*, when the length and velocity of *m n* are ſuppoſed to continue invariable from that poſition, and, therefore, agreeably to the definition, will be the *fluxion* of the generated ſpace A*m n*.

From this definition it appears, that the *fluxions* of quantities are, always, as the celerities by which the quantities themſelves increaſe in magnitude.

Mr. Simpſon obſerves, that there is an advantage in conſidering *fluxions*, not as mere velocities, but as the magnitudes which theſe velocities would, uniformly, generate in a given finite time: the imagination is not here confined to a ſingle point, and the higher orders of *fluxions* are rendered much more eaſy and intelligible. And though Sir Iſaac Newton defines *fluxions* to be the velocities of motions, yet he hath recourſe to the increments or moments, generated in equal particles of time, in order to determine thoſe velocities, which he afterwards teaches us to expound by finite magnitudes of other kinds. Simpſon's *Fluxions*, vol. i. pref. p. 6. and p. 2, &c.

FLUXIONS, *method of*, is the arithmetic and analyſis of *fluxions*, and fluents, or flowing quantities.

Foreigners uſually define the method of *fluxions*, the arithmetic, or analyſis, of infinitely, or rather indefinitely, ſmall variable quantities; or the method of finding an infiniteſimal, or infinitely ſmall quantity, which, being taken an infinite number of times, becomes equal to a given quantity.

Sir I. Newton, and, after him, the Engliſh authors, call theſe infinitely ſmall quantities, *moments*; conſidering them as the momentary increments, or decrements, of variable quantities, e. gr. of a line conſidered as generated by the flux of a point, or of a ſurface generated by the flux of a line.

Accordingly, the variable quantities are called *fluent*, or flowing quantities; and the method of finding either the *fluxion*, or the fluent, the method of *fluxions*.

M. Leibnitz conſiders the ſame infinitely ſmall quantities as

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as the differences, or differentials, of two quantities; and calls the method of finding thoſe differences, the *differential calculus*. Each of theſe ways of conſidering and denominating, has its advantages, which the retainers to this or that method ſtrenuouſly aſſert.

Flowing quantities, i. e. ſuch as, in the geneſis of figures by local motion, are continually increaſing and diminiſhing, are certainly very properly denominated fluents: and as all figures may be conceived as ſo generated, the infinitely ſmall increments or decrements of ſuch quantities, are very naturally denominated *fluxions*.

Beſide this difference in the name, there is another in the notation.

Sir I. Newton expreſſes the *fluxion* of a quantity, as x, by a dot placed over it, as $\dot{x}$; and M. Leibnitz expreſſes his differential of the ſame x, by prefixing a d, as dx; each of which methods of notation has likewiſe its advantage.

Setting aſide theſe circumſtances, the two methods are the ſame.

The method of *fluxions* is one of the greateſt, moſt ſubtle, and ſublime diſcoveries of this, or, perhaps, of any age: it opens a new world to us, and extends our knowlege, as it were, to infinity; it carries us beyond the bounds that ſeemed to have been preſcribed to the human mind, at leaſt infinitely beyond thoſe to which the ancient geometry was confined.

The hiſtory of this important diſcovery, as freſh as it is, is a little dark, and imbroiled. Two of the greateſt men of this age do both of them claim the invention, Sir I. Newton, and M. Leibnitz; and nothing can be more glorious for the method itſelf, than the zeal wherewith the partiſans of either ſide have aſſerted their title.

To give the reader a juſt view of this noble diſpute, and of the pretenſions of each party, we ſhall lay before him the origin of the diſcovery, and mark where each claim commenced, and how it was ſupported.

The firſt time the method made its appearance in public, was in 1684, when M. Leibnitz gave the rules thereof in the Leipſic Acts of that year; but the demonſtrations he kept to himſelf. The two brothers, the Bernoullis, were preſently ſtruck with it, and found out the demonſtrations, though very difficult; and practiſed the calculus with ſurpriſing ſucceſs.

However, M. Leibnitz began to propoſe his differential method in a letter, dated 21 Jan. 1677, in which he exactly purſues Dr. Barrow's method of tangents, publiſhed in 1670: and Sir I. Newton communicated his method of drawing tangents to Mr. Collins, in a letter dated 10 Dec. 1672; which letter, together with another dated 13 June, 1676, were ſent to M. Leibnitz by Mr. Oldenburgh, in 1676. So that there is a ſtrong preſumption that he might avail himſelf of the information contained in theſe letters, and other papers tranſmitted with them, and alſo in 1675, before the publication of his own letter, containing the firſt hint of his differential method. And it ſufficiently appears, that Sir I. Newton had invented his method before the year 1669, and that he actually made uſe of it in his Compendium of Analyſis and Quadrature of Curves before that time. His attention ſeems to have been directed this way, even before the plague which happened in London in 1665 and 1666, when he was about twenty-three years of age: and, therefore, there is no foundation for the hint ſuggeſted by the authors of the Encyclopedie Art. *Differentielle*, that Sir Iſaac borrowed the differential method from Dr. Barrow.

This is all we hear of it, till the year 1687, when Sir Iſaac Newton's admirable Principia came forth, which is almoſt wholly founded on the ſame calculus.

The common opinion, at that time, was, that Sir Iſaac, and M. Leibnitz, had each invented it about the ſame time: and what confirmed it was, that neither of them made any mention of the other; and that, though they agreed in the ſubſtance of the thing, yet they differed in their ways of conceiving; called it by different names, and uſed different characters.

In effect, M. Leibnitz's character was ſuppoſed, by foreigners, to be ſomewhat more commodious than that of Sir Iſaac Newton: accordingly, the method ſoon ſpreading itſelf throughout Europe, M. Leibnitz's character went with it; by which means the geometricians were inſenſibly accuſtomed to look on him as the ſole, or principal inventor.

The two great authors themſelves, without any ſeeming concern, or diſpute, as to the property of the invention, enjoyed the glorious proſpect of the progreſſes continually making under their auſpices, till the year 1699, when the peace began to be diſturbed.

M. Fatio, in a treatiſe Of the Line of ſwifteſt Deſcent, declared, that he was obliged to own Sir Iſaac Newton as the firſt inventor of the differential calculus, and the firſt by many years; and that he left the world to judge, whether M. Leibnitz, the ſecond inventor, had taken any thing from him. This preciſe diſtinction between firſt and ſecond inventor, with the ſuſpicion it inſinuated, raiſed a controverſy between M. Leibnitz, ſupported by the editors of the Leipſic Acts, and the Engliſh geometricians, who declared for Sir I. Newton. Sir Iſaac himſelf never appeared on the ſcene; his glory was become that of the nation; and his adherents, warm in the cauſe of their country, needed not him to animate them.

Writings ſucceeded each other but ſlowly, on either ſide; probably, on account of the diſtance of places; but the controverſy grew ſtill hotter and hotter: till, at length, it came to ſuch paſs, that, in the year 1711, M. Leibnitz complained to the Royal Society, that Dr. Keill had accuſed him of publiſhing the method of *fluxions* invented by Sir I. Newton, under other names, and characters.

He inſiſted, that nobody knew better than Sir Iſaac himſelf, that he had ſtolen nothing from him; and required, that Dr. Keill ſhould publicly diſavow the ill conſtruction which might be put on his words.

The ſociety, here appealed to as a judge, appointed a committee to examine all the old letters, papers, &c. that had paſſed among the ſeveral mathematicians, relating to the point; and, after a ſtrict examen of all the evidences that could be procured, gave in their report to this purpoſe: "That Mr. Leibnitz was in London in 1673, and "kept a correſpondence with Mr. Collins by means of "Mr. Oldenburgh, till Sept. 1676, when he returned "from Paris to Hanover, by way of London and Amſterdam: that it did not appear that M. Leibnitz knew "any thing of the differential calculus before his letter "of the 21ſt June, 1677, which was a year after a copy "of a letter, wrote by Sir I. Newton, in the year 1672, "had been ſent to Paris to be communicated to him, "and above four years after Mr. Collins began to communicate that letter to his correſpondents; wherein "the method of *fluxions* was ſufficiently explained, to "let a man of his ſagacity into the whole matter: and "that Sir I. Newton had even invented his method be"fore the year 1669, and, of conſequence, fifteen years "before M. Leibnitz had given any thing on the ſubject "in the Leipſic Acts." And thence they concluded, that Dr. Keill had not at all injured M. Leibnitz in what he had ſaid.

The ſociety printed this cenſure of theirs, together with all the pieces and materials relating thereto, under the title of Commercium Epiſtolicum de Analyſi Promota, Lond. 1712. This book was carefully diſtributed through Europe, to vindicate the title of the Engliſh nation to the diſcovery; for Sir Iſaac, as already hinted, never appeared in it: whether it were that he truſted his honour with his compatriots, who were zealous enough in the cauſe; or whether it were that he was even ſuperior to the glory thereof.

M. Leibnitz and his friends, however, could not ſhew the ſame indifference: he was accuſed of a theft; and the whole Commercium Epiſtolicum either expreſſes it in terms, or inſinuates it. Soon after the publication thereof, a looſe ſheet was printed, at Paris, in behalf of M. Leibnitz, then at Vienna. It is wrote with great zeal and ſpirit; and maintains, boldly, that the method of *fluxions* had not preceded that of *differences*: and even inſinuates, that it might have ariſen from it. The detail of the proofs, on each ſide, would be too long, and could not be underſtood without a large comment, which muſt enter into the deepeſt geometry.

M. Leibnitz had begun to work upon a Commercium Epiſtolicum, in oppoſition to that of the Royal Society; but he died before it was completed.

A ſecond edition of the Commercium Epiſtolicum was printed at London in 1722; where Sir Iſaac Newton, in the preface, account, and annotations, which were added to that edition, particularly anſwered all the objections which M. Leibnitz and M. Bernouilli were able to make ſince the Commercium firſt appeared in 1712. See alſo Raphſon's Hiſt. *Fluxion.* From the laſt edition of the Commercium, and the various original papers contained in it, it evidently appears that Sir Iſaac Newton had diſcovered his method of *fluxions* many years before M. Leibnitz's pretenſions.

It muſt be owned, that there are ſtrong preſumptions in favour of M. Leibnitz; preſumptions, we mean, that he was no plagiary: for that Sir Iſaac Newton was the firſt inventor, is paſt all diſpute; his glory is ſecure; the reaſonable part, even among the foreigners, allow it: and the queſtion is only, whether M. Leibnitz took it from him, or fell upon the ſame thing with him; for, in his Theory of Abſtract Notions, which he dedicated to the Royal Academy, 1671, before he had ſeen any thing of Sir I. Newton's, he already ſuppoſed infinitely ſmall

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quantities, ſome greater than others; which is one of the great principles of the ſyſtem.

The doctrine conſiſts of two parts, viz. the *Direct method of fluxions*, called, alſo, *Calculus differentialis*; and the *Inverſe method of fluxions*, or *Calculus integralis*.

The latter is directly oppoſite to the former; and is a ſequel of it: both of them are adopted into the new geometry, and make reigning methods therein.

The firſt deſcends from finite, to infinite; the latter aſcends from infinitely ſmall, to finite: the one de-compounds a magnitude; the other re-eſtabliſhes it.

The foundation of the direct method of *fluxions* amounts to this problem: the length of the ſpace deſcribed being continually (that is, at all times) given, to find the velocity at any time propoſed.

The foundation of the inverſe method of *fluxions* amounts to this problem: the velocity of the motion being continually given, to find the ſpace deſcribed by it at any time propoſed.

Direct method of FLUXIONS. All finite magnitudes are here conceived to be reſolved into infinitely ſmall ones, ſuppoſed to be generated by motion, as a line by the motion of a point, a ſuperficies by a line, and a ſolid by a ſuperficies; and they are the elements, moments, or differences, thereof.

The art of finding theſe infinitely ſmall quantities, or the velocities by which they are generated, and of working on them, and diſcovering other infinite quantities, by their means, makes the direct method of *fluxions*.

What renders the knowlege of infinitely ſmall quantities of ſuch ſignal uſe and extent is, that they have relations to each other, which the finite magnitudes, whereof they are the infiniteſimals, have not.

Thus, e. gr. in a curve, of any kind whatever, the infinitely ſmall differences of the ordinate and abſciſs have the ratio to each other, not of the ordinate and abſciſs, but of the ordinate and ſubtangent; and, of conſequence, the abſciſs and ordinate alone being known, give the ſubtangent unknown; or, which amounts to the ſame, the tangent itſelf. See the *Inverſe method of* FLUXIONS.

The method of notation in *fluxions*, introduced by the inventor, Sir I. Newton, is thus:

The variable, or flowing quantity, to be uniformly augmented, as ſuppoſe the abſciſs of a curve, he denotes by the final letters v, x, y, z; and their *fluxions* by the ſame letters with dots placed over them, thus, $\dot{v}$ $\dot{x}$ $\dot{y}$ $\dot{z}$. And the initial letters a, b, c, d, &c. are uſed to expreſs invariable quantities.

Again, if the *fluxions* themſelves are alſo variable quantities, and are continually increaſing, or decreaſing, he conſiders the velocities with which they increaſe, or decreaſe, as the *fluxions* of the former *fluxions*, or ſecond *fluxions*; which are denoted by two dots over them, thus, $\ddot{y}$ $\ddot{x}$ $\ddot{z}$.

After the ſame manner one may conſider the augments, and diminutions of theſe, as their *fluxions* alſo; and thus proceed to the third, fourth, fifth, &c. *fluxions*, which will be noted thus, $\dddot{y}$ $\dddot{x}$ $\dddot{z}$: $\ddddot{y}$ $\ddddot{x}$ $\ddddot{z}$: $\dddddot{y}$ $\dddddot{x}$ $\dddddot{z}$, &c. We may obſerve, in general, that the *fluxions* of all kinds and orders whatever, are contemporaneous, or ſuch as may be generated together, with their reſpective celerities, in one and the ſame time.

Laſtly, if the flowing quantity be a ſurd, as $\sqrt{a-b}$; he notes its *fluxion* $\dot{\sqrt{a-b}}$: if a fraction $\frac{x}{d-y}$ he notes it, $\frac{\dot{x}}{d-y}$. V. Wallis's Algebra, p. 392, apud Oper. vol. ii. See FLUENT.

The chief ſcope and buſineſs of *fluxions* is, from the flowing quantity given, to find the *fluxion*: for this we ſhall lay down one general rule, as ſtated by Dr. Wallis, and afterwards apply and exemplify it in the ſeveral caſes.

"Multiply each term of the equation ſeparately by the "ſeveral indices of the powers of all the flowing quan-"tities contained in that term; and in each multiplica-"tion, change one root or letter of the power into its "proper *fluxion*: the aggregate of all the products con-"nected together by their proper ſigns, will be the *fluxion* "of the equation deſired."

The application of this rule will be contained in the following caſes. I. To expreſs the *fluxions* of ſimple variable quantities, as already mentioned, you need only put the letter, or letters, which expreſs them, with a dot over them: thus, the *fluxion* of x is $\dot{x}$, and the *fluxion* of y is $\dot{y}$, and the *fluxion* of $x+y+v+z$, is $\dot{x}+\dot{y}+\dot{v}+\dot{z}$, &c.

Note, For the *fluxion* of permanent quantities, when any ſuch are in the equation, you muſt imagine o, or a cypher; for ſuch quantities can have no *fluxion*, properly ſpeaking, becauſe they are without motion, or invariable.

Again, the *fluxion* of a quantity, which decreaſes, inſtead of increaſing, is to be conſidered as negative.

II. *To find the* FLUXIONS *of the products of two or more variable or flowing quantities*—Multiply the *fluxion* of each ſimple quantity by the factors of the products, or the product of all the reſt; and connect the laſt products by their proper ſigns: then the ſum, or aggregate, is the *fluxion* ſought.

Thus, the *fluxion* of $x\,y$, is $\dot{x}\,y + x\,\dot{y}$. For, let two right lines, DE and FG, move parallel to themſelves from two other right lines, BA and BC, *Tab.* II. *Geometry*, *fig.* 32. and generate the rectangle DF. Let them always interſect each other in the curve BHR, and let D*d* ($\dot{x}$) and F*f* ($\dot{y}$) be the *fluxions* of the ſides BD (x) and BF (y); and draw *dm* and *fn* parallel to DH and FH. The *fluxion* of the area BDH (ſee the beginning of this article) is D*m* or $y\,\dot{x}$, and that of the area BFH is F*n* or $x\,\dot{y}$, and therefore the *fluxion* of the whole rectangle $EF = xy = BDH + BFG$ will be $\dot{x}\,y + x\,\dot{y}$. The *fluxion* of $y\,z\,u$ is $\dot{y}\,z\,u + y\,\dot{z}\,u + y\,z\,\dot{u}$; for if x be put $= z\,u$, then $y\,z\,u$ will be $= y\,x$, and its *fluxion* $= \dot{y}\,x + y\,\dot{x}$: but x being $= z\,u$, and $\dot{x} = \dot{z}\,u + z\,\dot{u}$, $\dot{y}\,x + y\,\dot{x}$, by ſubſtitution, will be $= \dot{y}\,z\,u + y\,\dot{z}\,u + y\,z\,\dot{u}$. And the *fluxion* of $x\,u\,y\,z$, is $\dot{x}\,u\,y\,z + x\,\dot{u}\,y\,z + x\,u\,\dot{y}\,z + x\,u\,y\,\dot{z}$; and the *fluxion* of $\overrightarrow{a+x} \times \overrightarrow{b-y}$ (the common product being $a\,b + b\,x - y\,a - x\,y$) will be $b\,\dot{x} - \dot{y}\,a - \dot{x}\,y - x\,\dot{y}$.

III. *To find the* FLUXION *of a fraction*—Multiply the *fluxion* of the numerator by the denominator, and from this product ſubſtract the *fluxion* of the denominator drawn into the numerator; this will be the numerator, and the ſquare of the denominator will be the denominator of the fraction expreſſing the *fluxion* of the given fraction.

Thus the *fluxion* of $\frac{x}{y}$ is $\frac{\dot{x}\,y - x\,\dot{y}}{y\,y}$.

For ſuppoſe $\frac{x}{y} = z$, then will $x = y\,z$, which equal quantities muſt have equal *fluxions*; therefore $\dot{x} = \dot{y}\,z + \dot{z}\,y$ and $\dot{x} - z\,\dot{y} = \dot{z}\,y$; and dividing all by y, $\frac{\dot{x} - z\,\dot{y}}{y} = \dot{z} =$ (becauſe $\frac{x}{y} = z$) $\frac{\dot{x} - \frac{x}{y} \times \dot{y}}{y} = \frac{\dot{x}\,y - x\,\dot{y}}{y} \div y = \frac{\dot{x}\,y - x\,\dot{y}}{y\,y}$: wherefore this laſt is the *fluxion* of the fraction $\frac{x}{y} = z$; becauſe z being $= \frac{x}{y}$, $\dot{z}$ will be equal to the *fluxion* of $\frac{x}{y}$.

And the *fluxion* of $\frac{a}{x}$ will be $\frac{-\dot{x}\,a}{x\,x}$; for the permanent quantity a having no *fluxion*, there can be no product of the *fluxion* of the numerator into the denominator, as there would have been, had a been $\dot{x}$, z, or any other variable quantity.

IV. *To find the* FLUXION *of a power*. Multiply the *fluxion* of the root by the exponent of the power, and the product by that power of the ſame root, whoſe exponent is leſs by unit than the given exponent; and likewiſe by the invariable quantity and co-efficient, if there be any.

Thus, the *fluxion* of $x\,x$ will be $2\,x\,\dot{x}$; for $\dot{x}\,x = x \times x$; but the *fluxion* of $x \times x = \dot{x}\,x + x\,\dot{x} = 2\,\dot{x}\,x$, &c. and the *fluxion* of x^3 will be $3\,x\,x\,\dot{x}$. That of x^8 will be $8\,x^7\,\dot{x}$, &c. that of $5\,x^5$ will be $25\,x^4\,\dot{x}$; that of $3\,a\,x^4$ will be $12\,a\,x^3\,\dot{x}$.

Or, if m expreſs the index of any power, as ſuppoſe x^m; its *fluxion* will be $m\,x^{m-1}\,\dot{x}$.

If the power be produced from a binomial, &c. as ſuppoſe $\overrightarrow{x+y}^2$, or $x\,x + 2\,x\,y + y\,y$, its *fluxion* will be $2 \times \overrightarrow{x+y} \times \overrightarrow{\dot{x}+\dot{y}}$, or $2\,x\,\dot{x} + 2\,x\,\dot{y} + 2\,\dot{x}\,y + 2\,y\,\dot{y}$.

If the exponent be negative, as ſuppoſe x^{-m} or $\frac{1}{x^m}$ its *fluxion* will be $-\,m\,\dot{x}\,x^{-m-1}$.

Or, if you would do it by way of fraction, $\frac{-\,m\,x^{m-1}\,\dot{x}}{x^{2m}}$ (for the ſquare of x^m is x^{2m}) $= -\,m\,x^{m-1-2m}\,\dot{x} = -\,m\,x^{-m-1}\,\dot{x}$ as before; $=$, removing x^{m-1} to the denominator, by changing the ſign of the exponent, $\frac{-m\,\dot{x}}{x^{m+1}}$.

If the power be imperfect, i. e. if its exponent be a fraction, as ſuppoſe $\sqrt[n]{x^m}$; or in the other notation $x^{\frac{m}{n}}$, ſuppoſe $x^{\frac{m}{n}} = z$: then if you raiſe up each member to the power of n, it will ſtand thus, $x^m = z^n$; the *fluxion* of which will be, by this general rule, $m\,x^{m-1}\,\dot{x} = n\,z^{n-1}\,\dot{z}$.

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Wherefore $\dot{z}$ will be $= \frac{m\dot{x}x^{m-1}}{nz^{n-1}}$ (by dividing both parts by nz^{n-1}) and $\frac{m\dot{x}x^{m-1}}{nz^{n-1}} = \frac{m}{n} \times \frac{x^{m-1}}{z^{n-1}} \times \dot{x}$; or $\frac{m}{n}\dot{x}\sqrt[n]{x^{m-n}}$; putting, inſtead of z^{n-1}, its value $x^{\frac{mn-m}{n}}$, and the above expreſſion will become $\frac{m}{n}\dot{x} \times \frac{x^{m-1}}{x^{\frac{mn-m}{n}}} = \frac{m}{n}\dot{x} \times x^{m-1-\frac{mn+m}{n}} = \frac{m}{n}\dot{x} \times x^{\frac{mn-n-mn+m}{n}} = \frac{m}{n}\dot{x} \times x^{\frac{m-n}{n}} = \frac{m}{n}\dot{x}\sqrt[n]{x^{m-n}}$. Or, more briefly, according to the rule, the *fluxion* of $\sqrt[n]{x^m}$ or $x^{\frac{m}{n}}$ will be $\frac{m}{n} \times \dot{x} \times x^{\frac{m}{n}-1} = \frac{m}{n}\dot{x}x^{\frac{m-n}{n}}$, &c.

V. *To find the* FLUXIONS *of ſurd quantities.* Suppoſe it required to find the *fluxion* of $\sqrt{2rx-xx}$, or $\overline{2rx-xx}^{\frac{1}{2}}$. Suppoſe $\overline{2rx-xx}^{\frac{1}{2}} = z$; then is $2rx-xx = zz$; and conſequently $r\dot{x}-x\dot{x} = z\dot{z}$; and, by diviſion, $\frac{r\dot{x}-x\dot{x}}{z} = \dot{z} =$ (by ſubſtitution) $\frac{r\dot{x}-x\dot{x}}{\sqrt{2rx-xx}} =$ to the *fluxion* of $\sqrt{2rx-xx}$.

Or, by the preceding rule, the *fluxion* of $\overline{2rx-xx}^{\frac{1}{2}}$ will be $\frac{1}{2} \times 2r\dot{x}-2x\dot{x} \times \overline{2rx-xx}^{\frac{1}{2}-1} = \overline{r\dot{x}-x\dot{x}} \times \overline{2rx-xx}^{-\frac{1}{2}} = \frac{r\dot{x}-x\dot{x}}{\overline{2rx-xx}^{\frac{1}{2}}}$. See POWER.

If it be required to find the *fluxion* of $\overline{ay-xx}^{\frac{1}{3}}$; for $\overline{ay-xx}^{\frac{1}{3}}$ put z; then $ay-xx = z^{\frac{1}{3}}$, and $a\dot{y}-2x\dot{x} = \frac{1}{3}\dot{z}z^{-\frac{2}{3}}$; and multiplying by 3, $3a\dot{y}-6x\dot{x} = \dot{z}z^{-\frac{2}{3}}$; and, conſequently, $3az^{\frac{2}{3}}\dot{y}-6z^{\frac{2}{3}}x\dot{x} = \dot{z}$; equal (ſubſtituting $\overline{ay-xx}^{2} = z^{\frac{2}{3}}$) $3a^3y^2\dot{y}-6a^2x^2y\dot{y}+3ax^4\dot{y}-6a^2y^2x\dot{x}+12ayx^3\dot{x}-6x^5\dot{x} =$ to the *fluxion* of $\overline{ay-xx}^{\frac{1}{3}}$.

VI. *To find the* FLUXION *of quantities compounded of rational and ſurd quantities*—Let it be required to find the *fluxion* of $\overline{bx^2+cax+ea^2} \times \sqrt{xx+aa} = z$. Put $\overline{bx^2+cax+ea^2} = p$, and $\sqrt{xx+aa} = q$. Then the given quantity is $pq = z$, and the *fluxion* thereof is $p\dot{q}+q\dot{p} = \dot{z}$: but $\dot{q}$ is $= \frac{x\dot{x}}{\sqrt{xx+aa}}$, and $\dot{p}$ is $= 2bx\dot{x}+ca\dot{x}$; therefore, in the equation $p\dot{q}+q\dot{p} = \dot{z}$, if in the place of p, q, $\dot{p}$, $\dot{q}$, we reſtore the quantities they repreſent, we ſhall have $\frac{bx^3+cax^2+ea^2x \times \dot{x}}{\sqrt{x^2+aa}} + 2bx\dot{x} \times \sqrt{x^2+a^2} + ca\dot{x} \times \sqrt{x^2+a^2} = \dot{z}$. Which being reduced to one denomination, gives $\frac{3bx^3+2acx^2+ea^2x+2ba^2x+ca^3x \times \dot{x}}{\sqrt{xx+aa}} = \dot{z} =$ to the *fluxion* of the given quantity.

VII. *To find the* FLUXION *of a logarithm.* The *fluxion* of the hyperbolic logarithm of any quantity is equal to the *fluxion* of that quantity divided by the quantity itſelf: e. gr. the *fluxion* of the hyperbolic logarithm of x is $= \frac{\dot{x}}{x}$: for let LQ *Tab.* II. *Analyſis, fig.* 49. be an hyperbola, whoſe aſymptotes are OR and OS, and whoſe parameter is AL = AO = 1: draw an ordinate PM parallel to AL, and the ſpace APML will be the hyperbolic logarithm of the line OP; and, therefore, the *fluxion* of the ſpace APML will be equal to the *fluxion* of the *hyperbolic* LOGARITHM of the line OP. But the *fluxion* of this ſpace, OP being $= x$, and PM $= y$, is $= y\dot{x}$, and OP : AO :: LA : MP by the nature of the curve; i. e. $x : 1 :: 1 : y = \frac{1}{x}$; therefore $y\dot{x} = \frac{\dot{x}}{x}$. Then, from the nature of LOGARITHMS, the hyperbolic logarithm of 10 (viz. 2.30258, &c.) is to the common logarithm of 10 (viz. 1) as the hyperbolic logarithm of any number x to the common logarithm of the ſame number x; i. e. L being made $=$ 2.30258, &c. L : 1 :: the hyperbolic logarithm of x : common logarithm of x: and therefore L : 1 :: the *fluxion* of the hyperbolic logarithm of x: the *fluxion* of the common logarithm of x: i. e. L : 1 :: $\frac{\dot{x}}{x} : \frac{\dot{x}}{\mathrm{L}x}$, which is the *fluxion* of the common logarithm of x; or becauſe $\frac{1}{\mathrm{L}} = 0.43429$, &c. the modulus of the Brigean or common form of logarithms, if $\frac{1}{\mathrm{L}}$ be $=$ M, the *fluxion* of the common logarithm of x (viz. $\frac{\dot{x}}{\mathrm{L}x}$) will be $= \frac{\dot{x}}{x} \times$ M; or, the *fluxion* of the hyperbolic logarithm of any number multiplied by M or 0.43429, &c. is $=$ the *fluxion* of the common logarithm of the ſaid number.

VIII. *To find the* FLUXION *of an exponential or percurrent quantity*, i. e. of a quantity having a variable exponent, as y^x. Suppoſe $y^x = u$; then, by the properties of logarithms, $x \times \log. y = \log. u$. And finding the *fluxions* of theſe terms, $\dot{x} \times \log. y + \frac{\mathrm{M}\dot{y}}{y} \times x = \frac{\mathrm{M}\dot{u}}{u}$, M being as in the preceding article: conſequently, the *fluxion* of y^x or $\dot{u} = \frac{u\dot{x}}{\mathrm{M}} \times \log. y + \frac{\dot{y}xu}{y} = \frac{\dot{x}}{\mathrm{M}} \times y^x \times \log. y + xy^{x-1}\dot{y}$.

IX. *To find the* FLUXION *of a rectangle, when one ſide x increaſes, and the other y decreaſes.* In this caſe the *fluxion* of the decreaſing quantity is negative with reſpect to that of the increaſing quantity (ſee the beginning of this article), and therefore, the ſign of the term affected with it ought to be changed; e. gr. the *fluxion* of the rectangle xy in theſe circumſtances will be expreſſed by $\dot{x}y - x\dot{y}$.

X. *To find the ſecond, third, &c.* FLUXION *of a flowing quantity.* Theſe *fluxions* differ in nothing, except their order and notation, from firſt *fluxions*, being actually ſuch to the quantities from which they are immediately derived; and therefore, they may be found, in the ſame manner, by the general rules already delivered.

Thus, by the 4th rule, the firſt *fluxion* of x^3 is $3x^2\dot{x}$; and if $\dot{x}$ be ſuppoſed conſtant, or if the root x be generated with an equable celerity, the *fluxion* of $3x^2\dot{x}$, or $3\dot{x} \times x^2$, will be $3\dot{x} \times 2x\dot{x} = 6x\dot{x}^2$, which is the ſecond *fluxion* of x^3; and $6\dot{x}^3$ will be its third *fluxion*: but if the celerity with which x is generated be variable, either increaſing or decreaſing, then $\dot{x}$, being variable, will have its *fluxion* denoted by $\ddot{x}$, &c. In this caſe the *fluxion* of $3x^2 \times \dot{x}$ will be, by the 2d and 4th rules, $6x\dot{x} \times \dot{x} + 3x^2 \times \ddot{x} = 6x\dot{x}^2 + 3x^2\ddot{x}$, the ſecond *fluxion* of x^3. And the third *fluxion* of x^3, obtained in like manner from the laſt, will be $6\dot{x} \times \dot{x}^2 + 6x \times 2\dot{x}\ddot{x} + 6x\dot{x} \times \ddot{x} + 3x^2\dot{\ddot{x}} = 6\dot{x}^3 + 18x\dot{x}\ddot{x} + 3x^2\dot{\ddot{x}}$. Thus alſo, if $\dot{y} = nx^{n-1}\dot{x}$, then $\ddot{y} = n \times n-1 \times x^{n-2}\dot{x}^2 + n\ddot{x}x^{n-1}$; and if $\dot{z}^2 = \dot{x}\dot{y}$, then $2\dot{z}\ddot{z} = \dot{x}\ddot{y} + \dot{y}\ddot{x}$, &c.

FLUXIONS, *inverſe method of*, or *calculus integralis*, conſiſts in finding finite magnitudes, from the infinitely ſmall parts thereof, and in determining the variable quantity or fluent from the velocity with which it flows at any point or term aſſigned, or the given *fluxion*.

It proceeds, as already obſerved, from infinitely ſmall quantities to finite; and recompounds and ſums up what the other has reſolved: whence it is alſo called, by ſome, the *ſummatory calculus*.

But what that has decompounded, this does not always re-eſtabliſh; ſo that the inverſe method is limited and imperfect, at leaſt hitherto; if it were once complete, geometry would be arrived at its laſt perfection.

To give an idea of its nature and office, take the inſtance already propoſed in the direct method: in that the infinitely ſmall quantities of the ordinates and abſciſs, being known, give the ſubtangent required; in this, on the contrary, the ſubtangent of an unknown curve being had, gives the infinitely ſmall quantities of the abſciſs and ordinate which produced it, and, of conſequence, the abſciſs and ordinate themſelves; which are finite magnitudes, in whoſe relation the whole eſſence of the curve is founded.

But the diſtinguiſhing uſe of this method is in meaſuring. The baſe of a parallelogram multiplied by the infinitely ſmall element of its altitude, gives an infinitely ſmall parallelogram; which is the element of the finite parallelogram, and is repeated an infinity of times therein, i. e. as many times as there are points in the height of the parallelogram.

To have the finite parallelogram, therefore, by means of its element, the element muſt be multiplied by the altitude; which is the inverſe method of *fluxions*, re-aſcending from the infinitely ſmall quantity to the finite.

Such a circuit of infiniteſimals, it is true, would be impertinent, in ſo ſimple a caſe; but when we have to do with ſurfaces terminated by curves, the method then becomes neceſſary, or, at leaſt, ſuperior to any other.

Suppoſe, e. gr. in a parabola, the ſpace included between two infinitely near ordinates, an infinitely ſmall portion of the axis, and an infinitely little arch of the curve; it is certain, this infinitely ſmall ſurface is no parallelogram; ſince the two parallel ordinates which terminate it on one ſide are not equal; and the arch of the curve, oppoſite to the little portion of the axis, is frequently neither equal nor parallel thereto; and yet this ſurface, which

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which is no parallelogram, may be conſidered, in the ſtricteſt geometry, as if it really were one, becauſe it is infinitely ſmall; and the error, of conſequence, infinitely little, i. e. none.

So that, to meaſure it, there needs nothing but to multiply an ordinate of the parabola by the infinitely ſmall portion of the axis correſponding thereto. Thus we have the element of the whole parabola; which element being raiſed, by the inverſe method, to a finite magnitude, is the whole ſurface of the parabola.

This advantage, ſo peculiar to the geometry of infinites, of being able, without any error, to treat little arches of curves as if they were right lines; curvilinear ſpaces, as if rectilinear ones, &c. enables it not only to go with more eaſe and readineſs than the ancient geometry, to the ſame truths, but to reach a great number of truths which were inacceſſible to the other.

Its operations, in effect, are more eaſy, and its diſcoveries more extenſive; and ſimplicity and univerſality are its diſtinguiſhing characters.

The preceding obſervations are more properly applicable to the method of infinites and indiviſibles than to the Newtonian method of *fluxions*, in which magnitudes of various kinds are capable of increaſe, not by a repeated acceſſion of parts, but by a continued motion or flux. See the ſequel of this article.

FLUXION *given, to find the flowing quantity belonging to any.*

To have the doctrine of the inverſe method correſpond and keep pace with that of the direct, we will apply it in the ſame caſes.

1. In the general, to expreſs the variable quantity of a *fluxion*, there needs nothing but to write the letters without the dots, or to ſubſtitute the variable or flowing letter for its *fluxion*. Thus the flowing quantities of $\dot{x}$, $\dot{y}$, $\dot{z}$, are x, y, z.

2. To find the fluent of a compound fluxional expreſſion conſiſting of the products of two or more flowing quantities drawn into their *fluxions*; or which conſiſts of the *fluxion* of each quantity drawn into the other, or product of the reſt of the quantities.

Multiply the flowing quantities together; and the product is the fluent required. E. gr. the fluent of $\dot{x}y+x\dot{y}$ is $= xy$; of $\dot{x}yz+x\dot{y}z+xy\dot{z}$ is $= xyz$, &c.

3. To find the *fluxion* of a fraction. The following rule will ſerve in many caſes. Divide the laſt term in the numerator by the *fluxion* of the negative ſquare root of the denominator; then divide this quotient by the affirmative ſquare root of the denominator for the required fluent.

Thus, the fluent of $\frac{\dot{x}y-x\dot{y}}{y^2}$ is $= \frac{x}{y}$.

4. To find the fluent of an expreſſion compounded of different fluxionary terms connected together by the ſigns + and −.

Find the ſeparate fluents of the different terms, and connect them together by the ſigns of their reſpective *fluxions*. Thus, the fluent of $a\dot{x}+\dot{x}y+x\dot{y}-\frac{\dot{x}y-x\dot{y}}{y^2}$ is $= ax+xy-\frac{x}{y}$.

5. To find the flowing quantity belonging to the *fluxion* of any power, either perfect, or imperfect. Take the fluxionary letter, or letters, out of the equation; then augment the index of the *fluxion* by 1, or unity: laſtly, divide the *fluxion* by the index of its power ſo increaſed by unity.

Thus, ſuppoſe $3xx\dot{x}$ propoſed; by taking away $\dot{x}$ it will be $3xx$; and by increaſing its index by unity, it will be $3xxx$; then dividing it by 3, its now (augmented) index, the quotient will be xxx, the flowing quantity required.

Again, the fluent of $\frac{n}{m}\dot{x}x\frac{n-m}{m}$ will be $x\frac{n}{m}$. In compound fluxionary expreſſions, if the fluxionary part is equal, or in an invariable ratio to the *fluxion* of the quantity under the vinculum, the fluent may be had by adding 1 to the index of the power, and dividing by the *fluxion* of the quantity under the vinculum drawn into the index of the power thus increaſed. E. gr. the *fluent* of $\overline{x+x^2}^2 \times \overline{3\dot{x}+6x\dot{x}}$ is $= \frac{\overline{x+x^2}^3 \times \overline{3\dot{x}+6x\dot{x}}}{3\times\dot{x}+2x\dot{x}} = \overline{x+x^2}^3$: the fluent of $\overline{a+cz^n}^m \times dz^{n-1}\dot{z}$ is $= \frac{\overline{a+cz^n}^{m+1} \times dz^{n-1}\dot{z}}{m+1\times nc\dot{z}z^{n-1}} = \frac{\overline{a+cz^n}^{m+1}\times d}{nc\times m+1}$; and the fluent of $\overline{a^m+z^m}^n \times z^{m-1}\dot{z}$ is $= \frac{\overline{a^m+z^m}^{n+1}}{m\times n+1}$.

By theſe methods the fluent is found when the *fluxion* is given; and the rules are derived from thoſe of the direct method; as the rules in diviſion and evolution in algebra are deduced from thoſe of multiplication and involution. As when a fluent conſiſts of a variable, and invariable part, the latter does not appear in the *fluxion*; ſo when any *fluxion* is propoſed, it is only the variable part of the fluent that can be derived from it. If $\dot{x}$ repreſent any *fluxion* that may be propoſed, the variable part of the fluent will be equal to x; for ſuppoſing y to be any variable quantity, if $x+y$ could repreſent the fluent of $\dot{x}$, then $\dot{x}+\dot{y}$ would be equal to $\dot{x}$, and $\dot{y}=o$, or y would be invariable, againſt the ſuppoſition. But ſuppoſing K to repreſent any invariable quantity, then $x+K$ may generally repreſent the fluent of $\dot{x}$. If it be required to find ſuch a fluent of $\dot{x}$ as ſhall vaniſh when x is ſuppoſed to vaniſh, it can be no other than x; and if it be required that the fluent ſhould vaniſh when x is equal to any given quantity a, then by ſuppoſing $x+K$ to vaniſh when x becomes equal to a; we ſhall have $a+K=o$, or $K=-a$; whence the fluent is $x-a$. In the ſame manner, the fluent of $-\dot{x}$ may be generally repreſented by $K-x$. When a *fluxion* that is propoſed coincides with any of thoſe which were deduced from their fluents in the preceding articles, the variable part of the fluent required muſt coincide with that which was there propoſed. As diviſion in algebra leads us to fractions, and evolutions to ſurds; ſo the inverſe method of *fluxions* leads us often to quantities that are not known in common algebra, and that cannot be expreſſed by common algebraic ſymbols. Maclaurin's Flux. art. 735.

We cannot here pretend to enter into a detail of the rules of the inverſe method of *fluxions*. We ſhall only obſerve in general, that a *fluxion* being propoſed, its fluent may ſometimes be found accurately in algebraic terms; but this is far from being always poſſible; and recourſe muſt ſometimes be had to a converging ſeries. Thus, if $nx^{n-1}\dot{x}$ were propoſed, the variable part of the fluent is found by adding unity to the exponent of the power, dividing by the exponent thus increaſed, and by the *fluxion* of the root; that is, the variable part of the *fluent* of $nx^{n-1}\dot{x}$ will be $\frac{nx^{n-1+1}\dot{x}}{n-1+1\times\dot{x}} = x^n$. But in many caſes this fluent requires the addition or ſubtraction of ſome conſtant quantity to render it complete, which can only be known from the nature of the problem under conſideration: e. gr. the fluent of $nx^{n-1}\dot{x}$ may be either repreſented by x^n or by $x^n\pm a$, becauſe a being conſtant, the *fluxion* of $x^n \pm a$, as well as of x^n is $nx^{n-1}\dot{x}$. To find this invariable quantity that muſt be added or ſubtracted, is to correct the fluent. In order to do this, the beſt way is to conſider how much the variable part of the fluent, firſt found, differs from the truth, in that particular circumſtance when the required quantity which the whole fluent ought to expreſs is equal to nothing; then, that difference added to or ſubtracted from the variable part, as occaſion requires, will give the fluent truly corrected. For, ſince the difference of two quantities flowing with the ſame celerity, or having equal *fluxions*, is either nothing at all, or conſtantly the ſame, the difference in that circumſtance will likewiſe be the difference in all other circumſtances; and, therefore, being added to the leſſer quantity, or ſubtracted from the greater, both become equal. Let the variable quantities x and y be firſt ſuppoſed to begin their exiſtence together, or to be generated at the ſame time: e. gr. 1. Let $\dot{y} = a^2x\dot{x}$, the fluent will be $y = \frac{a^2x^2}{2}$; if $y=o$, $\frac{a^2x^2}{2}$ vaniſhes, becauſe x is alſo $= o$, and the fluent needs no correction. 2. Let $\dot{y} = \overline{a+x}^3 \times \dot{x}$; and y will be $= \frac{\overline{a+x}^4}{4}$; but when $y=o$ and $x=o$, $\frac{\overline{a+x}^4}{4}$ becomes $= \frac{a^4}{4}$; and, therefore, $\frac{\overline{a+x}^4}{4}$ always exceeds y by $\frac{a^4}{4}$, and the fluent properly corrected will be $y = \frac{\overline{a+x}^4-a^4}{4} = a^3x+\frac{3a^2x^2}{2}+ax^3+\frac{x^4}{4}$. But this fluent may be found without correction, by expanding $\overline{a+x}^3$ in the original equation, which will become $\dot{y} = a^3\dot{x}+3a^2x\dot{x}+3ax^2\dot{x}+x^3\dot{x}$, whence $y = a^3x+\frac{3a^2x^2}{2}+ax^3+\frac{x^4}{4}$.

3. Let $\dot{y} = \overline{a^2-x^2}^{\frac{1}{2}} \times x\dot{x}$; then, $y = -\frac{\overline{a^2-x^2}^{\frac{3}{2}}}{3}$, and y being $= o$, $-\frac{\overline{a^2-x^2}^{\frac{3}{2}}}{3}$ becomes $= -\frac{a^3}{3}$; therefore $-\frac{\overline{a^2-x^2}^{\frac{3}{2}}}{3}$ is too little by $\frac{a^3}{3}$; and the fluent corrected will be $y = \frac{a^3}{3}-\frac{\overline{a^2-x^2}^{\frac{3}{2}}}{3}$, &c.

In the ſolution of other problems, the value of y will be equal

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equal to nothing, when that of x is equal to any given quantity a. E. gr. Let $\dot{y}=x^2\dot{x}$, and y is $=\frac{x^3}{3}$; but when $y=o$, $\frac{x^3}{3}$ is $=\frac{a^3}{3}$, by ſuppoſition; therefore, the corrected fluent will be $y=\frac{x^3-a^3}{3}$. 2. Let $\dot{y}=-x^n\dot{x}$, then $y=-\frac{x^{n+1}}{n+1}$, which corrected becomes $y=\frac{a^{n+1}-x^{n+1}}{n+1}$, &c. But if the propoſed *fluxion* were $\frac{a\dot{x}}{a-x}$, we cannot find its fluent by the rule above given; however, we may throw the *fluxion* into an infinite SERIES by dividing a by $a-x$ in the uſual method, and we ſhall find the quotient or $\frac{a}{a-x}=1+\frac{x}{a}+\frac{x^2}{a^2}+\frac{x^3}{a^3}$, &c. Hence $\frac{a\cdot}{a-x}=\dot{x}+\frac{x\dot{x}}{a}+\frac{x^2\dot{x}}{a^2}+\frac{x^3\dot{x}}{a^3}+$, &c. Now the fluent of each term of this ſeries may be found by the foregoing rule; and therefore the fluent of $\frac{a\dot{x}}{a-x}$ will be expreſſed by the ſeries $x+\frac{x^2}{2a}+\frac{x^3}{3a^2}+\frac{x^4}{4a^3}$, &c. which may be of uſe for determining the fluent when x is very ſmall in reſpect of a; becauſe in that caſe, a few terms at the beginning of the ſeries will be nearly equal to the value of the whole. But it often happens that the ſeries deduced in this method converges ſo ſlowly, as to be of little or no uſe. Or, becauſe the *fluxion* of the hyperbolic logarithm of any quantity is equal to the *fluxion* of that quantity divided by the quantity itſelf, the fluent of $\frac{a\dot{x}}{a-x}$ will be $=a\times$ hyp. log. of $a-x$. For the *fluxion* of $a-x$ is $-\dot{x}$, which divided by $a-x$ is $\frac{\dot{x}}{a-x}$. See Maclaurin's Tr. of Flux. art. 737. 744. 827. Sterling, De Summat. Serier. p. 28. and Simpſon's Fluxions, vol. i. p. 87, &c. Mathematicians do not always immediately recur to infinite ſeries, when it does not appear that a fluent can be aſſigned in a finite number of algebraic terms. The arches of a circle, and hyperbolic areas or logarithms, cannot be aſſigned in algebraic terms, but have been computed with great exactneſs by ſeveral methods. By theſe with algebraic quantities, any ſegments of conic ſections, and the arches of a parabola, are eaſily meaſured; and when a fluent can be aſſigned by them, this is conſidered as the ſecond degree of reſolution. When it does not appear that a fluent can be meaſured by the areas of conic ſections, it may however be meaſured in ſome caſes by their arcs; and this may be conſidered as the third degree of reſolution. If it does not appear that a fluent can be aſſigned by the arc of any conic ſections (the circle included) it may however be of ſome uſe to aſſign the fluent by an area, or arc of ſome other figure, that is eaſily conſtructed or deſcribed; and it is often important, that the propoſed *fluxion* be reduced to a proper form, in order that the ſeries for the fluent may not be too complex, and that it may not converge at too ſlow a rate.

We may therefore conſtitute three orders or claſſes of fluents. Firſt, ſuch as can be accurately aſſigned in finite terms by common algebraic expreſſions. Secondly, thoſe which can be reduced to circular arcs and logarithms. Thirdly, ſuch as can be aſſigned by hyperbolic or elliptic arcs. The firſt two claſſes (conſidering triangles and circles as conic ſections) may therefore be meaſured by the areas of conic ſections; and the third claſs by their perimeters, or lines that bound them.

The fluent of $\frac{\dot{x}}{\sqrt{1\pm x}}$ is of the firſt claſs; that of $\frac{\dot{x}}{\sqrt{x}\times\sqrt{1\pm x}}$, or of $\frac{\dot{x}}{\sqrt{1\pm xx}}$, of the ſecond; but the fluents of $\frac{\dot{x}\sqrt{x}}{\sqrt{1\pm xx}}$, $\frac{\dot{x}}{\sqrt{x}\times\sqrt{1\pm xx}}$, $\frac{\dot{x}}{1\pm xx}\Big|^{\frac{1}{4}}$, and $\frac{\dot{x}}{1\pm xx}\Big|^{\frac{3}{4}}$ are of the third claſs, and as far as has appeared hitherto, cannot be reduced to the former. See Maclaurin's Flux. book ii. chap. iii. art. 755. 798, &c.

It is to be obſerved, as to the fluent of $\frac{\dot{x}}{\sqrt{x}\times\sqrt{1\pm xx}}$, or of $\frac{\dot{x}}{1\pm xx}\Big|^{\frac{3}{4}}$, that it does not appear poſſible to repreſent them by any hyperbolic arc and algebraic quantities. But by aſſuming an elliptic arc likewiſe, they may be conſtructed. See Maclaurin, lib. cit. art. 802.

So likewiſe to repreſent the fluent of $\frac{\dot{z}}{\sqrt{z}\times\sqrt{b^2\pm 2ez-zz}}$ or of $\frac{\dot{p}}{\sqrt{a^2b^2\pm 2aep^2-p^4}}$, we muſt have recourſe to both the hyperbolic and elliptic arcs. Maclaurin, lib. cit. art. 805.

The fluent of $\frac{\dot{z}\frac{rn}{4}-1\dot{z}}{\sqrt{e+fz^n}}$ is aſſignable by the arcs of conic ſections, when r is an integer number; that is, by right lines, when r is equal to 4, or to any multiple of 4; by circular and parabolic arcs (reducible to logarithms) with right lines, when r is any other even number; by arcs of an equilateral hyperbola with right lines, when r is any number of the ſeries 3, 7, 11, 15, &c. and by arcs of the ſame hyperbola and right lines, with arcs of an ellipſis, that has its excentricity equal to the ſecond axis, when r is any of the numbers 1, 5, 9, 13, &c. See Maclaurin, ibid. art. 809.

We preſume, upon the whole, that few will be ſo ſcrupulous as to deny the Newtonian doctrine of *fluxions* to be intelligible, and accurately demonſtrated. But on the other hand it muſt be confeſſed, that the introduction of the notions of motion and velocity, which are mechanical, ſeems not to have thrown any light on this part of geometry. The conſideration of the limiting ratios of variable quantities, and that of the limiting polygons of curves, as it requires no other knowlege but what depends on the common properties of number and magnitude, ſo it ſeems, in all reſpects, the moſt clear and unexceptionable manner of conſidering the ſubjects treated of in the higher geometry. An eminent mathematician ſeems to declare himſelf of this opinion, when he ſays, that quadratures by limiting polygons is one of that kind which requires no other knowlege but what depends on the common properties of number and magnitude; and ſo may ſerve as an inſtance to ſhew, that no other is requiſite for the eſtabliſhment of principles for arithmetic and geometry; a truth, which though certain in itſelf, may perhaps ſeem doubtful from the nature and tendency of the preſent inquiries in mathematics. For among the moderns ſome have thought it neceſſary, for the inveſtigation of the relations of quantities, to have recourſe to very hard hypotheſes; ſuch as that of numbers infinite, and indeterminate; and that of magnitudes in *ſtatu fieri*, exiſting in a potential manner, which are actually of no bigneſs. And others, whoſe names are truly to be reverenced, on account of their great and ſingular inventions, have thought it requiſite to have recourſe even to principles foreign to mathematics, and have introduced the conſideration of efficient cauſes and phyſical powers, for the production of mathematical quantities; and have ſpoken of them, and uſed them, as if they were a ſpecies of quantities by themſelves. Vide Machin, in Phil. Tranſ. N° 447.

The elements of the doctrine of *fluxions* have been delivered by its great author in ſo conciſe a manner, as to give occaſion to one of the moſt ingenious writers of this age to repreſent it as founded on inconceivable principles, and full of falſe reaſonings. This author, in a letter, under the title of the Analyſt, publiſhed in the year 1734, has been at great pains to convince his readers, that the objects, principles, and inferences of the modern analyſis by *fluxions*, are not more diſtinctly conceived, or more evidently deduced, than religious myſteries and points of faith. He ſays he does not controvert the truth of the concluſions, but only the logic and method of mathematicians. He aſks how they demonſtrate, what objects they are converſant with, and whether they conceive them clearly; what principles they proceed upon, how ſound they may be, and how they apply them; declaring himſelf not concerned about the truth of the theorems, but only about the way of coming at them, whether it be legitimate or illegitimate, clear or obſcure, ſcientific or tentative. He conſiders the concluſions not in themſelves, but in their premiſes; not as true or falſe, uſeful or inſignificant, but as derived from ſuch principles, and by ſuch inferences. And for as much as it may ſeem an unaccountable paradox, that mathematicians ſhould deduce true propoſitions from falſe principles, be right in the concluſion, and yet err in the premiſes, he endeavours particularly to explain, how this may come to paſs, and ſhew how error may bring forth truth, though it cannot bring forth ſcience. His ſolution of the paradox is, that in the application of the method of infinitеſimals and *fluxions*, two errors are committed, which being equal and contrary, deſtroy each other. We cannot enter into a detail of all he ſays on theſe and many other heads, nor of all that has been ſaid on the other ſide, in defence of the method of

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fluxions, and of its inventor, Sir Iſaac Newton. An anſwer to the Analyſt, under the title of Geometry no Friend to Infidelity, appeared very early under the name of Philalethes Cantabrigienſis, ſuppoſed to be Dr. Jurin; a ſecond, by the ſame hand, in defence of the firſt, intitled, The Minute Mathematician, or the Free-thinker no juſt Thinker, publiſhed in 1735; a Diſcourſe of *Fluxions*, by Mr. Robins, firſt publiſhed in 1735 (ſee his Collection of Tracts, by Wilſon, vol. ii.); a Treatiſe of Sir Iſaac Newton's, with a commentary by Mr. Colſon; and ſeveral other pieces were publiſhed on this ſubject; particularly a very full and excellent treatiſe of *fluxions*, by Mr. Maclaurin, late profeſſor of mathematics in the univerſity of Edinburgh, containing not only a moſt diſtinct account of the principles of *fluxions*, but alſo of the chief diſcoveries in geometry, and mathematical philoſophy of this age. The curious may find an elegant account of this treatiſe in the Philoſophical Tranſactions, N° 468, 469.

We preſume that Mr. Maclaurin's demonſtrations are ſufficient to ſatisfy the moſt ſcrupulous; it would exceed the bounds of our deſign to inſert them at length here; but we cannot omit mentioning what ſeems neceſſary to explain and illuſtrate the notion of *fluxions*; and the principles on which this method of computation is founded.

In the doctrine of *fluxions*, magnitudes are conceived to be generated by motion; and the velocity of the generating motion is the *fluxion* of the magnitude. Lines are ſuppoſed to be generated by the motion of points: the velocity of the point that deſcribes the line, is its *fluxion*, and meaſures the rate of its increaſe or decreaſe. When the motion of a point is uniform, its velocity is conſtant, and is meaſured by the ſpace deſcribed by it in a given time: when the motion varies, the velocity at any term of the time is meaſured by the ſpace which would be deſcribed in a given time, if the motion was to be continued uniformly, from that term, without any variation. And this is analogous to the general doctrine of powers, or may be conſidered as a particular application of it. As a power which acts continually and uniformly is meaſured by the effect that is produced by it in a given time, ſo the velocity of an uniform motion is meaſured by the ſpace that is deſcribed in a given time. If the action of the power vary, then its exertion at any rate of the time is not meaſured by the effect that is produced after that term in a given time, but by the effect that would have been produced if its action had continued uniform from that term; and in the ſame manner, the velocity of a variable motion at any given term of time is not to be meaſured by the ſpace that is actually deſcribed after that term in a given time, but by the ſpace that would have been deſcribed, if the motion had continued uniformly from that term. If the action of a variable power, or the velocity of a variable motion, may not be meaſured in this manner, they muſt not be ſuſceptible of any menſuration at all. When it is ſuppoſed that a body has ſome velocity or other at any term of the time, during which it moves, it is not therefore ſuppoſed, that there can be any motion in a term, limit or moment of time, or in an indiviſible point of ſpace; and as velocity is always meaſured by the ſpace that would be deſcribed by it, continued uniformly for ſome given finite time, it cannot ſurely be ſaid, that geometers pretend to conceive motion or velocity without regard to ſpace or time, as the author of the Analyſt often ſuggeſts. This is a ſhort view of the nature and tendency of the doctrine of *fluxions*, which we ſhall now proceed to explain more particularly.

We have already ſaid that lines may be conceived as generated by the motion of points; in like manner ſurfaces may be conceived as generated by the motion of lines; ſolids by the motion of ſurfaces; angles, by the rotation of their ſides; the flux of time being ſuppoſed to be always uniform. The velocity with which a line flows, is the ſame as that of the point which is ſuppoſed to deſcribe or generate it. The velocity with which a ſurface flows, is the ſame as the velocity of a given right line; that, by moving parallel to itſelf, is ſuppoſed to generate a rectangle which is always equal to the ſurface. The velocity with which a ſolid flows, is the ſame as the velocity of a given plain ſurface, that, by moving parallel to itſelf, is ſuppoſed to generate an erect priſm or cylinder that is always equal to the ſolid. The velocity with which an angle flows, is meaſured by the velocity of a point, that is ſuppoſed to deſcribe the arch of a given circle, which always ſubtends the angle, and meaſures it.

In general, all quantities of the ſame kind (when we conſider their magnitude only, and abſtract from their poſition, figure, and other affections) may be repreſented by right lines, that are ſuppoſed to be always in the ſame proportion to each other as theſe quantities. They are repreſented by right lines in this manner in Euclid's Elements, in the general doctrine of proportion, and by right lines and figures in the data of that accurate geometer. In this method likewiſe, quantities of the ſame kind may be repreſented by right lines, and the velocities of the motions by which they are ſuppoſed to be generated, by the velocities of points moving in right lines. All the velocities we have mentioned are meaſured, at any term of the time of the motion, by the ſpaces which would be deſcribed in a given time, by theſe points, lines, or ſurfaces, with their motions continued uniformly from that term.

A *fluxion* being the velocity with which a quantity flows, at any term of the time while it is ſuppoſed to be generated, is therefore always meaſured by the increment or decrement that would be generated in a given time by this motion, if it was continued uniformly from that term without any acceleration or retardation; or it may be meaſured by the quantity that is generated in a given time by an uniform motion, which is equal to the generating motion at that term.

Time is repreſented by a right line that flows uniformly, or is deſcribed by an uniform motion; and a moment, or termination of time, is repreſented by a point or termination of that line. A given velocity is repreſented by a given line, the ſame which would be deſcribed by it in a given time. A velocity that is accelerated or retarded, is repreſented by a line that increaſes or decreaſes in the ſame proportion. The time of any motion being repreſented by the baſe of a figure, and any part of the time by the correſponding part of the baſe; if the ordinate at any point of the baſe be equal to the ſpace that would be deſcribed, in a given time, by the velocity at the correſponding term of the time continued uniformly, then any velocity will be repreſented by the correſponding ordinate. The *fluxions* of quantities are repreſented by the increments or decrements, deſcribed in the foregoing paragraph, which meaſure them; and inſtead of the proportion of the *fluxions* themſelves, we may always ſubſtitute the proportion of their meaſures.

When a motion is uniform, the ſpaces that are deſcribed by it in any equal times are always equal. When a motion is perpetually accelerated, the ſpaces deſcribed by it in any equal times that ſucceed after one another, perpetually increaſe. When a motion is perpetually retarded, the ſpaces that are deſcribed by it in any equal times that ſucceed after one another, perpetually decreaſe.

It is manifeſt, converſely, that if the ſpaces deſcribed in any equal times are always equal, then the motion is uniform. If the ſpaces deſcribed in any equal times that ſucceed after one another perpetually increaſe, the motion is perpetually accelerated; for it is plain, that if the motion was uniform for any time, the ſpaces deſcribed in any equal parts of this time would be equal; and if it was retarded for any time, the ſpaces deſcribed in equal parts of this time that ſucceed after one another would decreaſe; both of which are againſt the ſuppoſition. In like manner it is evident, that a motion is perpetually retarded, when the ſpaces that are deſcribed in any equal times that ſucceed after one another, perpetually decreaſe. The following axioms are as evident, as that a greater or leſſer ſpace is deſcribed in a given time, according as the velocity of the motion is greater or leſs.

Axiom 1. The ſpace deſcribed by an accelerated motion is greater than the ſpace which would have been deſcribed in the ſame time, if the motion had not been accelerated, but had continued uniform from the beginning of the time.

Axiom 2. The ſpace deſcribed by a motion while it is accelerated, is leſs than the ſpace which is deſcribed in an equal time by the motion that is acquired by that acceleration continued uniformly.

Axiom 3. The ſpace deſcribed by a retarded motion is leſs than the ſpace which would have been deſcribed in the ſame time, if the motion had not been retarded, but had continued uniform from the beginning of the time.

Axiom 4. The ſpace deſcribed by a motion while it is retarded, is greater than the ſpace which is deſcribed in an equal time by the motion that remains after that retardation, continued uniformly.

From theſe axioms, general theorems concerning motion, of uſe in the doctrine of *fluxions*, may be demonſtrated. Thus when the ſpaces deſcribed by two variable motions are always equal, or in a given ratio, the velocities are always equal, or in the ſame given ratio; and converſely, when the velocities of two motions are always equal to each other, or in a given ratio, the ſpaces deſcribed by thoſe motions in the ſame time are always equal, or in that given ratio; that when a ſpace is always equal to the ſum or difference of the ſpaces deſcribed by two other motions, the velocity of the firſt motion is always equal to the ſum or difference of the velocities of the other motions; and converſely, that when a velocity is always

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always equal to the ſum or difference of two other velocities, the ſpace deſcribed by the firſt motion is always equal to the ſum or difference of the ſpaces deſcribed by theſe two other motions. See Mr. Maclaurin's Treatiſe of Fluxions, book i. chap. 1.

The main point in the method of *fluxions*, is to obtain the *fluxion* of the rectangle, or product of two indeterminate quantities, ſince from thence may be derived rules for all other products and powers, be the coefficients, or the indices, what they will, integers or fractions, rational or ſurd; according to the manner of Sir Iſaac Newton, in the ſecond lemma of his ſecond book of Principles.

Mr. Maclaurin has therefore been very full in eſtabliſhing this point; and after what he has ſaid, we preſume that no reaſonable objection can lie either againſt the clearneſs and diſtinctneſs of the notion of *fluxions*, or againſt the truth of the principles, or accuracy of the demonſtrations by which their meaſures are determined. We cannot here inſert his demonſtrations at length; but as many readers may, perhaps, be deſirous of ſeeing the argument contracted into a narrow compaſs, we ſhall here give a ſummary of it, from the Philoſophical Tranſactions, N° 468, p. 331. or Martyn's Abridg. vol. viii. p. 31, &c.

A triangle that has two of its ſides given in poſition, is ſuppoſed to be generated by an ordinate moving parallel to itſelf along the baſe. When the baſe increaſes uniformly, the triangle increaſes with an accelerated motion, becauſe its ſucceſſive increments are *trapezia*, that continually increaſe; therefore if the motion with which the triangle flows, was continued uniformly from any term for a given time, a leſs ſpace would be deſcribed by it, than the increment of the triangle, which is actually generated in that time by axiom 1; but a greater ſpace than the increment which was actually generated in an equal time preceding that term, by axiom 2. And hence it is demonſtrated, that the *fluxion* of the triangle is accurately meaſured by the rectangle contained by the correſponding ordinate of the triangle, and the right line which meaſures the *fluxion* of the baſe. The increment which the triangle acquires in any time, is reſolved into two parts; that which is generated in conſequence of the motion with which the triangle flows at the beginning of the time, and that which is generated in conſequence of the acceleration of this motion for the ſame time. The latter is juſtly neglected in meaſuring that motion (or the *fluxion* of the triangle at that term) but may ſerve for meaſuring its acceleration, or the ſecond *fluxion* of the triangle. The motion with which the triangle flows, is ſimilar to that of a body deſcending in free ſpaces by an uniform gravity, the velocity of which, at any term of the time, is not to be meaſured by the ſpace deſcribed by the body in a given time, either before or after that term, becauſe the motion continually increaſes, but by a mean between theſe ſpaces.

When the ſides of a rectangle increaſe or decreaſe with uniform motions, it may be always conſidered as the ſum or difference of a triangle and trapezium; and this *fluxion* is derived from the laſt propoſition. If the ſides increaſe with uniform motions, the rectangle increaſes with an accelerated motion; and in meaſuring this motion at any term of the time, a part of the increment of the rectangle that may be determined, is rejected, as generated in conſequence of the acceleration of that motion.

Thoſe who have well underſtood what precedes, will not be at a loſs to conceive, that the *fluxions* of a curvilineal area, whether generated by an ordinate moving parallel to itſelf, or by a radius revolving round a given center, may be determined by demonſtrations of the ſame kind. When the ordinates of the figure increaſe, the increment of the area may be reſolved in like manner into two parts, one of which only is to be retained in meaſuring the *fluxion* of the area, the other being rejected as generated in conſequence of the acceleration of the motion with which the figure flows.

What has been hitherto ſaid will ſet the difference between the notion of *fluxions* and that of infiniteſimals, in a clear light. *Fluxions* may always be repreſented by finite quantities. The ſuppoſition of an infinitely little magnitude is too bold a poſtulatum for ſuch a ſcience as geometry. Nor have authors accounted explicitly for the truth and perfect accuracy of the concluſions derived from this conſideration. When they determine what is called the *difference*, but more accurately the *fluxion* of a quantity, they tell us, they reject certain parts of the element, becauſe they become infinitely leſs than the other parts. But this is no proper reaſon, not only becauſe a proof of this nature may leave ſome doubt as to the accuracy of the concluſion, but becauſe it may be demonſtrated that theſe parts ought to be neglected by them at any rate, or that it would be an error to retain them. If an accountant, that pretends to a ſcrupulous exactneſs, ſhould tell us, he had neglected certain articles, becauſe he found them to be of ſmall importance; and it ſhould appear that they ought not to have been taken into conſideration by him on that occaſion, but belong to a different account, we ſhould approve his concluſions as accurate, but not his reaſons. See Maclaurin's Treatiſe of *Fluxions* in the preface, and book i. chap. 12. where the method of INFINITESIMALS is expreſly treated of.

Mr. Maclaurin in the firſt part of his treatiſe conſiders *fluxions* in a merely geometrical form, and has demonſtrated the rules of the method with all poſſible accuracy and rigour; but as the great improvements made by this doctrine are chiefly to be aſcribed to the facility, conciſeneſs, and great extent of the methods of computation, or the algebraic part, it is neceſſary to add ſome account of theſe methods alſo.

Any quantities produced from each other by an algebraic operation, or whoſe relation is expreſſed by any algebraic form, being ſuppoſed to increaſe or decreaſe together, ſome will be found to increaſe or decreaſe by greater differences, or at a greater rate, others by leſs differences, or at a leſs rate; and while ſome are ſuppoſed to increaſe or decreaſe at one conſtant rate by equal ſucceſſive differences, others increaſe or decreaſe by differences that are always varying. Theſe rates of increaſe or decreaſe may be determined by comparing the velocities of points that always deſcribe lines proportional to the quantities as before mentioned, but they may alſo be determined without having recourſe to ſuch ſuppoſitions, by a juſt reaſoning from the ſimultaneous increments or decrements themſelves.

When a quantity A increaſes by differences equal to a, 2 A increaſes by differences equal to $2a$, and manifeſtly increaſes or decreaſes at a greater rate than A in the proportion of $2a$ to a or 2 to 1; and if m and n be invariable, $\frac{m}{n}$ A increaſes or decreaſes by differences equal to $\frac{ma}{n}$, and therefore at a greater or leſs rate than A in proportion as $\frac{ma}{n}$ is greater or leſs than a, or m is greater or leſs than n. This ſeems to be eaſily conceived, without having recourſe to any other conſiderations, than the relation of the differences by which the quantities increaſe or decreaſe. In order therefore to avoid figurative expreſſions in the algebraic part, it will be proper to ſubſtitute in the place of the definition and axioms before mentioned, others that are rather of a more general import, but are perfectly conſiſtent with them. Thus,

Fluxions *of quantities are any meaſures of their reſpective rates of increaſe, or decreaſe, while they vary or flow together.*

There can be no difficulty in determining thoſe meaſures when the quantities increaſe or decreaſe by ſucceſſive differences, that are always in the ſame invariable proportion to each other. While A by increaſing becomes equal to $A+a$, or by decreaſing equal to $A-a$, 2 A becomes equal to $2A+2a$, or to $2A-2a$; and as 2 A increaſes or decreaſes at a greater rate than A in the proportion of $2a$ to a; ſo the *fluxion* of A being ſuppoſed equal to a, the *fluxion* of 2 A muſt be equal to $2a$.

In the ſame manner the *fluxion* of $\frac{m}{n} \times$ A (or of $\frac{m}{n} \times A \mp e$, ſuppoſing m, n, and e to be invariable) is $\frac{m}{n} \times a$; and ſince m may be to n in any aſſignable ratio, a quantity may be always aſſigned that ſhall increaſe or decreaſe, at a greater or leſs rate than A in any proportion, or that ſhall have its *fluxion* greater or leſs than the *fluxion* of A in any ratio. In ſuch caſes, the ratio of the *fluxions* and that of the differences, by which the quantities increaſe or decreaſe, are the ſame.

But while A is ſuppoſed to increaſe at a conſtant rate by any equal ſucceſſive differences, if B increaſe or decreaſe by differences that are always varying, B cannot be ſaid to increaſe or decreaſe at any one conſtant rate; and it is not ſo obvious how the *fluxion* of A being ſuppoſed equal to its increment a, the variable *fluxion* of B is to be determined. It cannot be ſuppoſed that the *fluxions* and differences are always in the ſame proportion in this caſe; but it is evident, that if B increaſe by differences that are always greater than the equal ſucceſſive differences by which $\frac{m}{n} \times$ A increaſes, it cannot increaſe at a leſs rate than $\frac{m}{n} \times$ A; and it cannot increaſe at a greater rate than $\frac{m}{n} \times$ A, while its ſucceſſive differences

are

always less than those of $\frac{m}{n} \times A$. The *fluxion* of A, being still represented by a, the *fluxion* of B therefore cannot be less than $\frac{m}{n} \times a$ in the former case, or greater then $\frac{m}{n} \times a$ in the latter. The following propositions are consequences of this, and will enable us to determine at what rate B increases, when its relation to A is known.

The successive values of the root A being represented by $A-a$, A, $A+a$, &c. which increase by any constant difference a, let the corresponding values of any quantity produced from A, by any algebraic operation (or that has a dependence upon it so as to vary with it) be B−b, B, B+b, &c. Then if the successive differences b, b, &c. of the latter quantity always increase, how small soever a may be, then B cannot be said to increase at so great a rate as a quantity that increases uniformly by equal successive differences greater than b, or at so small a rate as any quantity that increases uniformly by equal successive differences less than b. In like manner, if the relation of the quantities is such, that the successive differences b, b, &c. continually decrease; then B cannot be said to increase at the same rate as a quantity that increases uniformly by equal successive differences greater than b, or less than b.

Therefore the *fluxion* of A being supposed equal to the increment a, the *fluxion* of B cannot be greater than b or less than b, when the successive differences b, b, &c. continually increase; and cannot be greater than b or less than b, when these successive differences always decrease.

In the same manner, if the latter quantity decrease while the former increases, and its successive values be B+b, B−b, &c. then if the decrements b, b, &c. continually increase, B cannot be said to decrease at so great a rate as a quantity that decreases uniformly by equal successive differences greater than b, or at so small a rate as a quantity that decreases uniformly by equal successive differences less than b. Therefore in this case the *fluxion* of A being supposed equal to a, the *fluxion* of B cannot be greater than b or less than b. And in the same manner if the successive decrements b, b, &c. always decrease, the *fluxion* of B cannot be greater than b, or less than b. Vid. Maclaurin's Flux. book ii. cap. 1. tom. ii. p. 579, seq.

As the *fluxions* of quantities are any measures of the respective rates, according to which they increase or decrease; so it is of no importance how great or small those measures are, if they be in the just proportion or relation to each other. Therefore if the *fluxions* of A and B may be supposed equal to a and b respectively, they may be likewise supposed equal to $\frac{1}{2}a$ and $\frac{1}{2}b$, or to $\frac{m\,a}{n}$ and $\frac{m\,b}{n}$.

Prop. 1. *The* fluxion *of the root* A *being supposed equal to* a, *the* fluxion *of the square* AA *will be equal to* $2A \times a$.

To demonstrate this, let the successive values of the root be $A-u$, A, $A+u$, and the corresponding values of the square will be $AA-2Au+uu$, AA, $AA+2Au+uu$, which increase by the differences $2Au-uu$, $2Au+uu$, &c. and because those differences increase, it follows from what has been said, that if the *fluxion* of A be represented by u, the *fluxion* of AA cannot be represented by a quantity that is greater than $2Au+uu$, or less than $2Au-uu$. This being premised, suppose, as in the proposition, that the *fluxion* of A is equal to a; and if the *fluxion* of AA be not equal to $2Aa$, let it first be greater than $2Aa$ in any ratio, as that of $2A+o$ to 2A, and consequently equal to $2Aa+oa$. Suppose now that u is any increment of A less than o; and because a is to u as $2Aa+oa$ is to $2Au+ou$, it follows, that if the *fluxion* of A should be represented by u, the *fluxion* of AA would be represented by $2Au+ou$, which is greater than $2Au+uu$. But it has been shewn, that if the *fluxion* of A be represented by u, the *fluxion* of AA cannot be represented by a quantity greater than $2Au+uu$. And these being contradictory, it follows, that the *fluxion* of A being equal to a, the *fluxion* of AA cannot be greater than $2Aa$. If the *fluxion* of AA can be less than $2Aa$, when the *fluxion* of A is supposed equal to a, let it be less in any ratio of $2A-o$ to 2A, and therefore equal to $2Aa-oa$. Then because a is to u as $2Aa-oa$ is to $2Au-ou$, which is less than $2Au-uu$, (u being supposed less than o, as before) it follows, that if the *fluxion* of A was represented by u, the *fluxion* of AA would be represented by a quantity less than $2Au-uu$, against what has been shewn. Therefore the *fluxion* of A being supposed equal to a, the *fluxion* of AA must be equal to $2Aa$.

The *fluxions* of A and B being supposed equal to a and b, respectively, the *fluxion* of A+B will be $a+b$, the *fluxion* of $\overline{A+B}^2$, or of AA+2AB+BB, will be $2 \times \overline{A+B} \times a+b$, or $2Aa+2Bb+2Ba+2Ab$, by the last article. The *fluxion* of AA+BB is $2Aa+2Bb$, by the same; consequently the *fluxion* of 2AB is $2Ba+2Ab$; and the *fluxion* of AB is $Ba+Ab$. Hence if P be equal to AB, and the *fluxion* of P be p, then p will be equal to $Bq+Ab$, and dividing by P, or AB, we find $\frac{p}{P}=\frac{a}{A}+\frac{b}{B}$. If $Q=\frac{A}{B}$, and q be the *fluxion* of Q, then $QB=A$, $\frac{q}{Q}+\frac{b}{B}=\frac{a}{A}$, or $\frac{q}{Q}=\frac{a}{A}-\frac{b}{B}$; and consequently $q=\frac{Q\,a}{A}-\frac{Q\,b}{B}=\frac{a}{B}-\frac{A\,b}{BB}$, or $\frac{a\,B-A\,b}{BB}$.

When any of the quantities decreases, its *fluxion* is to be considered as negative.

The rule for finding the *fluxion* of a power is usually deduced from the binomial theorem of Sir Isaac Newton. But as this theorem, though easily found by induction, is not so easy to demonstrate, it is proper to proceed upon a principle, the truth of which may be shewn from the first algebraic elements, with more facility and perspicuity. This principle is, that if n be any integer number, and the sum of the terms E^{n-1}, $E^{n-2}F$, $E^{n-3}F^2$, $E^{n-4}F^3$, &c. continued till their number be equal to n, be multiplied by E−F, the product will be E^n-F^n. For the terms being formed by subducting continually unity from the index of E, and adding it to the index of F, the last term will be F^{n-1}. The product of the sum of the terms multiplied by E will be $E^n+E^{n-1}F+E^{n-2}F^2 \ldots\ldots +EF^{n-1}$; their sum multiplied by −F gives $-E^{n-1}F-E^{n-2}F^2 \ldots -EF^{n-1}-F^n$; and the sum of these two products is E^n-F^n. Supposing E to be greater than F, E^n-F_n will be less than $n\,E^{n-1} \times \overline{E-F}$, but greater than $n\,F^{n-1} \times \overline{E-F}$. For each of the terms E^{n-1}, $E^{n-2}F$, $E^{n-3}F^2$, is greater than the subsequent term in the same ratio that E is greater than F, and E^{n-1} is the greatest term; consequently the number of terms being equal to n, $n\,E^{n-1}$ is greater than their sum; and $n\,E^{n-1} \times \overline{E-F}$ is greater than their sum multiplied by $\overline{E-F}$, or (by the last paragraph) greater than E^n-F^n. Because the last term F^{n-1} is less than any preceding term, $n\,F^{n-1} \times \overline{E-F}$ is less than the sum of the terms multiplied by $\overline{E-F}$, or less than E^n-F^n.

When n is any integer positive number, the root A being supposed to increase by any equal successive differences, the successive differences of the power A^n will continually increase. For let $A-a$, A, $A+a$, be any successive values of the root, and $\overline{A-a}^n$, A^n, $\overline{A+a}^n$ will be the corresponding values of the power. But $\overline{A+a}^n - A^n$ is greater than $n\,A^{n-1}a$; as appears by substituting in the last paragraph $\overline{A+a}$ for E, A for F, and a for $\overline{E-F}$. In like manner, $n\,A^{n-1}a$ is greater than $A^n-\overline{A-a}^n$. Therefore $\overline{A+a}^n - A^n$ is greater than $A^n-\overline{A-a}^n$, and the successive differences of the power continually increase.

Prop. II. *The* fluxion *of the root* A *being supposed equal to* a, *the* fluxion *of the power* A^n *will be* $n\,a\,A^{n-1}$.

For if the *fluxion* of A^n can be greater than $n\,a\,A^{n-1}$, let the excess be equal to any quantity r; suppose o equal to the excess of $\sqrt[n-1]{A^{n-1}+\frac{r}{n\,a}}$ above A, and consequently $\overline{A+o}^{n-1} = A^{n-1}+\frac{r}{n\,a}$. Then $n\,a \times \overline{A+o}^{n-1}$ will be equal to $n\,a\,A^{n-1}+r$, the *fluxion* of A^n. Let u be any increment of A less then o; and because a is to u as $n\,a \times \overline{A+o}^{n-1}$ to $nu \times \overline{A+o}^{n-1}$, it follows (from what has been said) that if the *fluxion* of A be now represented by the increment u, the *fluxion* of A^n will be represented by $nu \times \overline{A+o}^{n-1}$, which is greater than $nu \times \overline{A+u}^{n-1}$, and this last is itself greater than $\overline{A+u}^{n-1} - A^n$. But when the successive values of the root are $A-u$, A, $A+u$, those of the power are $\overline{A-u}^n$, A^n, $\overline{A+u}^n$, the successive differences of which continually increase; consequently if the *fluxion* of A be represented by u, the *fluxion* of A^n cannot be represented by a quantity greater than $\overline{A+u}^n - A^n$, or less than $A^n-\overline{A-u}^n$. And these being contradictory, it follows, that when the *fluxion* of A is supposed equal to a, the *fluxion* of A^n cannot be greater than $n\,a\,A^{n-1}$. If it can be less than $n\,a\,A^{n-1}$, let it be equal to $n\,a\,A^{n-1}-r$, or (by supposing $o = A^{n-1} - \sqrt[n-1]{A^{n-1}-\frac{r}{n\,a}}$) to $n\,a \times \overline{A-o}^{n-1}$. Then u being supposed

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poſed leſs than o, if the *fluxion* of A was repreſented by u, the *fluxion* of A^n would be repreſented by $nu \times \overline{A-o}^{n-1}$, which is leſs than $nu \times \overline{A-u}^{n-1}$ (becauſe we ſuppoſe u to be leſs than o) and therefore leſs than $A^n - \overline{A-u}^n$. But this is repugnant to what has been demonſtrated. Therefore the *fluxion* of A being ſuppoſed equal to a, the *fluxion* of A^n muſt be equal to $na\,A^{n-1}$.

Prop. III. *The* fluxion *of* A *being ſuppoſed equal to* a, *the* fluxion *of* $A^{\frac{m}{n}}$ *will be* $\frac{ma}{n} \times A^{\frac{m}{n}-1}$.

Firſt, let the exponent $\frac{m}{n}$ be any poſitive fraction whatſoever, ſuppoſe $A^{\frac{m}{n}} = K$; conſequently $A^m = K^n$; and the *fluxion* of K being ſuppoſed equal to k, $ma\,A^{m-1} = nk\,K^{n-1}$, and k or the *fluxion* of $A^{\frac{m}{n}}$ will be equal to $\frac{ma\,A^{m-1}}{nK^{n-1}} = \frac{ma\,K}{nA} = \frac{m}{n} \times a\,A^{\frac{m}{n}-1}$. When $\frac{n}{m}$ is negative, let it be equal to $-r$; and ſuppoſe $A^{-r} = K$, or $1 = A^r K$, then taking the *fluxions*, $rA^{r-1}\,aK + kA^r = o$, and $k = -\frac{rA^{r-1}\,aK}{A^r} = -rA^{-r-1}a = \frac{m}{n} \times a\,A^{\frac{m}{n}-1}$.

Prop. IV. *Suppoſing* P *to be the product of any factors* A, B, C, D, E, &c. *and the* fluxions *of* P, A, B, C, &c. *reſpectively equal to* p, a, b, &c. then will $\frac{p}{P} = \frac{a}{A} + \frac{b}{B} + \frac{c}{C} + \frac{d}{D}$, &c.

Let Q be equal to the product of all the factors of P, the firſt A excepted, that is, ſuppoſe $P = AQ$. Suppoſe R equal to the product of all the factors, the firſt two, A and B, excepted; that is, let $P = ABR$, or $Q = BR$. In the ſame manner let $R = CS$, $S = DT$, and ſo on. Then the *fluxions* of Q, R, S, T, &c. being ſuppoſed reſpectively equal to q, r, s, t, &c. it follows that $\frac{p}{P} = \frac{a}{A} + \frac{q}{Q} =$ (becauſe $\frac{q}{Q} = \frac{b}{B} + \frac{r}{R}$) $\frac{a}{A} + \frac{b}{B} + \frac{r}{R}$ = (becauſe $\frac{r}{R} = \frac{c}{C} + \frac{s}{S}$) $\frac{a}{A} + \frac{b}{B} + \frac{c}{C} + \frac{s}{S}$ = (becauſe $\frac{s}{S} = \frac{d}{D} + \frac{t}{T}$) $\frac{a}{A} + \frac{b}{B} + \frac{c}{C} + \frac{d}{D} + \frac{t}{T}$, and ſo on. Therefore $\frac{p}{P}$ is equal to the ſum of the quotients, when the *fluxion* of each factor is divided by the factor itſelf.

If the factors be ſuppoſed equal to each other, and their number be equal to n, then $P = A^n$, and by the laſt propoſition $\frac{p}{P} = \frac{na}{A}$; conſequently $p = \frac{nP\,a}{A} = na\,A^{n-1}$, as was before demonſtrated.

Prop. V. *If* $P = \frac{ABC, \&c.}{KLM, \&c.}$ *and the* fluxions *of the reſpective quantities be expreſſed by the ſmall letters* p, a, b, c, &c. *as before, then* $\frac{p}{P} = \frac{a}{A} + \frac{b}{B} + \frac{c}{C} - \frac{k}{K} - \frac{l}{L} - \frac{m}{M}$, &c.

For PKLM, &c. = ABC, &c. and $\frac{p}{P} + \frac{k}{K} + \frac{l}{L} + \frac{m}{M}$, &c. $= \frac{a}{A} + \frac{b}{B} + \frac{c}{C}$, &c. whence by tranſpoſition $\frac{p}{P} = \frac{a}{A} + \frac{b}{B} + \frac{c}{C} - \frac{k}{K} - \frac{l}{L}$, &c. Maclaurin, ibid.

The notation we have hitherto uſed is the ſame as Sir Iſaac Newton's, in the ſecond lemma of the ſecond book of his Principles. But it is generally more convenient to diſtinguiſh *fluxions* from other algebraic expreſſions, and in ſuch manner, that the ſecond and higher *fluxions* may be repreſented ſo as to preſerve the original fluent in view. Hence Sir Iſaac Newton, in his laſt method, repreſented variable or flowing qualities by the final letters of the alphabet, as x, y, z; their firſt, ſecond, &c. *fluxions*, reſpectively by $\dot{x}$, $\dot{y}$, $\dot{z}$, and $\ddot{x}$, $\ddot{y}$, $\ddot{z}$, &c. But as this doctrine has been conteſted and repreſented by the author of the Analyſt, as inconceivable and ſophiſtical, we thought it proper more fully to explain and demonſtrate the principles thereof, from Mr. Maclaurin's excellent treatiſe on this ſubject.

It is to be obſerved, that the *fluxions* of powers are commonly delivered in an algebraic form; but this is not neceſſary. The ſame may be done geometrically, by ſuppoſing a ſeries of lines in geometric progreſſion, the firſt term of which is invariable. Then if the ſecond term be ſuppoſed to increaſe uniformly, all the ſubſequent terms will increaſe with an accelerated motion. The velocities of the points that deſcribe thoſe lines being compared, it may be demonſtrated from common geometry, that the *fluxions* of any two terms, are in a ratio compounded of the ratio of thoſe terms, and of the ratio of the numbers that expreſs how many terms precede them reſpectively, in the progreſſion. Thus, if A, B, C, D, E, &c. repreſent any lines in geometric progreſſion, the firſt term (A) of which is invariable, then will the *fluxion*, for inſtance, of E be to the *fluxion* of D as 4 E is to 3 D, and the *fluxion* of E will be to the *fluxion* of B, as 4 E to B. The analogy between powers in algebra and lines in geometric progreſſion, is ſufficiently known. Thus A being invariable may be called unity or 1; let $B = \dot{x}$, then will $C = x\dot{x}$, $D = x^3$, $E = x^4$, &c. and conſequently, the *fluxion* of E or x^4, will be to the *fluxion* of B or $\dot{x}$, as $4x^4$ is to $\dot{x}$, or as $4x^3$ is to 1. Therefore if the *fluxion* of x be expreſſed by $\dot{x}$, the *fluxion* of x^4 will be expreſſed by $4x^3\dot{x}$, agreeably to the common algebraic method of expreſſion. Vide Mr. Maclaurin's Flux. book i. chap. 6. See alſo the Preſent State of the Rep. of Let. Oct. 1735, p. 248, 249, &c.

If the *fluxion* of B, or the ſecond term of the progreſſion, be invariable, every term of the progreſſion will have *fluxions* of as many degrees, as there are terms that precede it in the progreſſion. And the increment of any term generated in a given time may be reſolved into as many parts, as it has *fluxions* of different orders; and each part may be conceived to be generated, in conſequence of its reſpective *fluxion*. Hence *fluxions* of all orders may be illuſtrated and meaſured.

As to the higher orders of *fluxions*, it is to be obſerved, that when a motion is accelerated or retarded continually, the velocity may itſelf be conſidered as a variable or flowing quantity, and may be repreſented by a line that increaſes or decreaſes continually. When a velocity increaſes uniformly ſo as to acquire equal increments in equal times, its *fluxion* is meaſured by the increment which is generated in any given time. In this caſe, the velocity is repreſented by a line that is deſcribed by an uniform motion; and its *fluxions*, by the conſtant velocity of the point that deſcribes the line, or by the ſpace which this point deſcribes in a given time. When a velocity is not accelerated uniformly, but acquires increments in equal times, that continually increaſe or decreaſe, then its *fluxion* at any term of the time is not meaſured by the increment, which it actually acquires, but by that which it would have acquired, if its acceleration had been continued uniformly from that term for a given time. And in the ſame manner, when a motion is retarded continually, the quantity by which it would be diminiſhed in a given time, if its retardation was continued uniformly for any term, meaſures its *fluxion* at that term. While the point M deſcribes the line E e, let the point Q deſcribe the line I i, ſo that I Q may be always equal to the ſpace that would be deſcribed by the motion of M, if it was continued uniformly for a given time. Then I Q ſhall always repreſent the velocity of M, and the velocity of the

E M e
I Q i

point Q ſhall repreſent the *fluxion* of the velocity of M; which therefore is meaſured, at any term of the time, by the ſpace which would be deſcribed by Q, with its motion at that term continued uniformly for a given time. The velocity of M is the *fluxion* of EM; and therefore the velocity of Q repreſents the *fluxion* of the *fluxion* of EM. See the beginning of this article. Thus, when a *fluxion* of a quantity is variable, it may be conſidered itſelf as a fluent, and may have its *fluxion*, which is called the *ſecond fluxion* of that quantity. This may alſo have its *fluxion*, which is called the *third fluxion* of the firſt fluent; and motions may be eaſily conceived to vary in ſuch a manner, as to give ground for admitting ſecond *fluxions*, and thoſe of any higher order. And as the firſt *fluxion* of a variable quantity, at any term of the time, is meaſured by the increment, or decrement, which would be produced, if the generating motion was continued uniformly from that term, for a given time; ſo its ſecond *fluxion* may be meaſured by twice the difference betwixt this increment, or decrement, and that which would be produced, if the acceleration, or retardation, of the generating motion was continued uniformly from that term for the ſame time. Maclaurin, lib. cit. book i. chap. 1. § 70. 75. and chap. 5, 6.

See a farther illuſtration of ſecond and third *fluxions*, in the ſame author (chap. 3. and 4.) deduced from the conſideration of the *fluxions* of ſolids.

The author of the Analyſt has repreſented the notions of ſecond and third *fluxions*, as inextricable myſteries; and indeed,

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indeed, when ſome ſpeak of the velocities of velocities, &c. it is not eaſy to ſay what they mean. But it is to be obſerved, that the firſt *fluxion* of any fluent is not the velocity of that fluent, but the velocity of the motion by which the fluent is conceived to be generated. And in like manner, the ſecond *fluxion* of that fluent is not the velocity of the velocity of this fluent, but the velocity of the motion by which the quantity is generated that always repreſents its firſt *fluxion*, and ſo of the reſt.

When the *fluxion* of a quantity is variable it may be conſidered as a fluent; and its *fluxion*, which is the ſecond *fluxion* of the propoſed quantity, may be determined by the preceding propoſitions. Thus the *fluxion* of A being ſuppoſed equal to a, the *fluxion* of AA is $2Aa$; and if A be ſuppoſed to increaſe at an uniform rate, or its *fluxion* a to be invariable, $2Aa$ will increaſe by equal ſucceſſive differences; conſequently its *fluxion*, or the ſecond *fluxion* of AA, will be equal to any of theſe differences, as to $2a \times \overline{A+a} - 2Aa$, or $2aa$. If a be variable, let its *fluxion* be equal to z, and the *fluxion* of $2Aa$ (or ſecond *fluxion* of AA) will be $2aa+2Az$. In the ſame manner the *fluxion* of A being conſtant, the *fluxion* of $nA^{n-1}a$, or the ſecond *fluxion* of A^n is $na \times \overline{n-1} \times A^{n-2}a$, or $n \times \overline{n-1} \times aaA^{n-2}$; the *fluxion* of this, or third *fluxion* of A^n, is $n \times \overline{n-1} \times \overline{n-2} \times a^3 A^{n-3}$. And the *fluxion* of A^n of any order denoted by m, is $n \times \overline{n-1} \times \overline{n-2} \times \overline{n-3}$, &c. $\times a^m A^{n-m}$, where the factors in the coefficient are to be continued till their number be equal to m. When n is any integer poſitive number, the *fluxion* A^n, of the order n, is invariable and equal to $n \times \overline{n-1} \times \overline{n-2} \times \overline{n-3}$, &c. $\times a^n$. The quantities that repreſent theſe *fluxions* of A^n depend on a, which repreſents the *fluxion* of A. When A remains of the ſame value, the firſt *fluxion* of A^n is greater or leſs in the ſame proportion, as a is ſuppoſed to be greater or leſs; the ſecond *fluxion* of A^n, is in the duplicate ratio of a; and its *fluxion* of the order m, is as a^m. If a be variable, but z the *fluxion* of a, or the ſecond *fluxion* of A, be conſtant, then the fourth *fluxion* of AA will be conſtant and equal to $6zz$; for we found, that the ſecond *fluxion* of AA was $2aa+2Az$; the *fluxion* of which is $4az+2az$, or $6az$; and the *fluxion* of this is $6zz$. In like manner, the ſixth *fluxion* of A^3 will be conſtant in this caſe, and equal to $90z^3$.

The ſecond differences of any quantity B are the ſucceſſive differences of its firſt differences; and as the *fluxion* B increaſes when its ſucceſſive differences increaſe; ſo its ſecond *fluxion*, or its *fluxions* of any higher order increaſe, when its ſecond or higher differences increaſe. If we arrive at differences of any order that are conſtant, the *fluxion* of the ſame order is conſtant, and is expreſſed by that difference. Thus when A is ſuppoſed to increaſe by conſtant differences equal to a, and its *fluxion* is ſuppoſed equal to a, the ſecond difference of AA (or $\overline{A+a^2} - 2A\,\overline{A+a^2}$) is $2aa$, which is likewiſe its ſecond *fluxion*; and the third difference of A^3 is $6a^3$, which is its third *fluxion*. When n is any integer and poſitive number, the *fluxion* of A^n of the order n is equal to the *fluxion* of any of its firſt differences of the order $n-2$, and ſo on. For the *fluxion* of $\overline{A+a^n} - A^n$ (one of the firſt differences of A^n) of the order $n-1$ is $n \times \overline{n-1} \times \overline{n-2}$, &c. $\times \overline{\overline{A+a}^{n-n+1} - A} \times a^{n-1} = n \times \overline{n-1} \times \overline{n-2}$, &c. $\times a^n$, where the coefficients are ſuppoſed to be continued till their number be $n-1$, ſo that the laſt muſt be 2. And this we found to be the *fluxion* of A^n of the order n, in the preceding paragraph. In the ſame manner the *fluxion* of $\overline{A+a^n} - 2A^n + \overline{A-a^n}$ (the ſecond difference of A^n) of the order $n-2$, is equal to the *fluxion* of $\overline{A+a^n} - A$ of the order $n-1$; and conſequently equal to the *fluxion* of A^n of the order n. Theſe *fluxions* are invariable and equal to the laſt or invariable differences. But in other caſes the *fluxions* of A^n of any order are leſs than its ſubſequent differences of the ſame order, but greater than the preceding differences, as before mentioned. Maclaurin's Flux. art. 720, ſeq.

By ſuppoſing one of the variable quantities to flow uniformly, it will have no ſecond or higher *fluxions*, and the higher *fluxions* depending on it will be expreſſed in a more ſimple manner. Thus the *fluxion* of x being ſuppoſed conſtant, the firſt *fluxion* of x^n being $nx^{n-1}\dot{x}$, its ſecond *fluxion* will be $n \times \overline{n-1} \times \dot{x}^2 x^{n-2}$, and its *fluxion* of any order m will be $n \times \overline{n-1} \times \overline{n-2} \times \overline{n-3}$, &c. $\times \dot{x}^m x^{n-m}$, where the factors in the coefficient are to be continued till their number be equal to m.

The ſecond or higher *fluxions* of quantities may be found by particular theorems (without computing thoſe of the preceding orders) as may be ſeen by the laſt example.

See farther in Maclaurin's Fluxions, art. 734. See Rule 10. in the beginning of this article.

The uſe of the direct method of *fluxions*, ſee ſpecified under the articles EVOLUTE, INFLECTION, MAXIMIS and MINIMIS, and TANGENTS.

Thoſe of the inverſe method, ſee under QUADRATURE and RECTIFICATION *of curves*.

FLY, *Muſca*, in *Natural Hiſtory*. The account of the ſeveral ſpecies, genera, and claſſes of *flies*, is no ſmall part of the natural hiſtory of inſects. The number of the ſpecies of *flies* exceed perhaps even that of the butterfly; but the *flies* are in general ſmall, though there are ſome, as the libellæ, whoſe bodies are longer and larger than thoſe of the largeſt butterflies. The cicadæ alſo belong to the *fly* claſs; and there are ſome of thoſe, whoſe ſize exceed that of the largeſt butterflies in the thickneſs of their bodies. The generality of *flies*, however, are much ſmaller than the butterfly claſs, and many of them are indeed ſo very ſmall, as not eaſily to be diſtinguiſhed.

Many of the *flies* are in their prior ſtate hid from us, or detained among very diſpleaſing matters; it is in their winged ſtate that they become an agreeable object of our reſearches, and it may be moſt proper, therefore, to begin their hiſtory in that ſtate, occaſionally deſcending to the others.

It is a common error to imagine, that the ſmall *flies* one ſees in the ſpring, will become larger in ſummer. This is wholly without foundation, ſince all the *flies*, like other inſects which undergo a metamorphoſis, become of their full bigneſs, as ſoon as they arrive at the *fly* ſtate, and never grow afterwards.

The general and obvious character of *flies*, by which they are diſtinguiſhed from other winged inſects, is their having tranſparent wings, and never having on them any of that powder which is found on the wings of butterflies, and having no caſes or covers for them. They are, by this plain character of their tranſparent and naked wings, diſtinguiſhed from the butterfly, the beetle, the graſshopper, and other claſſes of winged inſects.

The parts of *flies* are the head, the CORCELET, and the body.

To the corcelet the wings are affixed, and in the body are contained the ſtomach, inteſtines, the parts of generation, and a great many of the tracheæ. The head in *flies* is uſually joined to the corcelet by a very ſhort neck, and can often turn on it as on a pivot. Some *flies* there are which have as it were two corcelets, one ſeparated from the other; the firſt in this caſe is uſually very ſmall, and the wings are affixed to the ſecond. The corcelet is the moſt prominent and rounded part of the inſect; it is always the ſtrongeſt part, and is frequently the thickeſt. The formica-leo and ſome water inſects, are transformed into *flies* which have double corcelets, or corcelets divided into two.

The moſt obvious diſtinctions for the arrangement of *flies* into claſſes, is the number of their wings; ſome having only two, others four. And this is ſo plain and obvious a diviſion, that it is wonderful that the writers of natural hiſtory have not long ſince fallen into it, nay, many of them have often omitted to tell us the number of wings of the ſpecies they deſcribe.

The firſt general diviſion of *flies* is therefore into that of the two-winged and four-winged kinds. A very ſlight obſervation is generally ſufficient to determine to which of theſe diviſions a *fly* belongs; but if we afterwards examine a *fly* with more attention, and take into conſideration the organs by which it takes its nouriſhment, one may obſerve, that ſome of them are able to thruſt out that organ to a conſiderable diſtance from their head, and that this organ, which, while in a ſtate of reſt, is folded up or ſhortened, or turned about, or laid cloſely down, when the creature wants to uſe it, is unfolded, lengthened, extended, or raiſed. This organ is what naturaliſts call the trunk of an inſect, but there are many other *flies* which have no trunk; theſe have no other than an opening, ſerving for a mouth, ſurrounded with lips and with ſome other parts. This ſort of opening, from its ſituation and figure, may very properly be called a mouth.

Some of theſe mouths have nothing analogous to teeth about them; but there are others which have teeth, ſaws, or grinders, placed on the outſide of the mouth, and moveable as in the caterpillars, with which the *flies* tear and deſtroy leaves, fruits, and fleſh: finally, there are alſo ſome *flies* to which nature has allotted both a trunk and theſe organs.

Theſe characters give us very naturally the diſtinctions of four ſubordinate claſſes under the two former general ones.

The firſt contains thoſe *flies* which have a trunk, and no teeth or ſaws. The ſecond contains thoſe which have a mouth

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mouth without any ſenſible teeth. The third, thoſe which have a mouth furniſhed with teeth; and the fourth, thoſe which have both trunks and teeth. Among the *flies* which have mouths furniſhed with teeth, ſome have them not only without, but within their mouths alſo.

All the two-winged *flies* belong to the firſt or ſecond of theſe claſſes; the great blue fleſh-*fly*, the ſmall *flies* that are ſo troubleſome about our houſes, and the gnats, are all of the firſt claſs, and have trunks and no teeth. The ſpring-*fly*, ſo common in gardens, and a ſort of *fly* reſembling the gnat kind, but much larger, are of the ſecond claſs, and have mouths, but no ſenſible teeth.

The four-winged *flies* furniſh us with great numbers to fill up the other two claſſes, left vacant by the former. All the bee-kind have a trunk and two teeth; all the waſp-kind have a mouth furniſhed with two teeth; and there are, beſide theſe, ſeveral of the four-winged *flies* which belong to the ſecond claſs; all the papilionaceous *flies*, produced of water tæniæ, are of this ſort, as having a mouth without teeth. Several ſmall four-winged *flies* are alſo of the firſt claſs; as the flying pucerons, and falſe pucerons, which have all trunks and no teeth: neither are the ſmaller ſpecies only of this claſs, ſince the cicadæ alſo belong to it.

A fifth claſs may, however, be alſo eſtabliſhed, though the ſpecies of it are only few, there being only two kinds of *flies* of it; this is, of thoſe which have their head ſerving the office, or made in the form of a trunk. The *flies* of this kind have very long heads, which, like thoſe of birds, terminate in a ſort of beak; this, however, in the *fly*-kind, is never opened except at the end: or, in other words, theſe *flies* have heads, which are lengthened out into the reſemblance of a bill, or figure of a trunk, but which is ſtiff, and cannot change its figure, nor alter its poſition, otherwiſe than by altering that of the whole head. At the end of this ſort of trunk are placed the teeth or other organs, by which the creature gets its food. The firſt example of theſe heads is in the ſcorpion-*fly*; and a very beautiful *fly*, that is frequently ſeen ſkipping and leaping about flowers, is the other.

Under theſe general claſſes, ſubordinate ones are to be formed, from whatever beſides is the moſt obvious and eſſential diſtinction among theſe little animals. The form of the body may very well afford us theſe diſtinctions. So that, in this reſpect, there are three ſubordinate claſſes under the five fore-mentioned claſſes: the firſt, of thoſe *flies* whoſe bodies are ſhort and broader than they are thick; the ſecond, of thoſe with long bodies; and the third, with bodies faſtened to the corcelet only by a fine filament: and under all theſe, the ſeveral genera are to be eſtabliſhed from other leſſer but conſtant and invariable differences; ſuch as the differences of the manner of their carrying their wings, the figures of their antennæ, the poſition of their trunks, and other ſimilar differences. See *Tab. of Inſects*, and WINGS, TRUNKS, &c.

FLIES, *bodies of*. The bodies of theſe inſects are extremely different one from another, and even thoſe whoſe general form makes them properly ranged in the ſame claſs, are not without their diſtinctions, by which they alone may be made to eſtabliſh ſubordinate genera.

Among the *flies* which have ſhort or ellipſoide bodies, ſome have the body extremely flat and thin; ſuch are thoſe of the *flies* produced from the worms which devour the pucerons; and others have the hinder part of the body bent downward in form of a hook.

The extremity of the body in theſe animals is uſually ſmaller than the adjoining parts. Yet there is a *fly* found in the neſts of ſwallows, the extremity of whoſe body is larger than any other part of it; and not only the form of the body, but the differences of the filament, by which, in many genera, it is connected to the corcelet, may furniſh great matter for the diſtinctions of the ſubordinate genera.

The hinder part, or extremity of the body alone, may alſo afford great matter of diſtinction. Thoſe *flies* which carry ſtings in their tails, have in that alone a ſufficient diſtinction.

Others there are which have organs placed there, which, though we need not fear them, offer ſubject enough for our admiration; it is indeed the females alone who have occaſion for theſe, and therefore the females alone are furniſhed with them.

Several of theſe inſtruments are a kind of auger or borer, carried in a caſe or ſheath. This ſometimes has the form of a long tail to the inſect, and its uſe is to pierce and bore the body, in which the creature is to depoſit its eggs. Several of the female ichneumons have this ſort of long tail; and there are other inſects which have a long and ſtrong piercer, which however does not make a tail to their body, but is partly lodged either under their belly, or in their body: of this kind are the cicadæ, and others. Other inſects of this kind have a ſingular inſtrument lodged in this part of their body, which may properly be called a ſaw. They never ſhew this on examination, unleſs their bodies be preſſed, and then we cannot but greatly admire the inſtrument itſelf, and the powers by which the creature moves it.

Other inſects of this claſs carry behind one or more long ſlender filaments, which, in their form and ſtructure, have ſome ſort of reſemblance to the antennæ; and the uſes of which are as little known to us, as thoſe of the antennæ. The genera of *flies* may very properly be diſtinguiſhed by means of theſe: among the four-winged *flies*, the ephemerons, and many other ſpecies, have them; and among the two-winged kinds, the ſmall *fly*, which is the male gall-inſect, furniſhes us with an inſtance of them. See *Tab. of Inſects*.

FLIES *of water-worms*. Theſe, according to their ſeveral ſpecies, have ſome varieties in their manner of egreſs from their ſhell, at their leaving the nymph ſtate for that of the perfect *fly*.

The long water-worms, compoſed of many rings, and with funnel-faſhioned tails, made with an aperture for the admiſſion of the air, ſurrounded with a multitude of hairs, retain, in their ſhell-ſtate, ſo much of the ſame form which they had while living, that the one is not eaſy to be diſtinguiſhed from the other. The nymph in each of theſe fills up only a ſmall part of the cavity, and the *fly* in many of them is produced perfect in five or ſix days. At this time the parts of the nymph being thoroughly ſtrengthened, it begins to ſhew the firſt ſigns of life in its attempt to open its priſon.

To effect this, nature has ſo provided for the incloſed *fly*, that the head is but ſlightly joined to the ſecond ring of the body; but the creature in this ſtate, not being lodged in that part of the worm, can make no efforts againſt it; all its endeavours are bent to force a ſlit or opening in the ſecond ring, like that in the back of the ſkin of a caterpillar that is going to change its ſkin, or like that of the butterfly chryſaliſes. The means the incloſed *fly* uſes to this purpoſe, are the inflating and ſwelling its head, and then thruſting out the bladder from its anterior part, with which theſe *flies* are provided by nature in this ſtage of their lives, and for this only purpoſe. When this ſlit or crack is effected, the head of the worm is in ſome meaſure ſeparated from the body, and the efforts of the *fly* to puſh itſelf forward, finiſh that ſeparation, and leave an aperture of a proper ſize for the egreſs of the *fly*.

But the water, on the ſurface of which this change is effected, is a thing much to be dreaded, and indeed is often of fatal conſequences to the new-born *fly*, ſince the *flies* produced of water-worms are as much afraid of this element, and are as eaſily drowned, as thoſe produced from worms who ſpend their lives on dry land.

The *flies* produced from this long water-worm are, however, in leſs danger, and leſs afraid of the water than many others; they advance ſlowly out of their ſhells in an horizontal direction, and, as ſoon as their fore-feet are at liberty, they boldly place them upon the water, as if upon dry land, and it ſerves as well for their ſupport; and as their other parts get at liberty, they are gradually ſet upon the water too, and the creature there reſts till its wings are unfolded, and all its parts have their proper form, and then takes its flight into its new element.

The *fly* produced from this long worm is of the ſhort-bodied kind, and much of kin to the common great blue fleſh-*fly*. It has a fleſhy trunk furniſhed with lips, and has no teeth; but though this *fly* is ſo far of the ſame claſs with that common ſpecies, it has enough to amply diſtinguiſh it in theſe ſeparate characters. The firſt is, that this has its antennæ formed of granulated filaments, whereas the other has them of the battledore kind: the wings of the fleſh-*fly* are not croſſed upon the body, whereas thoſe of this water-*fly* are; but what more than theſe diſtinguiſhes it from this, and indeed from all the other ſpecies of *flies*, is, that it has two oblong and ſlender bodies formed like pins, and pointed as thoſe, which are a little crooked, of a cruſtaceous ſtructure, and are inſerted in the upper part of the corcelet of the *fly*, and directed towards its hinder part. See *Tab. of Inſects*, N° 40.

Theſe prickles are hard, rigid, and immoveable.

FLY, *St. Mark*, in *Natural Hiſtory*, the name of a ſpecies of *fly*, which makes its firſt appearance every year about St. Mark's day, and is then ſeen in vaſt numbers; it is ſomewhat ſmaller than the large blue fleſh-*fly*, and has no trunk, but a mouth without teeth: notwithſtanding this ſeemingly innocent organization, the creature does great miſchief, and every gardener knows the effects of it at one time or other. Theſe *flies* are found about fruit-trees, and are always ſeen ſitting upon the buttons of the leaves, and the flower-buds; and they do great miſchief

to

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to many kinds of trees, by ſucking the juices of thoſe tender parts, and either deſtroying them before they open, or at leaſt rendering them very weak. Some tell us that theſe *flies* had originally a ſting, but that the miſchief they did, being very great, St. Mark deprived them of that offenſive weapon for all generations: this is a ſtory much believed by the country people in many of the Roman catholic kingdoms. The mouth is of the ſame figure with that of the tipula, or long-legs, being compoſed of two membranous lateral lips, like the two valves of a ſhell-fiſh, which defend and cover two other fleſhy lips within.

The male is eaſily diſtinguiſhed from the female, by having a much larger head, and reticular eyes much larger than her's, covering, in a manner, the whole head: beſides theſe, it has alſo a cluſter of three bright ſingle eyes, placed in a triangle on the upper part of the head, and reſembling the eyes of ſpiders. The wings of this *fly* are a little longer than its body, and croſſed in ſuch a manner, that one of them entirely covers the other, and even the body. This ſpecies has a ſingular manner of flying; they ſeem as if hanging in the air, their legs being ſuſpended ſtrait down from their body, and their length gives them an odd appearance. The common *flies* of this kind are of two ſpecies, one which is black, and another whoſe breaſt is a duſky red: but there are ſeveral other ſpecies ſo ſmall as not to be diſtinctly ſeen without a microſcope. They are all produced from worms, which are hatched from the eggs of the parent *fly*, depoſited under the ſurface of the earth. They are found in great plenty in September and October in dung, into which they have crawled out of the earth for food.

If a piece of cow-dung, in which the worms of this St. Mark *fly* are, be preſerved in a box, it will keep them alive the whole winter, and they will be found in the beginning of March, to be grown much larger than before, and to be leſs hairy, their hairs being longer, and ſtanding about nine on every ring. If this dung be laid on common earth at this time, they will crawl out of it into the ground, transform themſelves into the nymph ſtate, from which they iſſue in the form of *flies* about the middle of April.

The manner of theſe *flies* leaving their worm ſtate, to enter into that of the chryſalis or nymph, is worthy of obſervation. The worm ſeems in great diſorder, and twiſts itſelf about ſeveral ways, till at length the ſkin cracks on the ſurface of the back; immediately upon this, there appears the anterior part of the nymph at the aperture, and this forces its way out by degrees; the head becomes of no farther uſe, and is left with the ſkin; and the nymph, by diſtending and contracting itſelf, at length makes its way wholly out of it, and then remains at reſt till the *fly* iſſues out of it. The laſt transformation of this inſect, or the appearance of the *fly* from the nymph, has nothing ſingular in it, but is performed in the ſame manner, with the ſame change as in other animals of the ſame kind.

FLY, *fire*. See FIRE-*flies*.

FLY, *fiſhing*. See FISHING-*fly*.

FLY, *flower*, in *Natural Hiſtory*, the name of a ſmall but very beautiful *fly*, deſcribed by Cluſius. It is black, and has two ſilvery wings, two white eyes, ſeven yellow ſpots on the back, and a black one in the middle.

FLY, *harveſt*. See HARVEST.

FLY, *humble-bee*. See HUMBLE-BEE-*fly*, and CULEX.

FLY, *lantern*. See LANTERN-*fly*.

FLY, *roſe*. See ROSE.

FLY, *ſcorpion*. See SCORPION-*fly*.

FLIES, *eggs of*. See EGGS.

FLIES, *eyes of*. See EYE.

FLIES, *legs of*. See LEG.

FLIES, *rings of*. See RINGS.

FLY, in *Mechanics*, a croſs with leaden weights at its ends, or rather a heavy wheel at right angles to the axis of a heavy windlaſs or roller, by means of which the force of the power is not only preſerved, but equally diſtributed in all the parts of the revolution.

The *fly* may be applied to ſeveral ſorts of engines, whether moved by men, horſes, wind, or water; and is of great uſe in thoſe parts of an engine which have a quick circular motion, and where the power or reſiſtance acts unequally in the different parts of a revolution. In this caſe the *fly* becomes a moderator, making the motion of revolution almoſt every where equal.

The force of a *fly*, when joined with the ſcrew, for ſtamping the image upon coins, may be calculated thus: ſuppoſe its two arms to be each fifteen inches long, meaſuring from the center of the weights to the axis of the motion, and the weights to be fifty pounds each, and the diameter of the axis preſſing upon the dye to be one inch; if every ſtroke be made in half a ſecond, and the weights deſcribe an half circumference, which will in this caſe be of four feet, the velocity will at the inſtant of the ſtroke be at the rate of eight feet in a ſecond, and therefore the momentum eight hundred; but the arms of the *fly* being as leavers, one brachium of which is fifteen inches long, whilſt the other, viz. the ſemi-axis, is but half an inch, we muſt increaſe this force thirty times, which will give twenty-four thouſand; an immenſe force, equal to that of a hundred pound weight falling a hundred and twenty feet, or near two ſeconds in time; or to that of a body of ſeven hundred and fifty pounds, falling $16\frac{1}{12}$ feet, or one ſecond in time.

Some of theſe engines for coining crown-pieces have the arms of the *flies* five times as long, and the weights twice as heavy as thoſe here mentioned, ſo that the effect is ten times greater. Deſaguliers, Exper. Philoſoph. vol. i. p. 245. 339.

FLY, in the *Sea-language*, that part of the mariner's COMPASS on which the thirty-two winds are drawn, and to which the needle is faſtened underneath.

FLY *of an enſign*, is the breadth or extent from the ſtaff to the extremity or edge that flutters looſe in the wind.

Let FLY *the ſheets*, at *ſea*, a word of command, in caſe of a guſt of wind, leſt the ſhip ſhould overſet, or ſpend her top-ſails and maſts, to have the ſheet go a-main, and then the ſail will hold no wind.

FLY *the heels*, in the *Manege*. A horſe is ſaid to *fly* the HEELS, when he obeys the SPURS.

To FLY *groſs*, in *Falconry*, is ſaid of a hawk, when ſhe flies at the great birds; as cranes, geeſe, herons, &c.

FLY *on head*, is when the hawk, miſſing her quarry, betakes herſelf to the next check, as crows, &c. See HAWK.

FLY-*boat*, or *flight*, a large flat-bottomed Dutch veſſel, whoſe burthen is generally from four to ſix hundred tons. It is diſtinguiſhed by a remarkably high ſtern, reſembling a Gothic turret, and by very broad buttocks below.

FLY-*catcher*, *muſcicapa*, in *Ornithology*, the name of a genus of PASSERES in the Linnæan ſyſtem, including twenty-one different ſpecies; the characters of which are, that the bill is almoſt triangular, bent inwards at its beak, notched on both ſides and beſet with briſtles, and that the noſtrils are almoſt round. The birds of this genus found in Europe, are the *muſcicapa griſola* and *atricapilla*. The former, or ſpotted *fly-catcher*, has a large head, of a browniſh hue, ſpotted with black; the back is of a mouſe colour, the wings and tail duſky; the interior edges of the quill-feathers are edged with pale yellow; the breaſt and belly are white; the throat and ſides under the wings are duſked with red; the bill is broad at the baſe, and ridged in the middle; the inſide of the mouth is yellow; the legs and feet are ſhort and black. This is a bird of paſſage, appears with us in the ſpring, breeds here, and retires in Auguſt. It builds its neſt on the ſide of trees towards the middle, and, according to Morton, in his Hiſtory of Northamptonſhire, in the corners of walls, where ſpiders weave their webs. They feed on flies and cherries.

The other is called the COLD-*finch*, and is a rare ſpecies with us. It is a ſmall bird of the ficedula kind, and very nearly allied to the beccifago, or petty-chaps. It is called alſo, in ſome places, *chivin* and *borin*. It is a little larger than the wren, and has a very ſharp-pointed beak. Its head, neck, and back, are of a pale grey, and its throat and belly of a yellowiſh white. Its rump is white; its wings grey; its tail, feet, and legs, are brown; and its claws very ſlender. Ray's Ornithology, p. 158.

FLY-*tree*, in *Natural Hiſtory*, a name given by the common people in America to a tree, whoſe leaves, they ſay, at a certain time of the year, produce *flies*. On examining theſe leaves about the middle of ſummer, the time at which the *flies* uſe to be produced, there are found on them a ſort of bags of a tough matter, of about the ſize of a filbert, and of a duſky greeniſh colour; on opening one of theſe bags with a knife, there is uſually found a ſingle full-grown *fly* of the gnat kind, and a number of ſmall worms, which, in a day or two more, have wings, and fly away in the form of their parent. The tree is of the mulberry-kind, and its leaves are uſually very largely ſtocked with theſe inſect bags, and the generality of them are found to contain the inſects in the worm ſtate; when they become winged, they ſoon make their way out. The bags begin to appear when the leaves are young, and afterwards grow with them; but they never rumple the leaf, or injure its ſhape. They are of the kind of leaf galls, and partake in all reſpects, except ſize, of a ſpecies we have frequent on the large maple, or, as it is called, the ſycamore. Philoſ. Tranſ. N° 431. See farther, Reaumur's Hiſt. vol. vi. p. 34. See PUCERON.

FLY-*wort*. See CAMPION.

FLYERS, in *Architecture*, ſuch ſtairs as go ſtrait, and do not wind round, nor have the ſteps made tapering; but

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but the fore and back-part of each ſtair, and the ends, reſpectively parallel to one another.

So that if one flight do not carry you to your deſigned height, there is a broad half ſpace; and then you fly again, with ſteps every-where of the ſame breadth and length as before.

FLYING, the progreſſive motion of a bird, or other winged animal, in the liquid air.

Flying is either *natural*, or *artificial*.

FLYING, *natural*, is that performed by an apparatus, or ſtructure of parts, concerted for that end by nature herſelf. Such is that of moſt birds and inſects, and of ſome fiſhes.

In Virginia and New-England they have monſtrouſly large *flying* beetles. Philoſoph. Tranſact. N° 127. And in Languedoc, graſhoppers about an inch long, wherewith the ground, in ſeveral parts, in the year 1685, was covered one third of a foot deep. Ibid. N° 182.

The parts of birds, &c. chiefly concerned in *flying*, are the wings and tail: by the firſt, the bird ſuſtains and wafts himſelf along; and by the ſecond, he is aſſiſted in aſcending and deſcending, to keep his body poiſed and upright, and to obviate the vacillations thereof.

It is by the largeneſs and ſtrength of the pectoral muſcles, that birds are ſo well diſpoſed for quick, ſtrong, and continued *flying*. Theſe muſcles, which, in men, are ſcarce a ſeventieth part of the muſcles of the body, in birds, exceed and outweigh all the other muſcles taken together; upon which Mr. Willughby makes this reflection, that if it be poſſible for man to fly, his wings muſt be ſo contrived and adapted, that he may make uſe of his legs, and not his arms, in managing them.

The *flying* of birds is thus effected:

The bird firſt bends his legs, and ſprings with a violent leap from the ground; then opens, or expands the jointures of his wings, ſo as to make a right line, perpendicular to the ſides of his body: thus, as the wings, with the feathers therein, conſtitute one continued lamina, being now raiſed a little, and vibrating the wings, with great force and velocity, perpendicularly againſt the air, the air, though a fluid, reſiſts thoſe ſuccuſſions, both from its natural inactivity, and from its elaſticity, which makes it reſtore itſelf after it has been compreſſed, and re-act as much as it has been acted on: by ſuch means is the whole body of the bird protruded. The ſagacity of nature is very remarkable in the opening and recovering of the wing for freſh ſtrokes. To do it directly, and perpendicularly, it muſt needs have a great reſiſtance to overcome; to avoid which, the bony part, or bend, of the wing, into which the feathers are inſerted, moves ſide-ways with its ſharp end foremoſt, the feathers following it like a flag.

The reſiſtance the air makes to the withdrawing of the wings, and, conſequently, the progreſs of the bird will be ſo much the greater, as the waft, or ſtroke, of the fan of the wing is the longer: but as the force of the wing is continually diminiſhed by this reſiſtance, when the two forces come to be in equilibrio, the bird will remain ſuſpended in the ſame place; for the bird only aſcends ſo long as the arch of air, the wing deſcribes, makes a reſiſtance equal to the exceſs of the ſpecific gravity of the bird above the air: if the air, therefore, be ſo rare as to give way with the ſame velocity as it is ſtruck withal, there will be no reſiſtance, and, conſequently, the bird can never mount.

Mr. Ray, Willughby, &c. have ſuppoſed the tail to do the office of a rudder, in ſteering and turning the body this way, or that; but Borelli has ſhewn it to be unfit for any ſuch office. The *flying* of a bird, in effect, is quite a different motion from the ſailing of a ſhip: birds do not vibrate their wings towards the tail, as oars are ſtruck towards the ſtern, but waft them downwards; nor does the tail of the bird cut the air at right angles, as the rudder does the water, but is diſpoſed horizontally, and preſerves the ſame ſituation, what way ſoever the bird turns.

In effect, as a veſſel in the water is turned about on its center of gravity to the right, by a briſk application of the oars to the left, ſo a bird, in beating the air with its right wing alone, towards its tail, its fore-part will be turned to the left; as when in ſwimming, by only ſtriking out with the right arm and leg, we are driven to the left.

Add, that birds with long necks have another way of altering their courſe; for, by only inclining the head and neck towards this or that ſide, the center of gravity of the whole being changed, the bird will proceed according to this new direction.

Birds never fly upwards in a perpendicular line, but always in a parabola, the line deſcribed by projectiles. In a direct aſcent, the natural and artificial tendency would oppoſe and deſtroy each other; ſo that the progreſs would be very ſlow. In a direct deſcent, they would aid one another, ſo that the fall would be too precipitate. Indeed the hawk we frequently find take that advantage in ſeizing of the partridge: but ordinarily birds keep their wings expanded, and at reſt, to retard their deſcent; and at the ſame time ſtretch out their legs.

FLYING, *artificial*, is that attempted by men, by the aſſiſtance of mechanics.

The *art of flying* is one of the great *deſiderata* of mechanics: it has been attempted in divers ages: the diſcovery of it might prove of great ſervice, and alſo of great diſſervice to mankind.

Nobody ſeems to have bid ſo fair for that invention, as our famous friar Bacon, who lived upwards of five hundred years ago. He not only affirms the art feaſible, but aſſures us he himſelf knew how to make an engine, in which a man ſitting might be able to carry himſelf through the air like a bird; and affirms, that there was another perſon who had actually tried it with ſucceſs.

The ſecret conſiſted in a couple of large thin hollow copper globes, exhauſted of air, which being much lighter than air, would ſuſtain a chair, whereon a perſon might ſit.

F. Franciſco Lana, in his Prodromo, propoſes the ſame thing, as his own thought. He computes, that a round veſſel of plate-braſs, fourteen feet in diameter, weighing three ounces the ſquare foot, will only weigh 1848 ounces; whereas a quantity of air of the ſame bulk will weigh $2155\frac{2}{3}$ ounces; ſo that the globe will not only be ſuſtained in the air, but will carry with it a weight of $373\frac{2}{3}$ ounces; and by encreaſing the bulk of the globe, without increaſing the thickneſs of the metal, he adds, a veſſel might be made to carry a much greater weight.

But the fallacy is obvious: a globe of the dimenſions he deſcribes, Dr. Hook ſhews, would not ſuſtain the preſſure of the air, but would be cruſhed inwards. Therefore, in whatever *ratio* the bulk of the globe were increaſed, in the ſame muſt the thickneſs of the metal be alſo, and conſequently the weight increaſed: ſo that there would be no advantage in ſuch augmentation.

The ſame author deſcribes an engine for *flying*, invented by the Sieur Beſnier, a ſmith of Sable, in the county of Maine. Vide Philoſoph. Collect. N° 1.

The famous biſhop Wilkins was ſo confident of ſucceſs in this art, that he ſeems to intimate, that, in future ages, it will be as uſual to hear a man call for his wings when he is going a journey, as it is now to call for his boots. See Math. Magic, b. ii. ch. 7. Diſcovery of a new World, prob. xiv. p. 135. Secret and Swift Meſſenger, ch. iv.

FLYING *army* and *camp*. See CAMP.

FLYING *of colours*, is uſed by painters to denote their want of durableneſs, which they expreſs by their *ſtanding*.

FLYING-*fiſh*, a name given by the Engliſh writers to ſeveral ſpecies of fiſh, which by means of their long fins have a method of keeping themſelves out of water for ſome time. The *flying-fiſh*, moſt properly ſo called, is the exocœtus of the ancient authors, and of Artedi. See *Tab. of Fiſh*, N° 41.

It is called alſo the *adonis*, *hirundo*, and *mugil alatus*, or winged mullet, by authors; but they uſe theſe words indeterminately for this, and the other kinds.

Its general ſize is about ſix inches in length; its head is covered with ſcales, and it reſembles the herring in the form of its body, but the back is flat. The ſcales are large and ſilvery; the dorſal fin is ſmall; its eyes are large; the mouth is ſmall, and is placed low in the head; and its jaws are granulated, rather than toothed. Its belly is white; its tail forked; its gill-fins, commonly called its wings, are ſo long, as when laid cloſe to the body to reach to the tail, and they are as it were double, a ſmall fin compoſed of a ſeries of ſhort nerves or rays, connected by a ſmall membrane ſtanding before each. Theſe wings are of an olive colour on their upper ſide, and are ſpotted with very beautiful blue ſpots near their edges.

This fiſh, when it pleaſes, is able to riſe out of the water and fly to a conſiderable diſtance in the air; but when its wings are dry, is obliged to plunge again into the water to moiſten them. It does this often, when purſued by an enemy; and whole ſhoals have been ſeen thus flying together. It is common in the Mediterranean, and ſome other ſeas; but is ſeldom known in ours, nor in any of the colder climates. See a minute and accurate deſcription of the *exocœtus volitans*, or *flying-fiſh*, in the Phil. Tranſ. vol. lxviii. part ii. p. 791.

FLYING-*fiſh* is alſo a name of a fiſh of the gurnard kind. See *Sapphirine* GURNARD.

FLYING *pinion*, is a part of a clock, having a fly or fan, whereby to gather air, and ſo bridle the rapidity of the clock's motion, when the weight deſcends in the ſtriking part. See CLOCK.

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FOAL, or *colt*, the young of the horſe-kind. The word colt ſimply ſpoken, is, among the dealers, underſtood to mean the male kind; the female or male colt being called a filly.

Colts are uſually foaled in the beginning of ſummer, and it is the cuſtom to let them run with the mare till Michaelmas, when they are to be weaned. This is to be done ſooner or later, according as the cold weather comes in. Some of them are for not having them weaned till the middle of November, and that three days before the full of the moon, if it happen near that time. And ſome of the beſt writers on this ſubject are of opinion, that we do not let the *foals* ſuck long enough, and that this is the reaſon why they are ſo very long before they are fit for uſe. Theſe authors are of opinion, that a colt ought always to ſuck the whole winter, and that this would make them fit for ſervice a great deal ſooner than they are at preſent.

When firſt weaned, they muſt be kept in a convenient houſe, with a low rack and manger for hay and oats, that they may eat freely and eaſily, and the hay muſt be very ſweet and fine, eſpecially at firſt; a little wheat bran ſhould be mixed with the oats, in order to keep their bodies open, and make them eat freely and drink freely.

It has been obſerved, that the eating too much oats has rendered colts blind; but the cauſe has been wrongly attributed to the heating quality of the oats. If the oats are bruiſed in a mill before they are given them, though they eat ever ſo much of them, there never happens any miſchief of this kind; but endeavouring with their teeth to break and chew them when whole, they are apt to ſtretch and ſwell the veſſels of the head, and occaſion a fulneſs of blood about the eyes, which often terminates in inflammations, and in blindneſs.

The difficulty of chewing oats, and not their heating nature, is therefore the true reaſon of this miſchief; and if this be obviated by firſt bruiſing the grain, the colt always grows the better for eating it. His legs do not grow thick, but he becomes broader and better knit, and as he grows up, will bear fatigue much better than if he had been fed only with bran and hay. Above all things, theſe creatures are to be kept from wet and cold while they are young, for nothing is more tender than a colt, and the miſchiefs he gets at this time are not ſo eaſily overcome. Experience ſhews the great advantage of houſing and taking care of colts: for if the ſame ſtallion cover two mares, both alike in age, beauty, and all other particulars, and theſe bring both *foals* of the ſame ſex, ſo that there is no room to expect the leaſt difference between them; let one of theſe colts be houſed every winter, and let the other always run abroad, it will be found as they grow up, that the colt which has been kept abroad, ſhall have large fleſhy ſhoulders, flabby and gouty legs, weak paſterns, and bad hoofs, and ſhall be a dull heavy creature; and that the other, which has been houſed and taken care of, ſhall have a fine forehand, be well ſhaped, have good legs and good hoofs, and be of good ſtrength and ſpirit. From this it may be learned, that it is of no conſequence to have a good ſtallion, and a good mare, if the colts are ſpoiled in the breeding up.

It is obſerved, that ſome colts under the age of ſix months, though the mare yields plenty of good milk, yet decay and waſte daily. They are in this caſe always troubled with a cough. The breeders have a great many fantaſtic remedies in ſuch caſes, as the bag wherein the creature was foaled, the lungs of a fox, and the like; but a little liquorice and elecampane powder mixed with honey and milk, is a remedy greatly to be preferred to all theſe.

When the colts are kept up in the winter, they are not to be continually immured in the ſtable, but in the middle of the day, when the ſun ſhines warm, they ſhould always be let out to play about for an hour or two; and when the winter is ſpent, they ſhould be turned into ſome dry ground, where the graſs is ſweet and ſhort, and where there is good water, that they may drink at pleaſure. The winter after this, they may be kept in the ſtable without any farther care than that which is taken of other horſes; but after the firſt year, the mare colts and horſe colts are not to be kept together.

This may be the method every ſummer and winter till they are broke for uſe, which may be when they are three years old; and they will take the breaking much more eaſily, after this ſort of breeding, than if they had been all the time running about wild: for ordering them the ſecond year as the other horſes are ordered, they will be tame and gentle like them, and will not flounce and plunge about on the firſt mounting, as they otherwiſe would, but will take the ſaddle quietly. The common way of breaking a colt, by beating him and tiring him by trotting over plowed fields, however neceſſary it may be to a colt that has always run wild, is not to be choſen when it can be avoided; for it is breaking and ſpoiling the creature's ſpirit. Uſing him to other horſes, and winning him by gentleneſs, is a vaſtly preferable way. It is proper to wear no ſpurs for ſome time with a newly backed horſe.

In order to make him endure the ſaddle well, the way is to make it familiar to him, by clapping it with the hands as it lies on his back; then ſwaying upon it, and dangling the ſtirrups by his ſides, rubbing his ſides with them, and bringing him thus to be uſed to every thing about him. Then the crupper ſhould be often ſtrained, the girths looſened and tightened, and the ſtirrups taken up and let down at times, all the while making much of him. This will make every thing eaſy to him, and will make him gentle without breaking his ſpirit.

As ſoon as he will trot with the ſaddle obediently, the mouthing of him is to be conſidered. In order to this, put a trench of a full mouth into his mouth, and throw the reins over the fore-part of the ſaddle, ſo that he may have a full feeling of it; then put on a martingale, buckled at ſuch a length, that he may juſtly feel it when he jerks up his head. A broad piece of leather is then to be put round his neck, and the ends made faſt by plating it, or ſome other way at the withers, or before the wind-pipe, about two handfuls below the thropple, betwixt the leather and his neck; let the martingale paſs ſo that, at any time when he offers to duck or throw down his head, the caveſſon being placed upon the tender griſtle of his noſe, may correct and puniſh him. This will make him bring his head to, and form him to the rein. See HORSE.

FOCAGE, or FUAGE, fire-money, hearth-money, or chimney-money. See FUAGE.

FOCILE, FOCIL, in *Anatomy*, a name the Arabs give to the two bones of the arm, reaching from the elbow to the wriſt.

The biggeſt, which is what we call the *cubitus*, and *ulna*, they call the *greater focil*, *focile majus*.

The leſs, which we call *radius*, they call *focile minus*.

The like is obſerved with regard to the bones of the leg. The biggeſt of which, by the Latins called *tibia*, the Arab writers, &c. call the *great focil*; and the leſs, or *fibula*, the *leſſer focil*.

FOCUS, in *Geometry*, and the *Conic Sections*, is applied to certain points in the *parabola*, *ellipſis*, and *hyperbola*; wherein the rays reflected from all parts of theſe CURVES do concur or meet.

The FOCI *of an* ELLIPSIS are two points, as F f, *Tab. Con. Fig.* 21. in the axis A B, on which, as centers, the figure is deſcribed: or, two points in the longer axis, whence two right lines being drawn to any point in the circumference, ſhall be together equal to the axis itſelf. Theſe are alſo called *umbilici*. See CONIC *Section*.

To find the *foci* of an *ellipſis*. See ELLIPSIS.

FOCUS *of the hyperbola*. See CONIC *Section*, and HYPERBOLA.

The FOCUS *of a parabola* is a point in its axis, as F (*Tab. Conics, fig.* 18.) wherein the ſemiordinate F N is equal to the ſemiparameter: or, a point in the axis diſtant from the vertex, by a fourth part of the parameter, or latus rectum.

It is demonſtrated in conics, 1. That in a parabola, the diſtance of the *focus* from the vertex, A F, is to the parameter in a ſubquadruple ratio.

2. That the ſquare of the ſemiordinate is quadruple of the rectangle of the diſtance of the *focus* from the vertex, and the abſciſſe.

3. That the right line F M, *fig.* 19. drawn from the *focus* F to the extremity of the ſemiordinate of the parabola, is equal to the aggregate of the abſciſſe A P, and the diſtance of the *focus* from the vertex A F. See CONIC *Section*.

FOCUS, in *Optics*, is a point wherein ſeveral rays concur, and are collected; either after having undergone refraction, or reflection.

It is thus called, becauſe the rays being here brought together, and united; their force and effect are increaſed; ſo that they become able to burn: accordingly, it is in this point, that bodies are placed to ſuſtain the force of burning glaſſes, or mirrors.

It muſt be obſerved, that the *focus* is not, ſtrickly ſpeaking, a point; the rays are not all accurately collected into the ſame place: Huygens demonſtrates, that the *focus* of a lens convex on both ſides, is $\frac{1}{8}$ of the thickneſs of the lens.

FOCUS, in *Dioptrics*, is the point wherein refracted rays, rendered convergent by refraction, do concur, or meet, and croſs the axis.

The ſame point is alſo called the *point of concourſe*, or *concurrence*.

FOCUS, *Virtual*, in *Dioptrics*, is the point from which refracted rays, when by refraction they are rendered divergent, do begin to diverge or recede from each other.

The ſame point is alſo called *punctum diſperſus*, or *point*

of

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of divergency, in oppoſition to the *focus* which is called the point of concurrence. Suppoſe, e. gr. the concavity of a glaſs to be *a b c*, *Tab.* II. *Optics*, *fig.* 21, and its axis *d e*; let *f g* be a ray of light falling on the glaſs parallel to the axis *d e*, and let *d* be the centre of the arc *a b c*. This ray *f g*, after it has paſſed the glaſs, at its emerſion at *g*, will not proceed directly to *h*, but will be refracted from the perpendicular *d g* and become the ray *g k*. Draw then directly *g k*, ſo that it may croſs the axis in *e*. The point *e* ſo found, is called by Mr. Molyneux the virtual *focus* or point of divergence.

The effect of convex glaſſes, or lenſes, is to render the rays, tranſmitted through them, convergent, and to bring them together into a *focus*, which will be nearer, or farther off, as the lens is a portion of a greater or leſs ſphere.

The effect of concave lenſes is, to render the rays tranſmitted through them, divergent, or to diſperſe them from a virtual *focus*.

For the place, poſition, diſtance, &c. of the *foci* of rays refracted through plain, concave, and convex mediums of divers denſities, as air, water, glaſs, &c. ſee REFRACTION, LENS, &c.

The laws of the *foci* of glaſſes, and the methods of finding the ſame, being thoſe of moſt uſe and importance; we ſhall here ſubjoin them apart, as delivered and demonſtrated by Mr. Molyneux, in his *Dioptrica Nova*.

1. The *focus* of a convex glaſs, i. e. the point wherein parallel rays tranſmitted through a convex glaſs, whoſe ſurface is the ſegment of a ſphere, do unite, is diſtant from the pole or vertex of the glaſs, almoſt a diameter and half of the convexity.

2. In a plano-convex glaſs, the *focus* of parallel rays, or the place where they unite with the axis, is diſtant from the pole of the glaſs a diameter of the convexity, provided the ſegment do not exceed thirty degrees.

The rule or canon in plano-convex glaſſes is as 107 : 193 : : ſo is the radius of the convexity: to the refracted ray taken to its concourſe with the axis; which in glaſſes of larger ſpheres is almoſt equal to the diſtance of the *focus* taken in the axis.

3. In double-convex glaſſes of the ſame ſphere, the *focus* is diſtant from the pole of the glaſs about the radius of the convexity, if the ſegment be but thirty degrees.

But if the convexities be unequal, or if the two ſides be ſegments of different ſpheres, then the rule is,

As the ſum of the radii of both convexities: to the radius of either convexity alone: : ſo is the double radius of the other convexity: to the diſtance of the *focus*.

Here obſerve, that the rays which fall nearer the axis of any glaſs, are not united with it ſo near the pole of the glaſs as thoſe farther off: nor will the *focal* diſtance be ſo great in a plano-convex glaſs, when the convex ſide is towards the object, as when the plain ſide is towards it.

Hence it is truly concluded, that, in viewing any object by a plano-convex glaſs, the convex ſide ſhould always be turned outward; as alſo in burning by ſuch a glaſs.

FOCUS, *for the virtual*, obſerve, 1. That in concave glaſſes, when a ray falls from air parallel to the axis, the virtual *focus*, by its firſt refraction, becomes at the diſtance of a diameter and a half of the concavity.

2. In plano-concave glaſſes, when the rays fall parallel to the axis, the virtual *focus* is diſtant from the glaſs the diameter of the concavity.

3. In plano-concave glaſſes, as 107 : 193 : : ſo is the radius of the concavity: to the diſtance of the virtual *focus*.

4. In double concaves of the ſame ſphere, the virtual *focus* of parallel rays is at the diſtance of the radius of the concavity.

But, whether the concavities be equal or unequal, the virtual *focus*, or point of divergency of the parallel rays, is determined by this rule;

As the ſum of the radii of both concavities: is to the radius of either concavity: : ſo is the double radius of the other concavity: to the diſtance of the virtual *focus*.

5. In concave-glaſſes, expoſed to converging rays, if the point to which the incident ray converges, be diſtant from the glaſs farther than the virtual *focus* of parallel rays, the rule for finding the virtual *focus* of this ray is this;

As the difference between the diſtance of this point from the glaſs, and the diſtance of the virtual *focus* from the glaſs: is to the diſtance of the virtual *focus*: : ſo is the diſtance of this point of convergence from the glaſs: to the diſtance of the virtual *focus* of this converging ray.

6. In concave glaſſes, if the point to which the incident ray converges, be nearer to the glaſs than the virtual *focus* of parallel rays, the rule to find where it croſſes the axis, is this:

As the exceſs of the virtual *focus*, more than this point of convergency: is to the virtual *focus*: : ſo the diſtance of this point of convergency from the glaſs: is to the diſtance of the point where this ray croſſes the axis.

Rules for finding the FOCI *of glaſſes.*—To find the *focus* of a convex ſpherical glaſs, being of a ſmall ſphere, apply it to the end of a ſcale of inches, and decimal parts, and expoſe it before the ſun; upon the ſcale you will have the bright interſection of the rays meaſured out: or, expoſe it in the hole of a dark chamber; and where a white paper receives the diſtinct repreſentation of diſtinct objects, there is the *focus* of the glaſs.

For a glaſs of a pretty long *focus*, obſerve ſome diſtant object through it, and recede from the glaſs till the eye perceives all in confuſion, or the object begins to appear inverted; here the eye is in the *focus*.

For a plano-convex glaſs: make it reflect the ſun againſt a wall; you will on the wall perceive two ſorts of light; one more bright within another more obſcure: withdraw the glaſs from the wall, till the bright image is in its leaſt dimenſions; the glaſs is then diſtant from the wall about a fourth part of its *focal* length.

For a double convex: expoſe each ſide to the ſun in like manner; and obſerve both the diſtances of the glaſs from the wall. The firſt diſtance is about half the radius of the convexity turned from the ſun; and the ſecond, about half the radius of the other convexity.

Thus we have the radii of the two convexities; whence the *focus* is found by this rule.

As the ſum of the radii of both convexities: is to the radius of either convexity: : ſo is the double radius of the other convexity: to the diſtance of the *focus*.

FOCUS, in *Catoptrics*, is a point wherein the rays reflected from the ſurface of a mirror, or ſpeculum, and by reflection rendered convergent, do concur, or meet.

The effect of concave mirrors is to collect the rays falling on the concave ſurface into a *focus*.

The effect of convex mirrors is to diſperſe the rays falling on them, or render them more divergent.

For the laws of the *foci* of rays reflected from mirrors, or ſpecula, ſee MIRRORS.

The *foci* of concave glaſſes are had by reflection: for, as a concave mirror burns at the diſtance of about half the radius of the concavity; ſo a concave glaſs, being ſuppoſed a reflecting ſpeculum, unites the rays of the ſun at the diſtance of about half the radius of the concavity.

To find the FOCI *of all glaſſes geometrically.*—Dr. Halley furniſhes us with a general method for finding the *foci* of ſpherical glaſſes of all kinds, both concave and convex; expoſed to any kinds of rays, either parallel, converging, or diverging; under the following problem.

To find the *focus* of any parcel of rays diverging from, or converging to, a given point in the axis of a ſpherical lens, and inclined thereto under the ſame angle, the ratio of the ſines of refraction being given:

Suppoſe GL (*Tab. Optics*, *fig.* 20.) a lens; P a point in its ſurface; V its pole; C the centre of the ſphere whereof it is a ſegment; O the object, or point in the axis, to or from which the rays do proceed; and O P a given ray: and ſuppoſe the ratio of refraction to be as *r* to *s*. Then making CR to CO, as *s* to *r* for the immerſion of a ray; or as *r* to *s* for the emerſion (*i. e.* as the ſines of the angles in the medium which the ray enters, to the correſponding ſines in the medium out of which it comes), and laying CR, from C towards O, the point R will be the ſame for all the rays of the point O. Laſtly, drawing the radius PC, if need be, continued; with the centre R, and diſtance OP, ſtrike a piece of an arch, interſecting P C in Q. The line QR, being drawn, ſhall be parallel to the reflected ray; and PF, being made parallel thereto, ſhall interſect the axis in the point F; the *focus* ſought.

Or, make it, as CQ : CP : : CR : CF; then will CF be the diſtance of the *focus* from the centre of the ſphere.

This author gives a demonſtration of the method; and adds various figures, exhibiting the various caſes of rays either diverging or converging as they enter, or emerge out of, the ſurface either of a convex or concave lens.

From this principle all the rules for the *foci* of rays parallel to the axis, as likewiſe for the principal *focus* where the rays neareſt the axis do unite, are deduced. As,

Hence, 1. If OP be equal to CR; the points Q and C are coincident, and the rays OP, after refraction, run on parallel to the axis. 2. If the point Q fall on the ſame ſide of the axis, as is the point P; then the beams after refraction do tend on, either diverging or converging, as before: but if Q fall on the other ſide the axis, the diverging rays are made to converge by a convex, or the converging to diverge by a concave glaſs. 3. If OP do exceed CR, the *focus* is in all caſes on the ſame ſide of the glaſs, as is the centre of the ſphere C. But contrariwiſe, if OP be leſs than CR, the *focus* falls on the other ſide of the glaſs beyond the vertex V. 4. An object may be ſo placed, that the rays next the axis of a convex glaſs

ſhall

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ſhall have an imaginary *focus* tranſmitting diverging rays, when the more remote parts thereof ſhall make them converge to a real *focus*. 5. If OV, the diſtance of the object from the pole or vertex of the glaſs, be taken inſtead of OP, then will CQ be the difference of OV and CR; and as that difference is to CR, ſo is the radius CV to CF, the diſtance of the principal *focus* from the centre of the ſphere, whereof the glaſs is a ſegment. Or elſe, as CQ: OP or RQ:: PC: to VF, the *focal* diſtance from the pole of the glaſs. Whence follows a general rule for the *foci* of all glaſſes; only according to Corol. 3. if OV do exceed CR, the *focus* is on the ſame ſide of the glaſs as the centre of the ſphere: but if CR be greater, then the *focus* is on the oppoſite ſide of the glaſs: whence it will be determined whether the *focus* be real or imaginary.

What has been ſaid of one ſurface of the lens, is eaſily applicable to the other, taking F the *focus* for an object.

FODDER, any kind of meat for horſes, or other cattle: in ſome places hay and ſtraw mingled together are more peculiarly denominated *fodder*.

In the civil law it is uſed for a prerogative that the prince has, to be provided of corn, and other meat, for his horſes, by the ſubjects, in his warlike expeditions.

FODDER, in *Mining*, is a meaſure containing twenty-two hundred and a half weight, though in London but twenty hundred weight.

FODINA, a name ſome authors give to the LABYRINTH in the bone of the ear.

FŒCES. See FÆCES.

FŒCIALES. See FECIALES.

FŒCULA. See FECULA.

FŒCUNDITY. See FECUNDITY.

FŒNICULUM. See FENNEL.

FŒNUM *Græcum*. See FENUGREEK.

FOENUM *ſanctum*. See SAINT *Foin*.

FŒTOR, in *Medicine*, ſtinking or fetid EFFLUVIA, proceeding from the body, or the parts thereof.

Fœtors ariſe from ſtagnant, extravaſated, corrupted, or poiſoned humours: as alſo from any thing capable of attenuating and volatilizing the oils and ſalts; as abſtinence, heat, too much motion, acrimony of food, &c.

FOETOR *narium*, ſtench of the noſtrils; a ſort of diſeaſe ariſing from a deep ulcer withinſide the noſe, yielding a fetid ſmell.

Its cauſe, according to Galen, is a ſharp humour falling from the brain upon the mamillary proceſſes.

This is one of the cauſes for which marriage might formerly be annulled.

FOETOR *oris*, a term uſed by medical writers to expreſs that ill ſmell in the mouth, uſually, though often improperly, called by us a ſtinking breath. This is a malady ariſing in different caſes from very different cauſes; as from the ſcurvy, and particularly that ſpecies of it which affects the mouth, and is therefore called *ſtomacace*; from the French pox; from an ulceration whether ſimple or fiſtulous in the lungs, which is the caſe in conſumptions; from ulcers in the mouth; from caries or rottenneſs of the teeth, or from any other impurity of them; from crudities in the ſtomach ariſing from a bad digeſtion, and in particular, from a weakneſs about the left orifice of the ſtomach, from which part the fœtid vapours will often ariſe in very great abundance.

Method of cure. According to the different cauſes of this diſorder, it requires a very different method of cure. In caſes where it depends on the ſcurvy, pox, or other diſeaſes, thoſe diſeaſes are to be attacked by the proper medicines, in order to its cure; when it ariſes from a carious tooth, there is no cure for it, but drawing the tooth; when the impurities of the teeth occaſion it, the cleaning them proves a cure. Juncker's Conſp. Med. p. 607.

FŒTUS, in *Anatomy*, denotes the child, while yet contained in the mother's womb; but particularly after it is perfectly formed; till which time it is more properly called EMBRYO.

The manner of the conception, or generation of the *fœtus*, is matter of great controverſy. That all the parts of the animal did exiſt, and that its fluids were in motion, before generation, is generally allowed; but whether the animalcule was lodged in the male, or female, has been much diſputed. See GENERATION, CONCEPTION, and PREGNANCY.

The firſt thing that appears of a *fœtus*, is the placenta, like a little cloud, on one ſide of the external coat of the egg: about the ſame time the ſpine is grown big enough to be viſible; and a little after the cerebrum and cerebellum appear like two ſmall bladders: next, the eyes ſtand prominent in the head; then the punctum ſaliens, or pulſation of the heart, is plainly ſeen. The extremities diſcover themſelves laſt of all.

The formation of the bones in a *fœtus* is very gradual and regularly performed. In the firſt two months there is nothing of a bony nature in the whole; after this, the hardneſs of the parts where the principal bones are to be ſituated becomes by degrees preceptible. Dr. Kerkring deſcribes the progreſs of the oſſification from ſceletons which he had prepared from *fœtuſes* of two months, and thence up to nine. In the firſt two months, or till the end of that time, there appears not any thing bony; after this in the third and fourth months, and ſo on, the ſeveral parts, one after another, acquire their bony nature. In the firſt ſtages every thing is membranous, where the bones are to be; theſe by degrees tranſmigrate into cartilages; and from theſe by the ſame ſort of change continued, the bones themſelves are by degrees formed. All this is done by nature, by ſuch ſlow, though ſuch certain progreſſions, that the niceſt eye can never ſee it doing, though it eaſily ſees it when done.

While *fœtuſes* continue in the womb, their muſcles commonly act only by their natural contraction, or the *fœtus* is ſaid to be in a ſleeping ſtate; but ſometimes, when its eaſe or preſervation requires a change of ſituation, it ſeems to perform ſome voluntary motions, which are called its *ſtirrings*. The poſture of the child in the womb, is owing to the muſcles being left to their natural contractions, the ſtronger always prevailing, till their antagoniſts exert ſuch a reſiſtance by being ſtretched, as brings them to an equilibrium.

Fœtuſes increaſe proportionally leſs, the longer they continue in the womb. Mauriceau pretends, that the increaſe of a child, is ſixty-four times its own weight in triple the time. Thus he ſays, that at the birth, a child weighs twelve pounds, of ſixteen ounces each; at the three months, it weighs three ounces; at one month $\frac{3}{4}$ of a drachm; and at ten days, leſs than half a grain. Monro in Med. Eſſ. Edinb. vol. ii. p. 142.

FOETUS, *in the womb, ſituation of the*. The *fœtus*, when formed, is almoſt of an oval figure, while it lies in the womb: for its head hangs down, with its chin upon the breaſt: its back is round; with its arms it embraces its knees, which are drawn up to its belly, and its heels are cloſe to its buttocks; its head upwards, and its face towards its mother's belly. About the ninth month, its head, which was hitherto ſpecifically lighter than any other part, becomes ſpecifically heavier, its bulk bearing a much ſmaller proportion to its ſubſtance than it did.

The conſequence of this change is, that it tumbles in the liquor which contains it; its head falls down, its feet get up, and its face turns towards its mother's back. But being now in an irkſome poſture, though, at the ſame time, a favourable one for its exit, the motion it makes for its relief gives frequent pains to the mother, which cauſe a contraction of the womb for the expulſion of the *fœtus*.

What ſome anatomiſts pretend to allege farther as to the poſture of the *fœtus* in the womb, in the ſeveral ſtages of geſtation, is very precarious.

In the firſt month it is of no moment how it lies in the womb: in the latter months, after the *fœtus* is grown not only quick, but robuſt, it frequently changes its poſture of itſelf; as not only the mothers themſelves feel, but any other perſon, by laying the hand on their bellies, frequently may. However, its ordinary poſture is ſuppoſed to be ſitting: as the time of birth draws near, it turns itſelf, and preſents the head to the os uteri; though ſometimes it offers the feet firſt, and ſometimes lies acroſs, and offers either a hand, a knee, or the like: theſe are irregular ſituations, and without conſiderable addreſs of the midwife in turning the *fœtus*, both the mother and the infant are in danger. See DELIVERY.

FOETUS, *anatomy of the*. The *fœtus* is incloſed in two membranes, or coats; the inner, which immediately inveſts the *fœtus*, and the liquor wherein it lies, is called the AMNIOS; the outward membrane is called the CHORION.

In ſome animals there is a third membrane, called the ALLANTOIS, whoſe place is between the other two, and which ſerves for the diſcharge of the urine of the *fœtus*, brought hither by the urachus.

Dr. Needham ſeems to have diſcovered ſomething analogous hereto in the human *fœtus*, and calls it the *membrana urinaria*; but others chuſe only to make it a duplicate of the chorion; though the neceſſity of ſuch third membrane be the ſame in men, as in cows, ſheep, &c.

There are ſome differences in the ſtructure, mechaniſm, and proportion of the parts of a *fœtus*, from thoſe of an adult; and even ſome additional and extraordinary parts, by which the nutrition of this zoophyte, or plant-animal, as it is called, and the circulation of the blood therein, are effected.

The principal variations are about the liver, heart, and lungs.

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Of theſe, the moſt conſiderable are the umbilical veſſels, which are two arteries, a vein, and the urachus, ariſing from the placenta, and conveyed through the navel to the liver of the *fœtus*, near the navel; all which, after the birth, drying up, become impervious and uſeleſs.

In the liver itſelf there is an extraordinary communication between the porta and cava, called *canalis venoſus*, which, after the birth, gradually dries up. In the heart, at the mouth of the vena cava, is the foramen ovale, whereby that vein has a communication with the pulmonary vein: there is alſo a communication between the aorta and pulmonary artery, by means of the canalis arterioſus, which paſſes between the two, at about two inches diſtance from the baſe of the heart. It is by means of theſe two canals or paſſages, that the blood has been ſuppoſed to circulate in the *fœtus* while incloſed in the womb; they ſerving to convey and paſs the blood from the heart into the arteries, and from the veins into the heart again, without its paſſing through the lungs, which are now uſeleſs.

The lungs of a *fœtus* are of a darker colour, and cloſer conſiſtence, than after they have been breathed into, as appears from their ſwimming in water, after birth, which they will not do before; which difference has been ſaid to afford an uſeful experiment, in caſe of the ſuſpected murder of children: for if they were ſtill-born, the lungs ſink in water; if born alive, they ſwim. But this notion is not well founded; becauſe the uninflated lungs become ſpecifically lighter than water as ſoon as any degree of putrefaction takes place in them, and this happens ſoon after the death of the child; beſides, where the utmoſt care hath been taken to preſerve the child, it hath breathed once or twice, and then died.

The two canals above mentioned ſerve only to prevent the obſtruction the blood would otherwiſe have within the lungs, before they have been opened. After reſpiration has opened the lungs, the blood taking its courſe through them, thoſe paſſages cloſe up.

The head of the *fœtus* is much bigger in proportion to the body than afterwards; the bones and brain are ſofter, the ſutures open, and they leave a great ſpace on the top of the head, covered only with a membrane; and the glands, particularly the thymus and renales, are bigger and ſofter. For other differences in the proportion, ſee EMBRYO.

FOETUS, *nutrition of the*. How the nutrition of the *fœtus* is performed, is diſputed among the learned. Heiſter is of opinion, that the nutrition of the *fœtus*, during the firſt months, while the organs of concoction are not yet formed, is probably effected by means of the navel-ſtring alone. But in the more advanced ſtate of the *fœtus*, in the latter months, he ſuppoſes, that it is alſo nouriſhed by the mouth, by means of a ſoft and ſomewhat gelatinous fluid that ſurrounds it, and which is probably ſecreted from the amnios: in ſupport of which opinion he obſerves, 1. That a fluid ſimilar to that of the amnios is found in the mouth, the œſophagus, and the ſtomach, not only of the human *fœtus*, but in that of quadrupeds. 2. That this fluid is alſo found in the ſmall guts of the *fœtus*, but altered and digeſted. 3. That there are alſo found in the larger inteſtines real fœces, called meconium: ſometimes the whole ilium is full of theſe. 4. That in the firſt months there is a great quantity of this fluid ſurrounding the *fœtus*; but in the latter months, there is little of it, and the conſumption of it is not eaſily accounted for in any other way, than by its being ſwallowed by the *fœtus*. 5. That the liquid itſelf is ſo extremely proper for the nutrition of the *fœtus*, that a more fit one could not be formed or deſired. 6. That it ſeems to be continually preſſed into the mouth, œſophagus, and ſtomach of the *fœtus*, by the perpetual renitency of the uterus itſelf, and by the preſſure of the muſcles of the abdomen, and of the ambient air.

Hippocrates, among the ancients, was of opinion, that the *fœtus* was nouriſhed both by the mouth, and by the umbilical veſſels. He maintains, that the child in the womb, with its lips compreſſed together, attracts nouriſhment; for which he aſſigns this reaſon, that unleſs the child had ſucked in utero, it neither could depoſit excrement, nor know how to ſuck ſo ſoon as it is born. The celebrated Harvey maintained this doctrine; only that he ſubſtituted an albugineous aliment in place of Hippocrates's menſtrual blood. Mr. Gibſon, in the Medical Eſſays of Edinburgh, vol. i. p. 140. has alſo adopted this opinion, that the *fœtus* is nouriſhed by the mouth and by the navel alſo, as moſt probable.

He alledges, that the fluid contained in the amnios, and in which the *fœtus* ſwims, is not an excrementitious liquor, but a *materia nutricatus*; ſo that it is found in very conſiderable quantities, before the parts of the *fœtus* are viſibly delineated; and nature hath provided the delicate membrane, called the allantois, principally for preventing the urine of the *fœtus* from mixing with the liquor amnii, its food. Farther, the mouth, nay even its chaſm, long before the lips are obſervable, is always open; for air blown upon it through a pipe will evidently ſeparate its ſides: and Heiſter remarks to this purpoſe, that he has more than once, in the cold winter ſeaſon, found the liquor amnii frozen, and continued through the mouth and œſophagus to the ſtomach in a pretty large column. Mr. Gibſon adds, that there have been examples of human *fœtuſes* which have been brought into the world alive, either altogether wanting the umbilicus and its veſſels, or, at leaſt, having the umbilical rope broke aſunder. He then ſubjoins two analogical arguments in confirmation of this opinion, concerning the nutrition of the *fœtus* by the mouth and the umbilical veſſels, viz. one, deduced from the vegetation of plants, which, he ſays, in ſemine have two roots, the ſeminal, whoſe fibres are inſerted into the cotyledones of the ſeed, and the plantal, which ſucceeds the former, and ſuperſedes the uſe of the cotyledones, which die and fall off: and the other, from the apparatus for nouriſhing the chick in ovo; the albumen ovi anſwering the ſame purpoſe, with regard to the chick, as the liquor amnii does with reſpect to the *fœtus* in animals.

Dr. Fleming has lately produced a fact in ſupport of this hypotheſis, viz. that he had found hairs in the meconium of the *fœtus* of a calf: theſe, he apprehends, were looſened from the ſkin, and afterwards floating in the liquor amnii, were propelled with it into the ſtomach and inteſtines by the alimentary paſſage. But from a ſingle fact no general concluſion can be ſatisfactorily deduced. He adds, as a proof of the alimentary nature of the liquor amnii, that it is concretable by heat, like the yolk of an egg. Phil. Tranſ. vol. xlix. art. 42.

Dr. Monro, on the contrary, is of opinion, that the *fœtus* in viviparous animals is nouriſhed by the navel alone. He has given a curious diſſertation on this ſubject in the Medical Eſſays, vol. ii. p. 102, &c. where he obſerves, 1. That the *fœtus* is capable of receiving its whole nouriſhment by the umbilical vein alone, whereas no *fœtus* can ſubſiſt without the umbilical veſſels. 2. That the liquor of the amnios is ill calculated, in its natural ſtate, for the food of a *fœtus*; and becomes altogether unfit food in morbid caſes. 3. That it is highly improbable that a creature ſhould furniſh its ſubſiſtence out of its own body, which muſt be the caſe, if the *fœtus* feeds on the liquor of the amnios. 4. That it cannot be inferred from any reſemblance of the liquor of the ſtomach and amnios, nor from any other appearances, that the liquor of the amnios is ever ſent down into the ſtomach. 5. That no direct proof can be had of the liquor of the amnios being preſſed or ſwallowed down; but, on the contrary, all circumſtances make it probable, that it does not go down. 6. That all the phenomena of a *fœtus* can moſt reaſonably be accounted for, without ſuppoſing the liquor of the amnios to be any part of its food; hence he thinks it reaſonable to exclude the mouth from the office of conveying the aliment of the *fœtuſes* of viviparous animals, and to believe that all their nouriſhment is conveyed by the umbilical veſſels.

Dr. Monro has alſo given us ſeveral curious obſervations relating to the queſtion about the nutrition of the *fœtuſes* of oviparous animals.

He has alſo there conſidered the nouriſhment of plants in a *fœtus* ſtate. And he ſhews the analogy there is between theſe and animal *fœtuſes*. To fix the analogy between animals and plants, he obſerves, that the former may be ſaid to remain in the ſtate of a *fœtus*, ſo long as the young creature is ſolely nouriſhed by liquors furniſhed by the uterus of the parent; and plants are to be conſidered as *fœtuſes* only, while the ſeed is ripening, and before the earth, water, moiſture of the air, &c. have communicated immediately any matter for its increaſe.

The ſame author has given us ſome practical corollaries, from his eſſay on the nutrition of *fœtuſes* of viviparous animals, where he makes ſeveral very juſt obſervations relating to abortion, its cauſes, and the method of preventing it in many caſes.

The liquors ſent into the *fœtus* by the umbilical vein, not having their propelling force communicated from the mother, the ſtate of the mother's pulſe cannot effect the child otherwiſe than by occaſioning abortion, or vitiating the fluids. Hence the impreſſions ſaid to be made on children by the imaginations of the mother, cannot be accounted for phyſically. Hence alſo children may be infected with the diſeaſed juices of the mother; but it is poſſible for them to eſcape catching their mother's diſeaſes, if either theſe be only topical, without affecting the whole maſs of the fluids: or even when the mother's blood is ſpoiled, the child may be free of her diſeaſe, if the morbid particles be ſuch as the placentary veſſels cannot abſorb.

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The mother ſupplies liquors to the *fœtus*, which returns others to the mother, by means of the uterine and umbilical veſſels. This ſeems proved from obſervations; *fœtuſes* whoſe placenta were not in the leaſt ſeparated from the uterus, having been quite exhauſted of blood by the mother's dying of an hæmorrhage; and Dr. Monro acquaints us, that he has ſeen children pale and weak by violent floodings in the time of labour.

The liquors are not carried from the mother to the *fœtus*, or from the *fœtus* to the mother by continued canals. That is, the uterine arteries and veins do not anaſtomoſe with the veins and arteries of the ſecundines; but the extremities of the umbilical vein take up the liquors by abſorption, in the ſame way as the lacteal veſſels do in the guts; and the umbilical arteries pour their liquors into the large cavities of the ſinuſes, or other cavities analogous to them.

It is a queſtion, whence the *fœtus* has its red blood. Dr. Monro anſwers, that *fœtuſes* in viviparous animals have their red blood from the ſame ſource that chickens in ovo have theirs; which can be no other than the action of their heart, and of the veſſels of their body and ſecundines. Med. Eſſ. Ed. vol. ii. p. 183, 201, 206.

A liquor is found in the thorax of *fœtuſes*, which Mr. Petit inclines to believe is furniſhed by the thymus. See Mem. de l'Acad. des Sciences, 1733.

Reſpiration ſeems to be the great act by which the change is made in animals, from the ſtate of *fœtus* to that of motion, ſenſation, and the other qualities of animal life in their larger degree. Mr. Duverney obſerved this in the *fœtus* of a common ſnake: he broke the egg of one of theſe animals, at a time when it was juſt ready for hatching, and the young ſnake fell out rolled in a ſpiral, at firſt quite ſtiff and motionleſs; but it had no ſooner breathed three or four times, than it began to perform all the motions of animal life, in the moſt nimble and active manner.

FOETUS, *circulation of the blood of a.* See BLOOD.

Mr. Wolff, a late writer, has gone a great way towards demoliſhing both the ſyſtem of Galen and Harvey, and that of Mery, with regard to the circulation of the blood in the *fœtus*: he affirms, that it neither does, nor can paſs from the right auricle to the left, nor from the left to the right, through the foramen ovale. In ſupport of this aſſertion he obſerves, that there is a ſynchroniſm in the motion of the auricles of the heart, the ſyſtole and diaſtole happening, preciſely, at the ſame moment of time; and, therefore, the force that is neceſſary to make the blood paſs from one auricle into the other, cannot exert itſelf during the ſyſtole, becauſe the two auricles are equally and ſimultaneouſly contracted, and throw out the blood with which they are filled; nor can it be exerted during the diaſtole, becauſe the two auricles are then dilated, and receive extraneous blood from whatever part it comes: conſequently, there is no moment of time in which the blood can paſs from one auricle into the other. In diſſecting the heart of a new-born child, Mr. Wolff diſcovered, that the ſtructure of the organ of circulation in the *fœtus* is very different from what it was commonly imagined to be: for he found, that the aperture on the left ſide of it was very different from that on the right; the firſt being formed by that which foreigners call the arc of Vieuſſens and the valve of Euſtachius, and the ſecond being derived from the ſame arc and the valve of the foramen ovale: and from a farther examination of this ſtructure it appeared, that the auricles had no communication with each other, but were ſeparated by the inferior trunk of the vena cava; the aperture which is diſcernible in the right auricle being nothing more than the orifice of the cava, which effectuates its inoſculation into that auricle, while the aperture that is ſeen on the left ſide, and called the foramen ovale, is no more than another orifice of the ſame vein, which has its inoſculation in the left auricle. Thus both the auricles communicate with the vena cava, but have no communication with each other; and the foramen ovale is only the left orifice of the inferior vena cava. In order to determine the direction which the blood follows in its circulation we are to conſider, that, as the vena cava opens itſelf by its two orifices in the two auricles or ſinuſes of the heart, the blood which it contains muſt be conveyed partly into the right auricle by the right orifice, and partly into the left auricle by the left orifice; and the quantity of blood, which diſcharges itſelf into the right auricle, mixing itſelf there with the blood of the ſuperior vena cava, flows directly from thence into the right ventricle of the heart; nor can the leaſt drop of blood, that has once got into the right auricle, repaſs from thence to the left; and the quantity of blood, which paſſes from the inferior cava, through its left orifice, into the left auricle of the heart, contributes to diſengage the lungs, by turning its direction from the right auricle, the right ventricle, and conſequently from the lungs, which, being deſtitute of reſpiration, could not have tranſmitted this blood, or facilitated its paſſage. That portion of blood, therefore, mixing itſelf in the left auricle with that of the pulmonary veins, proceeds directly to the left ventricle, and from thence into the aorta; from whence it takes its courſe away in different channels through the whole body, without touching the lungs. Nov. Comment. Acad. Scient. Imp. Petropol. vol. xx. 1775.

The *fœtus* often dies in the womb. This is diſcovered to be the caſe by the following ſymptoms: the mother becomes languid and weak, and is ſubject to frequent faintings. She complains alſo of flying heats and chilneſſes, ſucceeding one another at ſhort intervals, and of ſtraitneſs of the præcordia, anxieties of mind, and vertiginous dizzineſs of the head. The breaſts, though before diſtended and hard, grow flaccid on this, and have an abundance of a thin watery ſerum in them. The *fœtus* is not perceived to move, and the belly hangs upon the thighs with an uncommon dead weight, and is affected with a remarkable coldneſs.

The death of the *fœtus* is often owing to a remarkably plethoric ſtate of the mother; and yet more frequently to her violent paſſions, whether of grief, anger, fear, or any other kind. The morbid conſtitution of the mother may alſo occaſion it, be it almoſt of any kind whatever, and alſo habitual diarrhœas. But the death of the *fœtus* is moſt frequently occaſioned by the bad ſucceſs of labour-pains, or bad aſſiſtance in them, and by its being left conſtricted by the womb.

The expulſion of the dead child is to be attempted by all the forcing medicines, ſuch as borax, and the like; and the ſpirits and ſtrength are to be kept up during the attempt, by giving analeptics in the intermediate time; but if theſe medicines have not the deſired effect, the manual operation of the man-midwife muſt be called in; and when the *fœtus* is taken out, the woman is to be treated with the utmoſt care in the common way of lying-in women. See DELIVERY.

Bartholine, in his treatiſe De Inſolitis Partus Viis, relates a great many ſtupendous caſes of *fœtuſes* dead and putrefied in the womb, the parts of which have made their way through apoſtemations; one whereof, at the navel, was ſome years in coming away. And in the Philoſoph. Tranſactions we meet with the like inſtances; particularly of one voided piece-meal by the anus, ſeveral years after conception.

Authors give accounts of *fœtuſes* found in the Fallopian tubes, and others in the cavity of the belly. M. de S. Maurice, in the Memoirs of the Royal Academy of Sciences, relates the hiſtory of a *fœtus* formed in the ovary of the mother, and which, at three months from impregnation, burſting the teſticle, forced its way through, into the epigaſtric region.

Others have occaſioned abſceſſes, on the opening of which a paſſage has been made for the *fœtus*, which has come away by piece-meal.

The ſtory of Margaret, counteſs of Holland, who is ſaid to have been delivered of 364 *fœtuſes*, all alive, and afterwards baptized, paſſes for a fable; and yet there is a picture of this notable delivery ſtill preſerved in the church of Loſdune, as a monument of the truth thereof. Albertus Magnus gives a like inſtance of a woman, who brought forth 150 *fœtuſes*, or embryos, all formed, as big as a little finger.

FOG, or *miſt*, a meteor, conſiſting of groſs vapours, floating near the ſurface of the earth.

If the vapours, plentifully raiſed from the earth and waters, either by the ſolar or ſubterraneous heat, meet, at their firſt entrance into the atmoſphere, with cold enough to condenſe them conſiderably, their ſpecific gravity being hereby increaſed, their aſcent will be ſtopped, and they will either return back in form of a dew, or of drizzling rain; or they will remain ſuſpended for ſome time, in form of a *fog*. See EVAPORATION.

Fogs are only low clouds, or clouds in the loweſt region of the air; and clouds are no other than *fogs* raiſed on high.

Objects viewed through *fogs* appear larger, and more remote than through the common air.

The fiſhing for herring is chiefly practiſed in *foggy* weather.

FOGAGE, in the *Foreſt Law*, is rank graſs, not eaten in the ſummer.

FOIBLE, a French term, frequently uſed alſo in our language.

It literally ſignifies *weak*; and in that ſenſe is applied to the body of animals, and the parts thereof: as, *foible* reins, *foible* ſight, &c. being derived from the Italian *fievole*, of the Latin *flebilis*, *to be lamented, pitied.*

But it is chiefly uſed with us ſubſtantively, to denote a defect,

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defect, or flaw, in a perſon, or thing. Thus we ſay, every perſon has his *foible*; and the great ſecret conſiſts in hiding it artfully: princes are gained by flattery, that is their *foible*: the *foible* of young people is pleaſure; the *foible* of old men is avarice; the *foible* of the great and learned is vanity; the *foible* of women and girls, coquetry, and an affectation of having gallants.

It is a term alſo uſed in fencing, to denote the weakeſt part of a blade; in oppoſition to the fort, which is the ſtrongeſt.

FOIL, in *Fencing*, denotes a blunt ſword, or one that has a button at the end covered with leather, uſed in learning the art of fencing.

FOIL, among *Jewellers*, a thin leaf of metal, placed under a precious ſtone, in order to make it look tranſparent, to improve the colour, or to give it an agreeable different colour, either deep or pale. Thus, the effect of giving luſtre is produced by the poliſh of the ſurface of the *foil*, which is colourleſs; but if a ſtone is wanted to be of a pale colour, a *foil* of that colour muſt be put under it; if deep, a dark one muſt be laid under it.

Theſe *foils* are made either of copper, tin, gold, or gold and ſilver together: the copper *foils* are generally known by the name of Nuremberg or German *foils*. They are prepared as follows.

Procure the thineſt copper-plates that can be got, beat theſe plates gently upon a well-poliſhed anvil, with a poliſhed hammer, as thin as writing paper; or paſs them between a pair of fine ſteel rollers, very cloſe ſet; and placing them between two iron plates, as thin as poſſible, heat them in the fire: then boil the *foils* in a pipkin, with equal quantities of tartar and ſalt, conſtantly ſtirring them, until by boiling they become white; after which, taking them out and drying them, give them another hammering, until they are fit for uſe. Care however muſt be taken, not to give the *foils* too much heat, for fear of melting; neither muſt they be too long boiled, for fear of attracting too much ſalt.

The manner of poliſhing theſe *foils* is as follows: take a plate of the beſt copper, one foot long, and about five or ſix inches wide, poliſhed to the greateſt perfection; bend this to a long convex, faſten it upon a half roll, and fix it to a bench or table: then take ſome chalk, waſhed as clean as poſſible, and filtered through a fine linen cloth, until it be as fine as can be made; having laid ſome of this upon the roll, and wetted the copper all over, lay the *foils* upon it, and, with a poliſhed ſtone and the chalk, poliſh them until they are as bright as a looking-glaſs. After this they muſt be dried, and laid up ſecure from duſt.

The beſt method of preparing *foils*, ſo as to give to colourleſs ſtones, as cryſtals, pebbles, or paſte, the luſtre and play of diamonds, is as follows:

Take leaves of tin, prepared in the ſame manner as for ſilvering looking-glaſſes, and cut them into ſmall pieces, of ſuch ſize as to cover the ſurface of the ſocket of the ſtones that are to be ſet: lay three of theſe one upon another; and, having moiſtened the inſide of the ſocket with thin gum water, and ſuffered it to dry, that only a ſlight thickneſs may remain, put the three pieces of leaves, lying on each other, into it, and adapt them to the ſurface in as even a manner as poſſible. When this is done, heat the ſocket, and fill it with warm quickſilver, which muſt be left in it for three or four minutes, and then gently poured out. The ſtone muſt then be thruſt into the ſocket, and cloſed with it; care having been previouſly taken, that it may enter the ſocket without ſlipping off the tin and quickſilver from any part of the ſurface. The work ſhould be well cloſed round the ſtone, to prevent the tin and quickſilver contained in the ſocket from being ſhaken out by any violence. The luſtre of ſtones, ſet in this manner, will continue longer, than when they are ſet in the common way.

When colouring *foils* are wanted, thoſe of copper, above deſcribed, may be either tinged with ſmoke, or ſtained or painted with ſome pigment or other colouring ſubſtance. The colours uſed for this purpoſe, may be tempered with oil, gummed or ſized water, or varniſh: for red, in imitation of ruby, carmine, with a little lake uſed in iſinglaſs ſize, or ſhell-lac varniſh, or bright lake in oil, ſhould be employed; for the garnet red, dragon's blood, diſſolved in ſeed-lac varniſh, may be uſed; and for the vinegar garnet, orange lake, tempered with ſhell-lac varniſh. For the amethyſt, lake, with a little Pruſſian blue, uſed with oil; for blue, where the effect of ſapphire is wanted, Pruſſian blue in oil, and ſpread on the *foil* more or leſs thinly, according to the lightneſs or deepneſs of the colour required; for the eagle marine, common verdigriſe with a little Pruſſian blue, tempered in ſhell-lac varniſh, ſhould be uſed; for a full yellow, yellow lacquer; and for the ſlighter colour of topazes, the burniſh and *foil* itſelf will ſerve, without any addition. For a deep green, the cryſtal of verdigriſe, tempered in ſhell-lac varniſh; but for the emerald, a little yellow lacquer ſhould be added. See DOUBLETS. Handmaid to the Arts, vol. ii. p. 333, &c.

FOIL, or FOYLE, among *Looking-glaſs-grinders*, a ſheet of tin, with quickſilver, or the like, laid on the back-ſide of a looking-glaſs, to make it reflect. See FOLIATING. The word is formed of the Latin *folium*, leaf.

FOILING, among *Hunters* the footing and treading of deer, which remains on the graſs, but ſcarce viſible.

FOLC-*land*. See FOLK-*land*.

FOLDAGE and FOLK-COURSE. See FALDAGE.

FOLD-*net*, among *Sportſmen*, a ſort of net with which ſmall birds are taken in the night: there are two ſizes of it; the leaſt may be managed by one man, but the largeſt muſt be carried by two, and uſed thus: let the net be fixed on both ſides to two ſtrong poles about twelve feet long, each man holding one of them; let a third carry lights behind them, at the diſtance of two yards: the net ſhould be carried between the wind and the birds, which rooſt on their perches with their breaſts againſt the wind: another perſon, who beats the buſhes on the other ſide of the hedge, will drive out the birds towards the light.

FOLD-*ſoca*, in *Law*. See FALDAGE.

FOLDS, in the *Manufactures*. See CLOTH, &c.

FOLDS *of the drapery*, in *Painting*. See DRAPERY.

FOLDING *of ſheep*. See SHEEP.

FOLIA, in *Botany*, is uſed for the leaves of plants, and alſo of flowers, but particularly the former; the leaves of flowers being more properly called PETALA.

FOLIACEUM *expanſum*, in *Anatomy*, is that extreme of the FALLOPIAN *tube*, next the ovary; and which is expanded like the mouth of a trumpet, and invironed with a ſort of fringe.

FOLIAGE, a cluſter or aſſemblage of flowers, branches, leaves, &c.

FOLIAGE is generally uſed for repreſentations of ſuch flowers, leaves, branches, rinds, &c. whether natural or artificial; uſed as enrichments on CAPITALS, FREEZES, PEDIMENTS, &c. See *Tab. Archit. fig.* 12.

FOLIATE, in the *Higher Geometry*, a name given by ſome to a curve of the ſecond order, expreſſed by the equation $x^3 + y^3 = a x y$, being one ſpecies of defective hyperbolas, with one aſymptote, and conſiſting of two infinite legs croſſing one another, and forming a ſort of leaf.

FOLIATING *of looking-glaſſes*, is the ſpreading a compoſition of ſomething which will firmly adhere to the back of the glaſs, and there reflect the image.

This compoſition is called the *foil*, and is uſually made with quickſilver, mixed with tin, and ſome other ingredients.

For the method of *foliating* looking-glaſſes, ſee LOOKING-GLASS.

In Philoſoph. Tranſ. N° 245. we have a method of *foliating* globe looking-glaſſes, communicated by Sir R. Southwell. The mixture is of quickſilver and biſmuth, of each three ounces; and tin and lead, of each half an ounce: to the two laſt throw on the marcaſite, and afterwards the quickſilver; ſtir them well together over the fire; but they muſt be taken off, and be towards cooling, before the quickſilver be put to them.

When you uſe it, the glaſs ſhould be well heated, and very dry; but it will do alſo when it is cold, though beſt when the glaſs is heated.

Mr. Boyle's method, which he prefers to any he ever met with in print, is this: take tin and lead, of each one part; melt them together, and immediately add of good tin-glaſs, or biſmuth, two parts; carefully ſkim off the droſs; then take the crucible from the fire, and, before the mixture grows cold, add thereto ten parts of clean quickſilver, and having ſtirred them well all together, keep the fluid in a new clean glaſs. When you go to uſe it, firſt purge it, by ſtraining it through linen, and gently pour ſome ounces into the glaſs to be *foliated*, through a narrow paper funnel, reaching almoſt to the glaſs, to prevent the liquor from flying to the ſides. After this, by dexterouſly inclining the glaſs every way, endeavour to faſten it to the internal ſurface; which done, let it reſt for ſome hours; then repeat the ſame operation, and ſo continue, at times, till the liquor is ſlowly paſſed over, and equally fixed to the whole ſuperficies; which may be diſcerned by expoſing the glaſs to the eye between that and the light. Boyle's Works abr. vol. i. p. 129.

FOLIATION, in *Botany*, &c. is uſed by Dr. Grew to expreſs the aſſemblage of the FOLIA, or PETALA, of a flower.

The *foliation* is the moſt conſpicuous part of flowers, being that collection of fugacious, coloured leaves, which conſtitutes the compaſs, or body of the flower.

It is of great uſe in the generation and preſervation of the young fruit, or ſeed: it filtrates a fine juice, to nouriſh it in the uterus, or piſtil.

In ſome ſpecies, as apricots, cherries, &c. it likewiſe ſerves

to

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to guard the young tender fruit from the violence of wind, weather, &c. for this, being of a very tender and pulpous body, and coming forth in the colder times of the ſpring, would be often injured by the extremities of weather, if it were not thus protected, and lodged within the flowers.

Before the flower opens, the *foliation* is curiouſly and artfully folded up in the calyx or perianthium.

Dr. Grew enumerates ſeveral varieties of their foldings, viz. the *cloſe couch*, as in roſes; the *concave couch*, as in the blattaria flore albo; the *ſingle plait*, as in pea bloſſoms; the *couch* and *plait*, as in marigolds; and the *rowl*, as in the ladies bower.

FOLIO, or rather FOLIUM, in books of account, &c. ſignifies *page*.

Thus *folio* 7. written abridgedly F° 7. denotes the ſeventh page, &c.

Folio recto, or F° R°, expreſſes the firſt ſide or page of a leaf.

Folio verſo, or F° V°, the ſecond, or back-ſide of the leaf.

The word is Italian, and literally ſignifies *leaf*.

FOLIO, among *Bookſellers*, a BOOK in *folio*; or ſimply, a *folio*, is that where the ſheet is only folded in two, each leaf making half a ſheet.

Beneath the *folio* are the *quarto*, *octavo*, *duodecimo*, *ſixteens*, *twenty-fours*, &c.

FOLIS, or FOLLIS, anciently ſignified a little bag or purſe; whence it came to be uſed for a ſum of money, and very different ſums were called by that name: thus, the ſcholiaſt on the Baſilics, mentions a *follis* of copper which was worth but the twenty-fourth part of the MILIARENSIS; the gloſſæ nomicæ, quoted by Gronovius and others, one of a hundred and twenty-five miliarenſes, and another of two hundred and fifty denarii, which was the ancient ſeſtertium; and three different ſums of eight, four, and two pound of gold, were each called *follis*. According to the account of the ſcholiaſt, the ounce of ſilver, which contained five miliarenſes of ſixty in the pound, was worth a hundred and twenty *folles* of copper. The gloſſographer, deſcribing a *follis* of two hundred and fifty denarii, ſays it was equal to three hundred and twelve pounds ſix ounces of copper; and as the denarius of that age was the eighth part of an ounce, an ounce of ſilver muſt have been worth a hundred and twenty ounces of copper; and, therefore, the ſcholiaſt's *follis* was an ounce of copper, and equal to the gloſſographer's *nummus*. But as Conſtantine's copper money weighed a quarter of a Roman ounce, the ſcholiaſt's *follis* and the gloſſographer's nummus contained four of them, as the ancient nummus contained four aſſes. See Phil. Tranſ. vol lxi. ii. p. 515, &c.

FOLIUM. See LEAF.

FOLIUM *branchiarum*, the *leaf of the gills*, a term uſed by ſome of the ichthyologiſts, to expreſs that part of the gills which looks red and fringed. The gills of fiſh are compoſed of certain bony circles, which are formed on the convex ſide with a great number of laminæ; theſe ſerve to receive the ramifications of the arteries, and are called the *folium* or leaf of the gills. The aorta or great artery reaches no farther than this part in fiſh. It has no deſcending trunk, but every part of the body is ſupplied by a large venal trunk, formed by the joining of the ſeveral ſmaller trunks of the ſeveral circles of the gills.

FOLIUM *caryophyllatum*, or clove-leaf. See CLOVE-*tree*.

FOLIUM *Indicum*, or *Indum*, called alſo TAMALAPATRA, and MALABATHRUM; a leaf brought from the Indies, growing chiefly about Cambaye, produced by a tree not unlike the lemon-tree; uſed in the compoſition of Venice-treacle.

FOLK-LAND, in our ancient Saxon cuſtoms, denoted COPYHOLD *lands*.

In oppoſition to theſe, charter-lands were called *book-lands*, or BOCK-*lands*.

Fundus ſine ſcripto poſſeſſus (ſays Sommer) *cenſum penſitans annuum, & officiorum ſervituti obnoxius: terra popularis.*

FOLKMOTE, FOLCMOTE, or FOLKESMOTE, among our Saxon anceſtors, ſignified any popular or public meeting of all the folk or people of a place, diſtrict, or the like; e. gr. of all the tenants at a court-leet, or court-baron; or of all the freemen of a county; or of all the barons, of a kingdom.

The word, ſays Stow, is ſtill in uſe among the Londoners, and ſignifies *celebrem ex omni civitate conventum*, an aſſembly of all the citizens. Manwood ſays it is the court holden in London, wherein all the folk and people of the city did complain of the mayor and aldermen for any miſgovernment.

Somner, in his Saxon dictionary, makes *folcmote* to denote a general aſſembly of the people, for doing fealty to the king, and conſidering and ordering matters of the commonwealth: whence ſome date the origin of parliaments.

Omnes proceres regni, & milites & liberi homines univerſi totius regni Britanniæ, facere debent in pleno folcmote *fidelitatem domino regi, coram epiſcopis regni. In* leg. Edw. Confeſſ. cap. 33. *Et amplius non ſit in huſtinga, miſkenninga*, i. e. ſpeaking amiſs; *neque in* folkeſmote, *neque in aliis placitis infra civitatem.* Charta H. I. pro London. Du-Cange.

When ſuch aſſembly is made in a city, it may be called a *burghmote*; when in the county, a *ſhiregemote*.

Cum aliquid vero inopinatum & malum contra regnum vel contra coronam regis emerſerit, ſtatim debent, pulſatis campanis, quod Anglice vocatur motbel, *convocares omnes & univerſos, quod Anglici vocant* folkmote, *&c.* Leg. Alfred.

FOLLICULUS, among *Gardeners*, the ſeed-veſſel, caſe, coat, huſk, or cover, wherewith ſeveral kinds of ſeeds and fruits are incloſed.

FOLLICULUS *fellis*. See GALL-*bladder*.

FOLLY, according to Mr. Locke, conſiſts in the drawing of falſe concluſions from juſt principles; by which it is diſtinguiſhed from madneſs, which draws juſt concluſions from falſe principles.

But this ſeems too confined a definition; *folly*, in its moſt general acceptation, denoting a weakneſs of intellect or apprehenſion, or ſome partial abſurdity in ſentiment or conduct.

FOMAHANT, or FOMALHAUT, in *Aſtronomy*, a ſtar of the firſt magnitude, in the water of the conſtellation AQUARIUS.

FOMENTATION, a liquid medicine, applied to any diſeaſed part, to reſolve, diſcuſs, ſoften, aſſwage, fortify, or conſtringe the ſame.

Fomentations are either *ſimple* or *compound*.

FOMENTATIONS, *compound*, are decoctions of roots, leaves, flowers, and ſeeds, made in common water, or other proper liquor; to which are ſometimes added ſalts, axungiæ, oils, &c.

To uſe, or apply them, they dip a hot linen cloth, or flannel, in the liquor, and ſpread it on the part affected.

There are alſo *fomentations* made another way, viz. by boiling certain drugs in linen bags, and then applying them, bags and all, on the part.

There is alſo a ſort of dry *fomentations*, being bags filled with medicines, but not boiled, only ſometimes ſprinkled with a little wine or brandy.

FOMENTATIONS, *ſimple*, are thoſe made with lukewarm water, milk, oil, oxycrate, or the like liquors.

Fomentations are alſo called *local baths*, or partial bathings; becauſe, being applied on a diſeaſed part, they have much the ſame effect as a bath, or half-bath, has on the whole body.

Fomentations have different names, according to the preparations of which they conſiſt, and the uſes to which they are applied. Thus, the anodyne *fomentation*, uſed for relieving acute pain, is compoſed of white poppy-heads, two ounces; elder flowers, half an ounce; which are boiled in three pints of water till one pint is evaporated, and then the liquor is ſtrained out: the aromatic *fomentation* is prepared by boiling half an ounce of Jamaica pepper in a pint of red wine for a little while, and ſtraining out the liquor: this is uſed both for external and internal complaints. Colics and diſorders of the bowels are often abated by fomenting the abdomen and region of the ſtomach with this warm liquor. The common *fomentation* is made by ſlightly boiling the dried tops of wormwood and camomile flowers, of each two ounces, in two quarts of water, and pouring off the liquor, to which may be added ſuch quantities of brandy or ſpirit of wine as the particular caſe may require. The emollient *fomentation* conſiſts of one ounce of camomile flowers; elder flowers, and ſweet fennel ſeeds, of each half an ounce; boiled for a little while in two quarts of water, and ſtrained, with the addition of ſpirit of wine, &c. The ſtrengthening *fomentation* is prepared of oak-bark, one ounce; granate peel, half an ounce; alum, two drams; and ſmith's forge water, three pints: the water is boiled with the bark and peel till one third is conſumed, and in the remaining decoction ſtrained, the alum is to be diſſolved. This aſtringent liquor may be applied to foment weak parts, and alſo uſed internally.

FONCEAU, in the *Manege*, is the bottom or end of a cannon-bitt-mouth; that is, the part of the bitt that joins it to the banquet. See CHAPERON.

FONGITES, a name given by the writers of the middle ages to a ſtone famous for its imaginary virtues. Authors are very vague in their deſcriptions of it; ſome deſcribing it as pellucid and colourleſs, like cryſtal; others, as opake and of a flame-colour; and ſome ſay, that it was partly of one and partly of the other of theſe colours. It is ſaid to mitigate pain, on being held for ſome time in the hand.

FONT, or *baptiſmal* FONT, a ſtone or marble veſſel, at the lower-end of a pariſh-church, ſerving to hold water to be uſed in adminiſtering the ſacrament of baptiſm.

A baptiſmal

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A baptiſmal *font* was anciently the character of a pariſh-church.

Its place, at preſent, is at the bottom of the church, or in a little chapel within the church. Anciently it was placed in a little church, diſtinct from the great one, though near to it, called the BAPTISTERY.

By the eighty-firſt canon it is required, that there ſhall be a *font* of ſtone in every church and chapel, where baptiſm is to be adminiſtered, the ſame to be ſet in the ancient uſual places; in which only *font* the miniſter ſhall baptize publicly.

FONT, in the *Art of Printing*, denotes a complete aſſort of letters, accents, &c. uſed in printing. See FOUNT.

FONTANELLA, in *Anatomy*, imports the quadrangular aperture found betwixt the os frontis, and oſſa ſincipitis, in children juſt born; which is alſo called *fons pulſatilis*.

FONTEVRAUD, or FRONTEVAUX, *order of*, in *Eccleſiaſtical Hiſtory*, a religious order inſtituted by Robert d'Arbriſſel, about the latter end of the eleventh century, and taken under the protection of the holy ſee by pope Paſcal II. in 1106, and confirmed by a bull in 1113, and inveſted by his ſucceſſors with very extraordinary privileges. The chief of this order is a female, who is appointed to inſpect both the monks and nuns. The order is divided into four provinces, which are thoſe of France, Aquitaine, Auvergne, and Bretagne, in each of which they have ſeveral priories. Bayle.

FONTICULUS, or FONTANELLA, in *Surgery*, a general name for ISSUES, SETONS, and the like other ſmall artificial diſcharges.

The word is a diminutive of *fons*, *fountain*, or *ſpring*.

FONTINALIA, or FONTANALIA, in *Antiquity*, a religious feaſt, held among the Romans, in honour of the deities who preſided over fountains, or ſprings. Varro obſerves, that it was the cuſtom to viſit the wells on thoſe days, and to caſt crowns into fountains. Scaliger, in his conjectures on Varro, takes this not to be a feaſt of fountains in general, as Feſtus inſinuates, but of the fountain which had a temple at Rome, near the Porta Capena, called alſo *Porta Fontinalis*: he adds, that it is of this fountain Cicero ſpeaks in his ſecond book De legib. The *fontinalia* were held on the 13th of October.

FONTINALIS, in *Botany*, the name of a genus of moſſes of the *cryptogamia* claſs; the characters of which are theſe: the capſules are ſeſſile, or have either no pedicles, or extremely ſhort ones; they are not naked as in the ſphagna, but are covered with calyptræ, and are included beſides in a membranous huſk, by which laſt particular they are diſtinguiſhed from the hypnums, bryums, and other moſſes which produce capſules.

There are only five known ſpecies of this genus. Linnæus enumerates only four ſpecies. Dillen. Hiſt. Moſc. p. 256.

FOOD, or ALIMENT, is whatever matter is taken in at the mouth, digeſted in the ſtomach, and other viſcera, and converted into the matter of the body, to repair or ſupply what is ſpent, or wanting.

The operations which the *food* undergoes, before it becomes a part of our body, are, 1. Maſtication. 2. Deglutition. 3. Concoction. 4. Chylification. 5. Sanguification. 6. Aſſimilation.

Food is of two kinds, viz. *eſculents*, or *meat*; and *potulents*, or *drink*.

The firſt *foods* of our great forefathers were water, and the ſpontaneous productions of the earth; with which alſo many whole nations ſuſtain themſelves to this day.

The variety of *foods*, it ſeems, does not make any difference in the ſubſtance, or actions, of the bodies ſuſtained thereby; the viſcera having a power of altering and aſſimilating them, however heterogeneous, into one ſimilar ſubſtance, like themſelves.

The difference in *foods* conſiſts principally in this: that ſome are more eaſily digeſted, and aſſimilated than others; and that ſome afford more nutritious juice than others: and to this end it is, that the divers kind of dreſſings have been invented, viz. to diſpoſe the matter for a more eaſy and plentiful aſſimilation.

The beſt, moſt ſimple, and light of digeſtion, are, the *foods* prepared of frumentaceous and leguminous ſeeds; as wheat, rye, barley, oats, and maize, dried, ground, fermented, baked, &c. peas, beans, vetches, &c. alſo, green plants, and pot-herbs; as lettuce, beet, parſley, &c. fruits; as apples, pears, berries, plums, cherries, &c. and the lean parts of animals, birds, fiſhes, inſects, &c. prepared by boiling, baking, ſtewing, &c.

And yet, for different intentions, different kinds of *foods* are required. Thus hard, dry, thick, heavy, feculent *foods*, are beſt for thoſe whoſe viſcera are ſtrong, digeſtion quick, &c. and ſoft, light, humid, ſimple *foods*, to ſuch are pernicious. Again, to the weak, valetudinary, ſtudious, and ſedentary, thoſe *foods* are beſt, which are either by art, or nature, the neareſt to chyle; as milk, broths, &c.

Where the temperature inclines to acidity, there alcalious *foods* are the more ſuitable; and acids, where the conſtitution inclines to be alcaline.

Some will have it, that iron, metals, minerals, &c. may, by a proper preparation, become *food*; on which account, decoctions of gold, chalybeats, &c. are extolled: but it is certain, that no ſuch matters can ever be aſſimilated, and become part of our body; they may act, indeed, on the blood, and the blood-veſſels, by their weight, impetus, &c. and, on that account, may be of uſe in medicine, but not as *food*.

A due regulation of the quantity and quality of our *food*, and a nice adjuſtment thereof to the concoctive powers, would be of the utmoſt conſequence to health and long life.

What we expend in motion, excretion, effluvia, &c. is but a determinate quantity; and the ſupply ſhould only keep pace with the expence: a juſt proportion of the two would, probably, preſerve us from acute diſtempers, as it certainly would from chronical ones; moſt, or all, of which, proceed from repletion, as appears from their being cured by evacuation.

The qualities of *foods*, as to eaſineſs, or difficulty, of digeſtion, Dr. Cheyne thinks, may be determined, in all caſes, from theſe three principles.

1. That thoſe ſubſtances which conſiſt of the groſſeſt parts, are hardeſt of digeſtion; becauſe their conſtituent parts touch in the moſt points, or have the greateſt quantity of contact, upon which their coheſion depends.

2. That thoſe ſubſtances whoſe parts are brought together with greater force, cohere proportionally cloſer, and are the more difficultly ſeparated.

3. That ſalts are very hard to be digeſted; becauſe united by plane ſurfaces, under which they are always comprehended: hence, in the laſt ſtages of the circulation, where it is ſlower, they readily ſhoot into larger cluſters, and ſo are hard to be driven out of the habit.

From theſe principles that author infers, that ſuch vegetables and animals as come ſooneſt to their growth, are eaſier of digeſtion than thoſe long in attaining to maturity; the ſmalleſt of their kind, ſooner than the larger; thoſe of a dry, fleſhy, and fibrous ſubſtance, ſooner than the oily, fat, and glutinous; thoſe of a white colour, ſooner than thoſe of a redder; thoſe of a ſoft, mild, and ſweet, ſooner than thoſe of a rich, ſtrong, poignant, aromatic taſte; land animals, than ſea animals; animals that live on light vegetable *food*, than thoſe on hard and heavy *food*; plain dreſſed *food*, than what is pickled, ſalted, baked, ſmoked, or otherwiſe high ſeaſoned; and boiled meat, ſooner than roaſt, &c.

The ſame author adds, that abſtinence and exerciſe muſt concur with the due *food* for the preſervation of health; and that where exerciſe is wanting, as in ſtudious perſons, the defect muſt be ſupplied by abſtinence. See DIET.

Phyſicians have attempted to determine the healthful quantity of *food* for a human body. Some ſay, that in winter, where the perſpiration of an unexerciſed perſon is only equal to the urine, the diet for twenty-four hours ought not to exceed four pounds, or four pounds and a half. In ſummer, the diet may be ſix pounds and a half, which may be carried off without the help of exerciſe, when the air is hot and dry.

Dr. Bryan Robinſon thinks, that if the quantity of *food* be ſuch as to make the perſpiration and urine of a natural day always nearly equal, and the morning weight of the body always nearly the ſame, that quantity is the truly healthful quantity of *food* for grown bodies, which uſe but little exerciſe.

The quantity of *food* neceſſary to keep a grown body in health, will be better and more eaſily digeſted, when it is ſo divided as to make the meats equal, than when they are very unequal. The diſtance between one meal and another ſhould bear ſome proportion to the largeneſs of the preceding meal.

The ſame author thinks, that good and conſtant health conſiſts in a juſt quantity of *food*, and a juſt proportion of the meat to the drink; and that to be freed from chronical diſorders contracted by intemperance, the quantity of *food* ought to be leſſened, and the proportion of the meat to the drink increaſed more or leſs, according to the greatneſs of the diſorders; and that both the quantity of *food*, and the proportion of meat to drink, ought to be ſuch as ſhall make perſpiration and urine nearly equal at all ſeaſons of the year. See his Differt. on the Food and Diſcharge of Human Bodies, p. 6.

FOOD *of plants*. What is generally underſtood by this term, is ſuch matter, of whatever kind, as being added and united to the firſt ſtamina of plants or plantulæ, at their ſowing, or to their roots, and thence to their trunks and other parts afterwards, gives them their increaſe, or, in other words, is itſelf the matter of that increaſe. The

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great art of the husbandman is the giving this *food* to plants, in the best manner, and to the greatest advantage. But before he can expect to arrive at any true knowlege in this article, it is necessary that he should know what this *food* or matter of nourishment is. There are five things generally allowed to contribute to the growth and increase of plants; these are nitre, water, air, fire, and earth; but it has been much disputed which of all these it is that increases, or is properly the *food* of the plant. Many people say much of the acid spirit residing in the air; but as this is sharp enough to corrode iron bars, it is too sharp to be fit for nourishing tender plants. As to nitre, it is said to nourish them; but its true office is not actually nourishing, but preparing other things to nourish them. Nitre applied to the root of a plant will kill it; but at a distance, so attenuates, cuts and divides the viscous matters found in the earth, that after this they are fit to nourish plants, though they were not so before. Water has been thought by some the only *food* of plants; but Van Helmont's famous experiment, usually brought to prove this, is nothing, for the water contains earth, and therefore is never given to a plant as water alone.

Air, because of its elasticity, is necessary to the increase of plants, but it is not that increase, though Bradley and others have taken great pains to prove that it is so. As to fire, we are very well assured indeed, that no plant can live without heat; but though different degrees of it are necessary to different plants, yet none can live in actual fire; nor has fire ever been thought the food of plants, except by Mr. Lawrence, and some of the metaphysicians. This author indeed says, plants are true fire-eaters, and others explain away the meaning of the phrase, by defining that fire to be only the minutest particles of earth put in motion; if this be the case, probably enough the doctrine may be true. But in plain fact, earth alone is the true *food* and matter of increase of plants. Every plant is earth, and the growth and increase of that plant is only the addition of more earth to it, in the same form. Nitre and other salts, as those of dung, &c. prepare, attenuate, and divide the earth, destined for the increase of vegetables; water and air move it by conveying, and fermenting it in the juices; but earth itself still is the *food*. When the additional earth is once assimilated to the plant, it becomes a part of it, and remains for ever with it; but let water, air, and heat, be taken away, and the plant remains a plant still, though a dead one.

The excess of the other things proves, that they are not the proper *food* of the plant, by destroying not nourishing it. Too much nitre or other salts corrode and kill the plant, too much water drowns it, too much air dries the roots of it, too much heat burns it; but too much earth a plant can never have, unless wholly buried under it, so as to exclude the necessary action of the rest of the assistant articles. See PLANTS.

FOOL, according to Mr. Locke, is one who makes false conclusions from right principles; by which he is distinguished from a madman. See FOLLY.

Dr. Willis relates, that, upon dissecting a *fool*, the principal differences found between him and a man of sense, were, that the brain was smaller; and that the cervical plexus, formed of the intercostal nerve, whereby the correspondence between the brain and heart is effected, was less, and sent forth fewer branches to the heart, &c. Nervor. Descript. & Us. cap. 26.

FOOL'*s stones*, in *Botany*. See ORCHIS.

FOOT, a part of the body of most animals, whereon they stand, walk, &c.

Animals are distinguished, with respect to the number of *feet*, into bipedes, q. d. *two-footed*; such are men and birds; quadrupedes, q. d. *four-footed*; such are most land animals; and multipedes, q. d. *many-footed*; as insects. The reptile kind, as serpents, &c. have no feet.

Lobsters have twelve *feet*; spiders, mites, and polypuses, eight; flies, grashoppers, and butterflies, have six *feet*.

Galen has several good observations on the wise adjustment of the number of *feet* in men and other animals, in his book De Usu Part. lib. iii.

The *fore-feet* of the mole are admirably formed to dig, and scratch up, the earth, and make way for its head, &c. in water fowls, the legs and *feet* are excellently adapted to their respective occasions, and manners of living; in such as are to wade in rivers, the legs are long, and bare of feathers a good way above the knee; their toes also are broad; and in such as bear the name of *mudsuckers*, two of the toes are somewhat alated, that they may not easily sink in walking upon boggy places.

Others, which are to swim, are *whole-footed*; i. e. have their toes webbed together; as in the goose, duck, &c. and it is pretty enough to observe, how artfully these will gather up their toes and *feet*, when they withdraw their legs, or go to take their stroke in swimming; and again expand, or open, the whole *foot*, when they press upon, or drive themselves forward in the water.

FOOT, in *Anatomy*. The *great foot* denotes the whole extent from the jointure of the hip to the tip of the toes; as the great hand does the whole from the shoulder to the fingers ends.

The *pes magnus*, or *great foot*, is divided into the thigh, the leg, and the *foot* properly so called.

Its bones are, the femur, or thigh-bone; the TIBIA, the PATELLA, and FIBULA, for the leg; and those of the *tarsus*, *metatarsus*, and toes.

Its arteries are branches of the crural artery, and its veins terminate in the crural vein. Of these there are five principal ones; viz. the SAPHÆNA, great and little ischiadic, the MUSCULUS, POPLITEA, and SURALIS.

FOOT, properly so called, or the *lesser foot*, denotes only the extremity of the leg, consisting of three parts; viz. the *tarsus*, the space from the ankle to the body of the *foot*, answering to the wrist in the hand; *metatarsus*, the body of the *foot* to the toes, and *digiti*, or toes. Each of these parts consist of a great number of bones; as the *calx*, *talus*, *cuneiformia*, and *cuboides*. The bottom of all is called the sole, or *planta pedis*. See TALUS, &c.

FOOT, *cartilages of the*. The *astragalus* is covered by three cartilages; the first covers the three surfaces which make the convex part and sides of the pully; the second the concave surface of its inferior part, and the third the convex surface of its inferior part, being continued over the inferior part, so far as to form three other small surfaces; one of which is not articular in a strict sense. The first of these cartilages is for the articulation of this bone with the *tibia* and *fibula*, the second for the *os calcis*, and the third for the *os scaphoides*; two of the inferior surfaces formed by the continuation of the third cartilage, are for the articulation of this bone with the *os calcis*; and the third contributes to the formation of a channel for the passage of a tendon.

The *os calcis* has four cartilages, of which three are superior, one large, and two small, for its triple articulation with the *astragalus*; the fourth is anterior for the *os cuboides*. And to these must be added a small thin cartilage of a kind of ligamentary substance, under the tubercle, on the outside of this bone. The *os scaphoides* has two cartilages; one posterior, for its articulation with the *astragalus*, and one anterior, divided into three parts, for the three *ossa cuneiformia*.

The *os cuboides* has two remarkable cartilages, one posterior, for its articulation with the *os calcis*; the other anterior, lying in two planes, for its articulation with the two last metatarsal bones; it has likewise a cartilage on the inside for the *os cuneiforme*, which is next to it, and one on the lower part, covering an oblique eminence situated there.

The three *ossa cuneiformia* have each of them a posterior cartilage for their articulation with the *os scaphoides*, and one anterior for the three first metatarsal bones; they have likewise small cartilaginous surfaces on their lateral sides for their articulation with each other; and besides, the first and third bones are joined thereby to the lateral parts of the basis of the second metatarsal bone, and the third to the *os cuboides*. The bases and heads of the metatarsal bones are covered with cartilages. The phalanges also have, in the same manner, cartilages at their bases and heads, except at the heads or extremities of the last. The sesamoide bones are covered with cartilages on that side, by which they slide on other bones; but great caution is required not to confound the remains of tendons, ligaments, and aponeuroses, with the true cartilages, particularly on the posterior part of the *os calcis*. Winslow's Anatomy, vol. i. p. 132, &c.

FOOT, *ligaments of the*. The *foot* being made up of many bones, must necessarily, beside those ligaments, by which it is tied to the bones of the leg, have several others to connect not only the three parts of which it is composed, but also the particular bones of each part to one another. In each ankle there are three ligaments for their articulations with the *foot*; one anterior, one middle, and one posterior. The ligaments of the inner ankle are all fixed to the inside of the *astragalus*; the anterior and middle ligaments of the outer ankle are more or less broad, and are fixed in the outside of the *astragalus*, the posterior, which is the narrowest, and pretty thick, is chiefly fixed in the outside of the great portion of the *os calcis*. All these ligaments lie on the outside of the capsula, which surrounds the articulation of the *astragalus* with the bones of the leg. The ligaments by which the bones of the tarsus are connected to one another, are short, flat, of different breadths, and run from one bone to another, in different directions. Some of these are common to several bones, and others belong only to two. The *astragalus* is tied to the other bones of the tarsus by several true ligaments; to the inside of the *os calcis*, by one which

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which comes from the lateral *apophyſis* of the *os calcis*, in an inequality on its hinder part, and is fixed again to the poſterior internal tuberoſity of the body of the *aſtragalus*, to the outſide of the ſame bone, by two ligaments which come from the edge of the oblique inferior depreſſion of the *aſtragalus*, and afterwards ſeparating a little, are fixed in the outſide of the great *apophyſis* of the *os calcis*, one forward, which ſeems to ſend off a ſmall portion to the *os cuboides*, and the other backward, of different breadths; to the *os ſcaphoides* ſuperiorly by a ligament, which goes from the neck of the *aſtragalus*, to the upper part of that bone, and from thence is extended to the middle of the *os cuneiforme*; to the ſame bone internally by two ligaments, one of which is a continuation of that which goes from the lateral *apophyſis* of the *os calcis* to the cartilaginous production of the *aſtragalus*; the other is near the ſame production, being partly covered by the former, and fixed in the tuberoſity of the *os ſcaphoides* to the *os calcis*, by a ligament which comes from the oblique inferior depreſſion of the *aſtragalus*, and is fixed in the oblique ſuperior depreſſion of the *os calcis*; and to theſe the principal ligaments of the *aſtragalus*, ſeveral ſmaller may be added, which are uſually ſeen, and increaſe the number very greatly.

The capſular ligaments go very little farther than the edges of the articulations of this bone with the reſt; they adhere very cloſely to the true ligaments, and are covered and hid by them. The *os calcis* is connected to the *os ſcaphoides*, by a continuation of the ligament that goes from its lateral internal *apophyſis* to the cartilaginous production of the *aſtragalus*, by a ligamentary plane, which goes from its great *apophyſis*, to the inferior part of the *ſcaphoides*; and by a narrower ligament, which goes from the ſuperior internal part of its great *apophyſis*, and ends in the neareſt part of the circumference of the *ſcaphoides*. It is connected to the *os cuboides* by ſeveral ligamentary *faſciculi*, which go from its extremity in its ſuperior oblique depreſſion, to the contiguous angle of the *os cuboides*; by one from near the lateral external tuberoſity of the *os calcis*, to a part of the *cuboides* near the former; by one fixed to the exterior and inferior part of the great *apophyſis* of the *os calcis*, to the contiguous part of the *cuboides*; by a pretty broad plane, which covers the inferior part of the *os calcis*, and ends in the oblique eminence of the *cuboides*; and by a broader plane, which, filling the lower part of the lateral concavity in the *os calcis*, is chiefly inſerted in the contiguous angle of the *os cuboides*. The capſular ligaments agree with thoſe of the *aſtragalus*.

The *os ſcaphoides* is tied to the *os cuboides* on its outſide by one ligament, which connects it to the contiguous angle of that bone: on its upper part two go from it to the ſecond and third *oſſa cuneiformia*; on its interior ſide it is joined to the convex ſide of the great *os cuneiforme* by two ligaments, and on its lower, it has four; the firſt appears double, and goes from the tuberoſity of this bone to the baſis of the firſt *os cuneiforme*; the ſecond and third go obliquely to the ſecond and third *os cuneiforme*; and the fourth is a little tranſverſe, being fixed in the inferior internal angle of the *os cuboides*.

The *os cuboides*, beſide thoſe already deſcribed, has ligaments which tie it above, below, and on the outſide, with the third *os cuneiforme*, and the two laſt bones of the metatarſus; the ſuperior ligaments are almoſt equally flat, the inferior irregularly thick, and ſtronger than the ſuperior. The three *oſſa cuneiformia* are connected together on their upper part by particular ligamentary planes, which go more or leſs tranſverſely, from one bone to another, being all joined to one common ligamentary plane which covers theſe three bones, and alſo the *os cuboides*; they are alſo connected by ligaments to the three firſt bones of the metatarſus.

The bones of the metatarſus are connected together by their baſes and heads; the ligaments which go between the baſes are ſuperior and inferior. The ſuperior ſmall and flat, the inferior ſtrong and thick; thoſe between their heads have nearly the ſame diſpoſition, but the inferior have this peculiar to them, that by filling up the ſpaces between the heads, they keep them at ſome diſtance from one another; the inferior portions are fixed in the angles at the lower part of each head, and are ſtrengthened by their union and intertexture with the *aponeuroſis plantaris*. Winſlow's Anatomy, vol. i. p. 134, &c.

FEET, *bathing of the*. The uſes of warm bathing in general, and of the *pediluvium* in particular, are ſo little underſtood, that they are often prepoſterouſly uſed, and ſometimes as injudiciouſly abſtained from.

In the Medical Eſſays of Edinburgh, we find an ingenious author's opinion of the warm *pediluvium*, notwithſtanding that of Borelli, Boerhaave, and Hoffman, to the contrary, to be, that the legs becoming warmer than before, the blood in them is warmed; this blood rarifying, diſtends the veſſels; and in circulating imparts a great degree of warmth to the reſt of the maſs; and as there is a portion of it conſtantly paſſing through the legs, and acquiring new heat there, which heat is, in the courſe of circulation, communicated to the reſt of the blood; the whole maſs rarifying, occupies a larger ſpace, and of conſequence circulates with greater force. The volume of the blood being thus increaſed, every veſſel is diſtended, and every part of the body feels the effects of it; the diſtant parts a little later than thoſe firſt heated. The benefit obtained by a warm *pediluvium* is generally attributed to its making a derivation into the parts immerſed, and a revulſion from thoſe affected, becauſe they are relieved; but the cure is performed by the direct contrary method of operating, viz. by a greater force of circulation through the parts affected, removing what was ſtagnant, or moving too ſluggiſhly there. Warm bathing is of no ſervice where there is an irreſoluble obſtruction, though, by its taking off from a ſpaſm in general, it may ſeem to give a moment's eaſe; nor does it draw from the diſtant parts, but often hurts by puſhing againſt matter that will not yield with a ſtronger impetus of circulation than the ſtretched and diſeaſed veſſels can bear; ſo that where there is any ſuſpicion of ſchirrhus, warm bathing of any ſort ſhould never be uſed. On the other hand, where obſtructions are not of long ſtanding, and the impacted matter is not obſtinate, warm baths may be of great uſe to reſolve them quickly. In recent colds, with ſlight humoral peripneumonies, they are frequently an immediate cure. This they effect by increaſing the force of the circulation, opening the ſkin, and driving freely through the lungs that lentor which ſtagnated or moved ſlowly in them. As thus conducing to the reſolution of obſtructions, they may be conſidered as ſhort and ſafe fevers; and in uſing them we imitate nature, which by a fever often carries off an obſtructing cauſe of a chronical ailment. Borelli, Boerhaave, and Hoffman, are all of opinion, that the warm *pediluvium* acts by deriving a larger quantity of blood into the parts immerſed. But arguments muſt give way to facts: the experiments related in the Medical Eſſays ſeem to prove to a demonſtration, that the warm *pediluvium* acts by rarifying the blood.

A warm *pediluvium*, when rightly tempered, may be uſed as a ſafe cordial, by which circulation can be rouſed, or a gentle fever raiſed; with this advantage over the cordials and ſudorifics, that the effect of them may be taken off at pleaſure. Med. Eſſ. Edinb. abr. vol. i. p. 237, &c.

Pediluvia are ſometimes uſed in the ſmall-pox; but Dr. Stevenſon thinks their frequently tumultuous operations render that ſuſpected, and at beſt of very doubtful effect; and he therefore prefers Monſ. Martin of Lauſanne's method of bathing the ſkin, not only of the legs, but of the whole body, with a ſoft cloth dipped in warm water, every four hours, till the eruption; by which means the puſtules may become univerſally higher, and conſequently more ſafe. Med. Eſſ. abr. ib. p. 248.

FOOT, *bleeding in the*. Bleeding in the *foot* is an operation of very old ſtanding, and has been uſed by the oldeſt phyſicians, for diſorders of the head and breaſt, and for obſtructions of the menſtrual, and habitual diſcharges by the hæmorrhoidal veins. It has been of old ſuppoſed, that the bleeding from the ſaphæna was more particularly ſerviceable in ſome caſes, and from the cephalica in others; but this is now known to be highly erroneous, and the ſurgeon is always to take that which lies faireſt and moſt conſpicuous. If the veins on the metatarſus or inſtep do not appear ſo fairly as might be wiſhed, it is common to take one of thoſe about the ankle, or the calf of the leg or ham.

The patient to be blooded in the *foot*, muſt firſt keep both *feet* ſome time in warm water, that the veins may become turgid, and the ſurgeon have his choice which he will take. Having fixed upon the proper *foot*, the ligature muſt be made about two fingers breadth above the ankle, and the patient muſt then return the *foot* into water. The ſurgeon is to kneel on one knee, and having wiped the *foot* dry, to put it either againſt his other knee, or upon a board placed over the veſſel of hot water, and the vein muſt be held ſecure from ſlipping away, with the left hand, while the orifice is made with the other. If the blood does not flow freely, the *foot* muſt be returned into the warm water, till by the colour of the water, ſtrength of the patient, &c. it is found to have bled enough. Heiſter's Surgery, p. 280.

FEET, *fractures of the*. The bones of the *foot* which compoſe the tarſus, the metatarſus, and toes, are equally liable to fractures with the other bones, but on account of the great complication of nerves, tendons, ligaments, and membranes, fractures in this part are uſually attend-

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ed with very bad ſymptoms. The bones are carefully to be replaced and ſecured by bandage; but fractures of the *feet*, like thoſe of the hands, can ſeldom be ſo perfectly cured, as not to leave a ſtiffneſs or want of motion behind; if the patient ſhould be ſo happy as to eſcape ulcers, caries, or incurable fiſtulæ. Theſe bad ſymptoms, when they appear in the courſe of the cure, are no way to be remedied but by the amputation of the limb; nor will that indeed always ſecure the patient from death. Heiſter, p. 138.

Dr. Waltherus has given a minute deſcription of the muſcles and ligaments of the ſole of the *foot*, in the Nova Act. Erudit. Lipſ. April, 1732.

FOOT, in the *Manege*, is the extremity of a horſe's leg, from the cornet to the lower part of the hoof. The four *feet* are diſtinguiſhed by four different names: the two *fore-feet* are by ſome called the hands of a horſe; but that term is in diſuſe, the common expreſſion being the *far fore-foot*, to denote the right *foot* before; and the *near fore-foot*, the *ſtirrup-foot*, and the *bridle-hand foot*, to denote the left *foot* before.

Of the two hinder *feet*, the right is called the *far hinder-foot*; and when ſpears were uſed, it was called the *ſpear-foot*, becauſe in reſting the ſpear, the ſocket of it anſwered the right hinder *foot*. The left hind *foot* is called the *near foot behind*.

FOOT-*derobé*, in the *Manege*. A horſe's *foot* has this appellation when it is worn and waſted by going without ſhoes, ſo that for want of a hoof, it is a hard matter to ſhoe him.

A horſe's *foot* is ſaid to be worn and waſted, called in French *uſé*, when he has but little hoof, and not enough for ſhoeing.

FOOT, *to gallop upon a good*, or put a horſe upon a good *foot*, called in French *ſur le bon pied*. See *Falſe* GALLOP.

FOOT, *fat*, in the *Manege*. A horſe is ſaid to have a *fat foot*, when the hoof is ſo thin and weak, that unleſs the nails be driven very ſhort, he runs the riſque of being pricked in ſhoeing. The Engliſh horſes are very ſubject to this diſorder.

FOOT, in the *Military Art*, is uſed for the *foot* ſoldiers, or the INFANTRY of an army.

FOOT, in the *Greek* and *Latin Poetry*, denotes a metre, or meaſure, compoſed of a certain number of long and ſhort ſyllables.

The ſpondee, iambic, trochee, and pyrrhic, are diſyllabic *feet*; i. e. they conſiſt of two ſyllables each; the dactyl, anapæſt, moloſſus, tribrach, bacchius, antibacchius, amphibrachys, and creticus, are triſyllabic, or conſiſt of three ſyllables each; the proceleuſmaticus, choriambus, and epitrite, are quadriſyllabic, or compoſed of four ſyllables. See each under its proper head, SPONDEE, IAMBIC, &c.

There are alſo other *feet*, invented by grammarians, of five, ſix, or more ſyllables; but they are not worth the reciting.

Hexameter verſes conſiſt of ſix *feet*; pentameters, only of five.

FOOT, *even and odd*, par and impar. In poetry, and, particularly, in iambic verſes, *feet* are denominated *odd* and *even*, in reſpect of their ſituation in the verſe. Thus, the firſt, third, and fifth, *foot* of the verſe, are uneven; becauſe thoſe numbers are not capable of being divided into two equal parts.

In the ancient tragedy, the iambic verſes, which prevailed therein, only allowed uneven *feet* to the ſpondees; ſo that the ſecond, the fourth, and ſixth, *feet*, were to be iambics, becauſe they were even. This regular mixture of ſpondees in the uneven *feet*, rendered the verſe the more ſolemn and noble.

The comic poets, the better to diſguiſe their verſe, and make it more like proſe, took the contrary courſe; putting ſpondees, where the tragic poets would only have allowed iambics.

FOOT is alſo a long meaſure, conſiſting of twelve inches.

The *foot* long is divided into twelve inches, and the INCH into barley-corns.

Geometricians divide the *foot* into ten digits, and the digit into ten lines, &c.

The French divide their *foot*, as we do, into twelve inches; and the inch into twelve lines.

The *foot* ſquare is the ſame meaſure, both in length and breadth, containing 144 ſquare, or ſuperficial inches.

The cubic, or ſolid *foot*, is the ſame meaſure in all the three dimenſions, containing 1728 cubic inches.

The *foot* is of different lengths, in different countries. The Paris royal *foot* exceeds the Engliſh by nine lines and a half; the ancient Roman *foot* of the Capitol conſiſted of four palms; equal to eleven inches and ſeventenths Engliſh; the Rhinland, or Leyden *foot*, by which the northern nations go, is to the Roman *foot*, as 950 to 1000. The proportions of the principal *feet* of ſeveral nations, compared with the Engliſh and French, are here ſubjoined.

The Engliſh *foot* being divided into one thouſand parts, or into twelve inches, the other *feet* will be as follow:

	Th. Pts.	F.	Inch.	Li.
London - - Foot	1000	0	12	0
Paris foot, the royal, by Greaves	1068	1	0	9·7
Paris foot, by Dr. Bernard	1066	1	0	1
Paris foot, by Graham, from the meaſure of half the toiſe of the Chatelet, the toiſe containing ſix Paris feet -	1065.41⅔			
By Monnier, from the ſame data - - -	1065.351			
From both theſe it may be fixed at - - -	1065.4	1	0	9·4
Amſterdam - - Foot	942	0	11	3
Antwerp - - Foot	946	0	11	2
Dort - - - Foot	1184	1	2	2
Rhinland, or Leyden - Foot	1033	1	0	4
Lorrain - - Foot	958	0	11	4
Mechlin - - Foot	919	0	11	0
Middleburg - - Foot	991	0	11	9
Straſbourg - - Foot	920	0	11	0
Bremen - - Foot	964	0	11	6
Cologn - - - Foot	954	0	11	4
Francfort on the Mayn Foot	948	0	11	4
Spaniſh - - Foot	1001	0	11	0
Toledo - - Foot	899	0	10	7
Roman - - Foot	967	0	11	6
Bononia - - Foot	1204	1	2	4
Mantua - - Foot	1569	1	6	8
Venice - - Foot	1162	1	1	9
Dantzick - - Foot	944	0	11	3
Copenhagen - Foot	965	0	11	6
Prague - - Foot	1026	1	0	3
Riga - - - Foot	1831	1	9	9
Turin - - Foot	1062	1	0	7
The Greek - - Foot	1007	1	0	1
Old Roman - - Foot	970			
Roman *foot*, from the monument of Coſſutius in Rome, by Greaves - - -	967			
From the monument of Statilius, by the ſame - -	972			
Of Villalpandus, deduced from the congius of Veſpaſian	986			

Mr. Raper, who has induſtriouſly collected a variety of authorities relating to the meaſure of the old Roman *foot*, determines the mean to be nearly 968 thouſandth parts of the London *foot*. And by an examination of the ancient Roman buildings in Deſgodetz's Edifices Antiques de Rome, Paris, 1682, he concludes, that the Roman *foot* before the reign of Titus exceeded 970 parts in 1000 of the London *foot*; and in the reigns of Severus and Diocleſian fell ſhort of 965. Phil. Tranſ. vol. li. art. 69. p. 774, &c.

The Paris *foot* being ſuppoſed to contain 1440 parts, the reſt will be as follow:

Paris - - -	Foot	1440
Rhinland - -	Foot	1391
Roman - -	Foot	1320
London - -	Foot	1350
Swediſh - -	Foot	1320
Daniſh - -	Foot	1403
Venetian - -	Foot	1540⅖
Conſtantinopolitan -	Foot	3120
Bononian - - -	Foot	1682⅖
Straſbourg - -	Foot	1282¾
Norimberg - -	Foot	1346¼
Dantzick - -	Foot	1721½
Hall - - -	Foot	1320

In Scotland, this MEASURE of length, though conſiſting of twelve inches, exceeds the Engliſh *foot*, ſo that 185 of the former is equal to 186 of the latter.

FOOT-*bank*, or FOOT-*ſtep*, in *Fortification*. See BANQUETTE.

FOOT *of the foreſt*, *pes foreſtæ*, in our *Ancient Cuſtoms*, contained 18 inches, or 1½ of the common *feet*.

Notandum eſt, quod pes foreſtæ *uſitatus tempore Ric. Oyſell, in arrentatione vaſtorum, factus eſt, ſignatus & ſculptus in pariete cancellæ eccleſiæ de Edwynſtone, & in eccleſiæ Beatæ Mariæ de Nottingham: Et dictus* pes *continet in longitudine octodecim pollices*, &c. Ex Regiſt. Abb. de Novo Loco in Com. Nott.

FOOT, *fore*. See FORE-*foot*.

FOOT-*geld* was an ancient amercement, for not cutting out the balls of the feet of great dogs in the foreſt; to prevent their running after the king's deer.

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FOOT-*guards*. See GUARDS.
FOOT-*hooks*, in a *Ship*. See FUTTOCKS.
FOOT, *horary*. See *Univerſal* MEASURE.
FOOT-*husks*, among *Gardeners*, are the ſhort heads out of which flowers grow. See CALYX.
FOOT *of a ſail*, denotes the lower edge or bottom.
FOOT-*level*, an inſtrument which ſerves to do the office both of a level, a ſquare, and a *foot* rule.
The *foot level*, repreſented *Tab. Surveying*, *fig.* 15. conſiſts of two branches, about an inch broad; opening and ſhutting like a two-foot rule.
Theſe branches are hollowed half way up the ſide of each to receive a kind of tongue, or thin piece of braſs, which is faſtened to one of them, by means whereof the branches may be ſhut cloſe together. The uſe of this tongue is ſuch, that when the end of it is placed in the branch it is not faſtened to, where there is a pin that holds it, the two branches will ſtand at right angles; to the head of the inſtrument is likewiſe added a ſquare piece of braſs; by means whereof it does the office of a ſquare. At the bottom of the angle of the ſaid piece of braſs is a little hole, wherein is faſtened a line with a plumbet; which falling on a perpendicular line drawn on the tongue, ſhews whether any thing the inſtrument is applied to, be level or not. See LEVEL.
FOOT, *lieutenant colonel of*. See LIEUTENANT.
FOOT-*pace*, *half-pace*, or *landing-place*. See STAIR-*caſe*.
FOOT-*rule*. See RULE.
FOOT-*ropes*, are thoſe to which the *foot* of the ſail is ſewed. They are alſo the ſame with the horſes of the yards. See HORSE.
FOOT-*waleing* denotes the whole inſide planks or lining of a ſhip, uſed to prevent any part of the ballaſt or cargo from falling between the floor-timbers.
FOP, probably derived from the *vappa* of Horace, applied in the firſt ſatire of his firſt book to the wild and extravagant Nævius, is uſed among us to denote a perſon who cultivates a regard to adventitious ornament and beauty to exceſs.
FORAGE. See FORRAGE.
FORAMEN, in *Anatomy*, a name given to certain holes, or perforations, in divers parts of the body; as the
FORAMEN *auditorium internum*, which is ſituate in the back-ſide of the *apophyſis petroſa*, in ſome meaſure behind the *veſtibulum* and baſis of the *cochlea*. It is a kind of blind hole divided into two foſſulæ, one large, the other ſmall; the large one lies loweſt, and ſerves for the *portio mollis* of the auditory nerve, or ſeventh pair; the ſmall one is uppermoſt, and is the opening of a ſmall duct, through which the *portio dura* of the ſame nerve paſſes. The inferior foſſula is full of little holes, which in the natural ſtate are filled with nervous filaments of the *portio mollis*, which go to the ſpindle, to the ſemicircular canals, and to thoſe of the *cochlea*. It is this foſſula which forms that ſhallow cavity at the baſis of the ſpindle of the *cochlea*. The paſſage of the *portio dura* of the auditory nerve runs behind the tympanum, and its orifice is the ſtylomaſtoide hole. Fallopius gave this duct the name of the aqueduct, from its reſemblance to the aqueducts in Italy. It begins by the ſmall foſſula, and pierces from within outwards, the upper part of the *apophyſis petroſa* making there an angle or curvature; from thence it is inclined backward behind the ſmall pyramid of the tympanum, and runs down to the ſtylomaſtoide hole, through which it goes out. It communicates likewiſe by a ſmall hole with the ſinus of the pyramid, and lower down by another hole with the barrel of the ear. In ſome ſkulls this aqueduct of Fallopius is open on the upper part of the *apophyſis petroſa*, a kind of break appearing in it, formed by a double hole. It is at this place that it makes the angle already mentioned, but it is commonly covered with a bony lamina. Winſlow's Anat. p. 52.
FORAMEN *lacerum*. See DURA *Mater*.
FORAMEN *of the membrana tympani*, is a perforation in the membrane of the tympanum, or drum in the ear; which admits of the paſſage of wind, ſmoke, &c. from the *meatus a palato* to the drum.
This paſſage is very ſmall, and runs obliquely from the tympanum through the upper part of its membrane, near the proceſs of the malleus. The exiſtence of this perforation is more evident, when ulcers affect the palate, by the egreſs of wind upon the patient's ſtopping his noſe and mouth, and forcing the wind by the ears, than by any anatomical inſpection.
FORAMEN *ovale*, or FORAMEN *Botalli*, an oval aperture or paſſage through the heart of a fœtus, which cloſes up after birth. See *Tab. Anat. (Splanch.) fig.* 12. *lit. g*.
It riſes above the coronary vein, near the right auricle; and paſſes directly into the left auricle of the heart.
The *foramen ovale* is one of the temporary parts of the fœtus, wherein it differs from an adult. It ſerves for the circulation of the blood in the fœtus, till ſuch time as the infant breathes, and the lungs are opened.
Its uſe was firſt exactly deſcribed by Leon. Botallus of Aſti in Piedmont, in the year 1562, who, tracing the courſe and paſſage of the blood, aſſerted the *foramen ovale* to be that opening whereby the blood in fœtuſes was conveyed from the right ventricle to the left.
The modern anatomiſts have admitted the diſcovery; and the *foramen ovale* is now generally allowed a part neceſſary in the ſyſtem of the circulation of the blood in the fœtus. The different hypotheſes relating to this ſubject by Harvey, Mery, and Wolff, may be found under the articles BLOOD and FOETUS.
At the aperture of the *foramen* there is a kind of floating membrane, which looks like a valve; but it has nothing of the office thereof; it does not hinder the blood from paſſing from either auricle to the other. All it ſerves for, according to Mr. Winſlow, is, to cloſe the *foramen* after the birth.
It has generally been thought, that the *foramen ovale* may ſometimes remain open, even in adults; and, in effect, divers authors furniſh us with inſtances thereof. See Phil. Tranſ. N° 460. § 5.
Dr. Connor aſſures us, he found it but half cloſed in a girl of four or five years old; and in another girl, which he opened at Oxford, there was room left to thruſt a tent through. Diſſert. Med. Phyſ. de Stup. Oſ. Coal.
The accurate Mr. Cowper adds, that he has often found the *foramen ovale* open in adults. Anat. Append. *fig.* 3.
And the Paris anatomiſts obſerve, that in a ſea-calf the *foramen ovale* is always open; by which means it is enabled to ſtay ſo long under water.
Somewhat of this, too, is ſuppoſed to have been the caſe in the extraordinary recoveries of divers perſons drowned, hanged, &c. See DROWNING.
But Mr. Cheſelden ventures to ſet aſide all theſe authorities; and contends, that the *foramen ovale* is neither open in any adult land-animals, nor in amphibious creatures.
When he firſt applied himſelf to diſſection, he tells us, he had no diſtruſt of the frequent accounts in authors of the *foramen* being open; but he afterwards found, that he himſelf often miſtook the oſtium of the coronary veins for the *foramen*; and the like he imagines other authors to have done; who aſſert, that it is always open in amphibious animals; for that, upon a diligent inquiry into theſe animals, he could never find it open in any of them. Neither does he think that ſufficient to enable thoſe creatures to live under water, as the FOETUS does *in utero*; unleſs the *ductus arterioſus* were open alſo. Cheſel. Ap. Der. Phyſ. Theol. lib. iv. cap. 7.
FORCE, *Vis*, or *Power*, in *Mechanics*, *Philoſophy*, &c. See VIS, and POWER.
Whenever a body, which was at reſt, begins to move, or has a motion which is either not uniform, or not direct, the cauſe of this change in the ſtate of the body is called *force*.
While a body remains in the ſame ſtate, either of reſt, or of uniform and rectilinear motion, the cauſe of its remaining in ſuch a ſtate, is in the nature of the body, and it cannot be ſaid, that any extrinſic *force* has acted on it. This internal cauſe or principle is called *inertia*.
Mechanical *forces* may be reduced to two ſorts; one of a body at reſt, the other of a body in motion.
The *force* of a body at reſt, is that which we conceive to be in a body lying ſtill on a table, or hanging by a rope, or ſupported by a ſpring, &c. and this is called by the names of *preſſure*, *tenſion*, *force*, or *vis mortua*, *ſolicitatio*, *conatus movendi*, *conamen*, &c. To this claſs alſo of *forces* we muſt refer centripetal and centrifugal *forces*, though they reſide in a body in motion; becauſe theſe *forces* are homogeneous to weights, preſſures, or tenſions of any kind.
The meaſure of this *force* is the weight with which the table is preſſed, or the rope ſtretched, or the ſpring is bent; and as to this meaſure there is no diſpute, notwithſtanding the diverſity of appellations by which it is called.
The *force of a body in motion* is on all hands agreed to be a power reſiding in that body, ſo long as it continues its motion; by means of which, it is able to remove obſtacles lying in its way; to leſſen, deſtroy, or overcome the *force* of any other moving body, which meets it in an oppoſite direction; or to ſurmount any dead preſſure or reſiſtance, as tenſion, gravity, friction, &c. for ſome time; but which will be leſſened or deſtroyed by ſuch reſiſtance, as leſſens or deſtroys the motion of the body.
This is called *moving force*, *vis motrix*, and by ſome late writers *vis viva*, to diſtinguiſh it from the *vis mortua* ſpoken of before; and by theſe appellations, however different, the ſame thing is underſtood by all mathematicians; namely, that power of diſplacing, of withſtanding oppoſite moving *forces*, or of overcoming any dead reſiſtance, which reſides in a moving body, and which, in whole or in part, continues to accompany it, ſo long as the body moves.

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But about the meaſure of this ſort of *force*, mathematicians are divided into two parties. Both ſides agree, that the meaſure of this *force* depends partly upon the maſs, or weight, of the body, and partly upon its velocity; ſo that upon any increaſe of weight or velocity, the moving *force* will become greater. It is alſo agreed, that the velocity being given, or being the ſame in two bodies, their *forces* will be in proportion to their maſſes or weights.

But when two bodies are equal, and the velocities with which they move are different, the two parties no longer agree about the meaſure of the moving *force*.

The Newtonians and Carteſians maintain, that the moving *force* is in proportion to the velocity with which the bodies move. But the Leibnitians aſſert, that the moving *force* is in proportion to the ſquare of the velocity; ſo that if the velocity of a moving body be double, triple, quadruple, &c. of that of another equal body, the *force* of the former will be four times, nine times, ſixteen times as great as that of the latter. See Dr. Jurin, in Phil. Tranſ. N° 476.

Hence the Newtonians allege, that the momentum or moving *force* of bodies is in the compound ratio of their weights and velocities; and the Leibnitians, that it is in the compound ratio of their weights, and the ſquares of the velocities. If we allow the diſtinction, already ſtated, between the *vis viva* and the *vis mortua*, they appear, by the moſt familiar experiments with the balance, and other mechanical powers, to be in the ſimple proportion of the velocity multiplied into the maſs; e. gr. four pounds being placed at the diſtance of ſix inches from the center of motion of a balance, and two pounds at the diſtance of twelve, will have a *vis viva*, if the balance be put into a ſwinging motion. Theſe *forces* appear to be equal, becauſe, with contrary directions, they ſoon deſtroy each other; but they are to one another in the ſimple ratio of the velocity multiplied into the maſs, viz. $4\times6=24$, and $2\times12=24$. Whereas if the *forces*, in this caſe, had been as the maſs into the ſquare of the velocity, the weight 2 placed at near $8\frac{1}{2}$ inches would have deſtroyed the motion of the weight 4 at ſix inches diſtance, and have reduced it to an equilibrium; i. e. $6\times6\times4=144$; and 8.426, &c. $\times$ 8.426, &c. $\times$ 2 = 144. With regard to the *vis mortua*, it is plain, that 2 at the diſtance 12 keeps 4 in equilibrio at the diſtance 6; and the leaſt alteration either of weights or diſtances will deſtroy the equilibrium. Deſag. Exp. Phil. vol. i. p. 393.

Though Leibnitz was the firſt that expreſly aſſerted the *force* of a body in motion to be as the ſquare of its velocity, in a paper inſerted in the Leipſick Acts of the year 1686, yet Huygens has been thought to have led him into this notion, by ſome demonſtrations in the fourth part of his book De Horologio Oſcillatorio, relating to the center of oſcillation, and by his diſſertations, in anſwer to the objections of the abbot Catalan, one of which was publiſhed in 1684. This eminent mathematician had demonſtrated, that in the colliſions of two bodies, perfectly elaſtic, the ſum of the products of the bodies by the ſquares of their reſpective velocities, was the ſame after the ſhock as before; and this propoſition is ſo far general as to obtain in all colliſions of bodies that are perfectly elaſtic. It is alſo true, when bodies of a perfect elaſticity ſtrike any immoveable obſtacle, as well as when they ſtrike one another; or when they are conſtrained by any power or reſiſtance to move in directions different from thoſe in which they impel one another. Theſe conſiderations might have induced Huygens to lay it down as a general rule, that bodies conſtantly preſerve their *aſcenſional force*, that is, the product of their maſs, by the height to which their center of gravity can aſcend; and, therefore, in a given ſyſtem of bodies the ſum of the ſquares of their velocities will remain the ſame, and not be altered by the action of the bodies among themſelves, nor againſt immoveable obſtacles. Leibnitz's metaphyſical ſyſtem led him to think that the ſame quantity of action or *force* ſubſiſted in the univerſe; and finding this impoſſible, if *force* were eſtimated by the quantities of motion, he adopted Huygens's principle of the preſervation of the aſcenſional *force*, and made it the meaſure of moving *forces*. But it is to be obſerved, that Huygens's principle, above mentioned, is general only when bodies are perfectly elaſtic; and in ſome other caſes, which Mr. Maclaurin has endeavoured to diſtinguiſh; ſhewing at the ſame time that no uſeful concluſion in mechanics is affected by the diſputes concerning the menſuration of the *force* of bodies in motion, which have been objected to mathematicians. Analyſt, Query 9.

See Maclaurin's Fluxions, vol. ii. art. 533. and preceding articles. *Hæc conſtans lex eſt, corpora ſervare* vim ſuam aſcendentem, *& idcirco ſummam quadratorum velocitatum illorum ſemper manere eandem. Hoc autem non ſolum obtinet in ponderibus pendulorum & percuſſione corporum durorum, ſed in multis quoque mechanicis experimentis.* Huygen, Oper. tom. i. p. 248.

Huygens, p. 247. of the ſame book obſerves, *Quod ſæpe pereat pars motus, licet hunc in aliquo effectu edendo conſumi, affirmare non poſſumus, ut in multis caſibus percuſſionis durorum corporum—ita ut minime pro lege naturæ habendum ſit, eandem motus quantitatem ſemper conſervari, niſi alicui impendatur & conſumatur; ſed hæc conſtans lex eſt corpora ſervare vim ſuam aſcendentem,* &c. Where it is to be obſerved, that by hard bodies Huygens means ſuch as are elaſtic, as appears from his treatiſe De Motu Corporum & Percuſſione, Oper. vol. ii.

But it is to be obſerved, that though it be true, that in the colliſion of elaſtic bodies the *vis viva*, or aſcenſional *force*, is preſerved before and after the ſhock; yet during the ſhock, while the elaſtic bodies are bending, and preſs on each other, there ſeems to be a diminution of this *force*, which is afterwards reſtored by the action of their elaſticity; though the followers of Leibnitz do not allow that any *force* is loſt even during the ſhock. They ſay, the *vis viva* is communicated to the ſpring while it is bending, and then is recommunicated to the bodies by the unbending of the ſpring. They alſo deny that any *force* is loſt in the percuſſion of ſoft bodies. For though the *force* of the bodies impelling each other be diminiſhed, yet their *force* does not periſh, but is communicated to ſome other matter, ſuch as the ſubtle fluid cauſing coheſion and elaſticity. *Vis viva quæ in percuſſione amittitur, non perit, ſed conſervatur.* Wolf. Coſmol. § 486. *In toto univerſo ſemper conſervatur eadem virium vivarum quantitas.* Ibid. § 487. *Vis viva—dum figura corporum in contactu mutatur, in alia materia conſervatur.* Ibid. Demonſtr. § 486. Mr. Dan. Bernouilli, ſpeaking of this principle of the preſervation of the *vis viva*, obſerves, *Quamvis principium univerſale ſit, non tamen eſt ſine circumſpectione adhibendum, quia ſæpe contingit ut motus tranſeat in materiam alienam. Ita verbi gratia poſitio illius valet pro regulis motuum ex percuſſione eruendis, ſi modo corpora ſint perfectè elaſtica; ſed cum talia non ſunt, facile eſt videre, partem* virium vivarum *ſive* aſcenſus potentialis *in compreſſionem corporum impenſam corporibus non reſtitui, ſed materiæ cuidam ſubtili, ad quam tranſiit, impreſſam hærere.* And Mr. Daniel Bernouilli, in this treatiſe, has aſſumed the preſervation of the *vis aſcendens* of Huygens, or, as others expreſs it, the *conſervatio virium virarum*; and, in Mr. Bernouilli's own expreſſion, *æqualitas inter deſcenſum actualem aſcenſumque potentialem*, as an hypotheſis of wonderful uſe in mechanics. But a late author contends, that the concluſions drawn from this principle are oftener falſe than true. See De Conſervat. Virium vivarum Diſſert. Lond. 1744. 4to.

Mr. Robins, in his remarks on Mr. J. Bernouilli's treatiſe, entitled, Diſcours ſur les Loix de la Communication du Mouvement, informs us, that Leibnitz adopted this opinion through miſtake; for, though he maintained that the quantity of *force* is always the ſame in the univerſe, he endeavours to expoſe the error of Des Cartes, who aſſerted, that the quantity of motion is always the ſame; and in his diſcourſe on this ſubject in the Acta Eruditorum, 1686, he ſays, that it is agreed on by the Carteſians, and all other philoſophers and mathematicians, that there is the ſame *force* requiſite to raiſe a body of one pound to the height of four yards, as to raiſe a body of four pounds to the height of one yard; but being ſhewn how much he was miſtaken in taking that for the common opinion, which would, if allowed, prove the *force* of the body to be as the ſquare of the velocity it moved with, he afterwards, rather than own himſelf capable of ſuch a miſtake, endeavoured to defend it as true; ſince he found it was the neceſſary conſequence of what he had once aſſerted; and maintained, that the *force* of a body in motion was proportional to the height from which it muſt fall, to acquire that velocity; and the heights being as the ſquares of the velocities, the *forces* would be as the maſſes multiplied by them; whereas, when a body deſcends by its gravity, or is projected perpendicularly upwards, its motion may be conſidered as the ſum of the uniform and continual impulſes of the power of gravity, during its falling in the former caſe, and till they extinguiſh it in the latter. Thus, when a body is projected upwards with a double velocity, theſe uniform impulſes muſt be continued for a double time, in order to deſtroy the motion of the body; and hence it follows, that the body, by ſetting out with a double velocity, and aſcending for a double time, muſt ariſe to a quadruple height, before its motion is exhauſted. But this proves that a body with a double velocity moves with a double *force*, ſince it is produced or deſtroyed by the ſame uniform power continued for a double time, and not with a quadruple *force*, though it ariſes to a quadruple height; ſo that the error of Leibnitz conſiſted in his not conſidering the time, ſince the velocities alone

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alone are not the cauſes of the ſpaces deſcribed, but the times and the velocities together; and yet this is the fallacious argument on which he firſt built his new doctrine; and thoſe which have been ſince much inſiſted on, and derived from the indentings or hollows produced in ſoft bodies by others falling into them, are much of the ſame kind. Robins's Tracts, vol. ii. p. 178. Maclaurin's View of Sir I. Newton's Diſcov. p. 135.

Catalan and Papin replied to Leibnitz's paper publiſhed in 1686; and from that time the controverſy became more general, and was carried on for ſeveral years by Leibnitz, John and Daniel Bernouilli, Herman, Poleni, Wolfius, s'Graveſande, Camus, Muſchenbroek, &c. on one ſide; and Pemberton, Eames, Deſaguliers, Dr. S. Clark, M. de Mairan, Jurin, Maclaurin, Robins, &c. on the other. See Act. Erud. 1686. 1690. 1691. 1695. & Nouv. de la Rep. Let. Sept. 1686. 1687. art. 2. Comm. Epiſt. inter Leibn. & Bern. Ep. 24. p. 143. Diſcours ſur les Loix de la Comm. du Mouvement, Oper. tom. iii. & Diſſ. de vera Notione Virium virarum, ib. Act. Petropol. tom. i. p. 131, &c. Hydronamica, ſec. 1. Herm. in Act. Petrop. tom. i. p. 2, &c. Polen. de Caſtellis. Wolf. in Act. Petrop. tom. i. p. 217, &c. & in Coſmol. Gener. Graveſ. in Journ. Lit. & Phyſ. Elem. Math. 1742. lib. ii. cap. 2 & 3. Mem. de l'Acad. des Scienc. 1728. Muſchenbr. Int. ad Phil. Nat. 1762. vol. i. p. 83, &c. Pemb. &c. in Phil. Tranſ. N° 371. N° 375. N° 376. N° 396. N° 400. N° 401. or Abridg. vol. vi. p. 216, &c. Mairan in Mem. de l'Acad. Sc. 1728. Phil. Tranſ. N° 459. or Abr. vol. viii. p. 236. Phil. Tranſ. vol. xliii. p. 423, &c. Maclaurin's Account of Sir Iſaac Newton's Diſcoveries, p. 117, &c. Fluxions, ubi ſup. & Receuil des Pieces qui ont emporté le Prix, &c. tom. i. Deſag. Courſe Exp. Phil. vol. i. p. 393, &c. vol. ii. p. 49, &c. Robins, ubi ſupra.

The nature and limits of this work will not admit our giving a full account of the arguments and experiments which have been repeatedly urged on both ſides of this queſtion. Thoſe who are deſirous of farther information than this article furniſhes, with reſpect to the ſubject in diſpute, may conſult the preceding references. We ſhall, however, endeavour to collect a ſummary account of this controverſy. The chief arguments that have been urged on both ſides have been deduced from the mutual colliſion of bodies, from the action of ſprings, from the compoſition and reſolution of motion, from the impreſſions made by falling bodies on ſoft ſubſtances, and from ſome experiments in hydraulics relating to the velocities of fluids.

It is a well known law of MOTION, that action and reaction are equal with oppoſite directions, and are to be eſtimated always in the ſame right line; and from this law it follows, that the ſum of the motions of any number of bodies, eſtimated in a given direction, continues the ſame in their mutual actions and colliſions, till ſome external influence diſturbs them. The advocates for the new opinion concerning the *forces* of bodies have found it impoſſible to explain the actions and colliſions of perfectly hard bodies, void of all elaſticity, conſiſtently with their doctrine; and, therefore, they have denied the exiſtence of any ſuch bodies; though it is reaſonable to ſuppoſe, that the ultimate elementary particles of bodies, void of all pores, or atoms, are perfectly hard or inflexible, ſo as not to yield in the ordinary colliſions of bodies; whilſt they have admitted the exiſtence of bodies perfectly elaſtic, none of which are to be met with in nature. Notwithſtanding this evaſion, they have been no leſs puzzled in explaining the colliſion of ſoft bodies, and reconciling the phenomena with their doctrine; for if a ſoft body, with the velocity u, ſtrikes another equal ſoft body, they will proceed as in one maſs with the velocity $\frac{1}{2}u$, dividing the motion of the firſt body equally between them, by the forementioned law. According to the new opinion, the *force* of the firſt body before the ſtroke was uu, the *force* of each of them after the ſtroke is $\frac{1}{2}u \times \frac{1}{2}u$, or $\frac{1}{4}uu$; and the ſum of their *forces* after the ſtroke is $\frac{1}{2}uu$; ſo that the ſum of their *forces* after the ſtroke is only half of what it was before the ſtroke, while the quantity of motion is preſerved the ſame as it was without any change. In order to account for the loſs of one half of the *force* of the firſt body in the ſtroke, they allege, without proof, that when the parts of ſoft bodies yield without reſtoring themſelves, being void of all elaſticity, a certain quantity of *force* is loſt in the compreſſion of their parts by the colliſion; whereas there is no way by which *force* is loſt in one body, but by the communication of it to another; ſo that there is no juſt reaſon for ſuppoſing, as they have done, that any motion or *force* is loſt in flattening or hollowing ſoft bodies in their colliſions.

If we admit the common rules of finding the velocities of non-elaſtic bodies after colliſion, which Mr. s'Graveſande, an advocate for the new opinion, allows, it will follow, according to that opinion, that equal cauſes may have unequal effects: e. gr. Let a and b be two equal non-elaſtic bodies; let b be at reſt, while a moves towards it with eight degrees of velocity. In this caſe, the common velocity after the ſtroke will be half the velocity of a before the ſtroke, i. e. four degrees, dividing the ſum of the quantities of motion in the two bodies by the ſum of the quantities of matter; conſequently the force in b, thus communicated by the ſtroke, will be as its ſquare or 16. Again, let b move forward with two degrees of velocity, and a follow it with ten degrees, the relative velocity will be 8 as before; and, therefore, the ſtrokes in both caſes are equal; the velocity of b after the ſtroke will be half the ſum of the velocities before the ſtroke, or ſix degrees. According to the new opinion, the *forces* being as the ſquares of the velocities, the *force* of b before the ſtroke will be to its *force* after the ſtroke, as the ſquare of 2 is to the ſquare of 6, i. e. as 4 to 36. Subtract the *force* of b before the ſtroke from the *force* it has after the ſtroke, and you have the degree of *force* communicated by the ſtroke; which, if this opinion be true, would be 32, i. e. double the number of degrees communicated by the ſame *force* in the former inſtance, which was as 16; and, therefore, equal ſtrokes produce unequal effects. The intropreſſion of the parts, which is the other part of the entire effect of the ſtroke, will make but a ſmall alteration in the matter; ſince the intropreſſions in all caſes are equal, when the relative velocity is ſuppoſed to be the ſame.

It has been alſo alleged by the advocates for the new doctrine, particularly by Mr. Bernouilli, that the preſervation of the ſum of the abſolute motions of bodies, in their colliſions, reſults immediately from the equality of action and reaction; the augmentation or diminution of the *force* of the one being the neceſſary conſequence of the diminution or augmentation of the *force* of the other. But the third law of motion is general, and extends to bodies of all kinds; and it is well known, that when ſoft bodies meet in oppoſite directions, the ſum of their abſolute motions or *forces* is diminiſhed; and when the bodies are equal, and their velocities likewiſe equal, it is totally deſtroyed by this colliſion; and if two elaſtic bodies meet each other with contrary velocities, then on their firſt compreſſion it is evident, that both their *forces* are diminiſhed at the ſame time, and it may happen, that in reſtoring themſelves, both their *forces* may be increaſed at the ſame time. It is not the ſum of the abſolute motions or *forces* of bodies, but this ſum eſtimated in a given direction, that is preſerved unaltered in their colliſions, in conſequence of the third law of motion; nor can the preſervation of the ſum of the abſolute *forces* of any ſort of bodies be conſidered as an immediate conſequence of it.

The advocates for the new opinion farther maintain, that the *force* of bodies is that power of acting in them, which muſt be meaſured by its whole effect, till its motion be deſtroyed; and they alſo lay it down as a definition or axiom, that *force* is proportional to the number of ſprings which it can bend before it be conſumed. Accordingly they ſhew, that a body with a velocity as 2, is able to bend and overcome the reſiſtance of four ſprings, one of which alone is equivalent to the *force* of the ſame body moving with a velocity as 1; and hence they infer, that, in the former caſe, the *force* is quadruple, though the velocity be only double of what it is in the latter caſe. But we may obſerve in general, that cauſes are not to be meaſured by any effects produced by them, conſidered without regard to their circumſtances: thus, motions and *forces* are not to be meaſured by the effects produced, without regard to the times and directions of the motions. It is not conſidered in the preceding argument, and in others of a ſimilar kind, that the *force* which one body loſes, in acting upon another, is not equal to that which it produces or deſtroys in the other, eſtimated in any direction at pleaſure, but in that only in which the firſt body acts; and that body, in conſequence of its *inertia*, not only reſiſts any change in its quantity of motion, but likewiſe any change in the direction of its motion. For the farther illuſtration of this argument, let the bodies A and B (*Tab.* III. *Mechanics*, *fig.* 37.) by moving towards each other, compreſs equal and ſimilar ſprings placed between them, till by the re-action of theſe ſprings their motions be deſtroyed. Mr. Bernouilli expreſly owns, that the actions of the ſprings on thoſe bodies are conſtantly equal to each other; and yet maintains that they deſtroy a *force* in B greater than the *force* of A, in the ſame proportion as the body A is greater than B, or (C being the center of gravity of A and B) as CB is greater than CA. He, therefore, maintains, that equal preſſures or actions of ſprings generate, in the ſame time,

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forces that may be unequal in any aſſignable ratio, which is repugnant to the plaineſt notions we can form of action and *force*. If we ſuppoſe the body A to compreſs the ſprings from A to C, then the body B will compreſs all the ſprings from B to C, in the ſame degree, and in the ſame time; and thence he infers, that the *force* of A is to the *force* of B in the ſame proportion as the number of ſprings from C to A to the number of ſprings from C to B. But ſince the motion, *force*, or effect of any kind, produced or deſtroyed in A or B, depends upon the immediate action which produces the effect, and upon it only; and ſince, in this caſe, the actions of the ſprings upon the bodies A and B are thoſe which deſtroy their motion; and ſince it is allowed that the actions of the ſprings on theſe bodies are equal, is it not evident that the *forces* deſtroyed by them in the ſame time muſt be equal? And is it not manifeſt, that the *forces* which are produced or deſtroyed in bodies are to be meaſured by the efforts which the ſprings exert upon the bodies in producing this effect, and not by the number of ſprings? It is the laſt ſpring only, which is in contact with the body that acts upon it, the reſt ſerving only to ſuſtain it in its action; and, therefore, any change produced in the body, by whatever name it be called, ought to be determined from the action of this laſt ſpring only, and in juſt reaſoning ought to be computed from this alone. Moreover, if two unequal bodies, moving with unequal velocities, ſtrike upon two equal ſprings, with one end leaning againſt an immoveable ſupport, and each of them bend the ſpring on which it ſtrikes exactly to the ſame degree; and in ſo doing the moving *force* of each body be entirely conſumed; in this caſe there will be, according to the Leibnitzians, two equal effects produced, ſince the ſprings are equal and equally bent, and the moving *forces* are wholly conſumed in producing them; and, therefore, on their principles, theſe moving *forces*, being the cauſes of equal effects, muſt be equal. But thoſe who eſpouſe the old opinion, deny this concluſion, unleſs the times of producing theſe effects are equal; and they allege in the preſent caſe, that the greater body will take up a longer time in producing its effect, or in bending its ſpring; conſequently the moving *forces* of theſe two bodies may be unequal, though they bend equal ſprings to the ſame degree. In like manner, when a ſpring, already bent to ſome certain degree, does, by unbending, drive before it a body which gave way to its preſſure, the preſſure of the ſpring may produce a greater effect, when it continues for a longer time. Dr. Jurin has very accurately conſidered the action of ſprings. Having premiſed the three following axioms, viz. 1. That a ſpring will unbend itſelf more ſlowly according to the ſize of the body againſt which it acts; 2. That its preſſure is in proportion to the degree in which it is bent; and, 3. That a greater preſſure produces a greater moving *force* in a given time: he deduces from them the following propoſition, viz. that moving *forces* are not proportional to the maſſes of the bodies, and the ſquares of their velocities; for when two ſprings, A and B, equal, and equally bent, puſh before them, by unbending, two unequal bodies, the ſpring A, which acts on the greater body, will unbend more ſlowly than the other, and, therefore, in every inſtant of time, will have unbent itſelf leſs than B; conſequently its preſſure will be greater than that of B at the ſame inſtant; and the infinitely ſmall moving *force* produced by A in every moment will be greater than that of B; whence it follows, that the ſum of the infinitely ſmall moving *forces*, i. e. the whole moving *force*, produced by A, will be greater than that of B in the ſame time; ſo that the ſpring A, not being wholly unbent, when the preſſure of B ceaſes, will continue to act on the greater body, the moving *force* of which will increaſe, and, therefore, more and more exceed the moving *force* of the ſmaller body; but, ſince the products of the maſſes and ſquares of the velocities are equal in the two bodies, the moving *forces*, which are proved to be unequal, cannot be proportional to the ſame products. He then ſubjoins the two following axioms, viz. 4. That ſprings of unequal lengths, when bent alike, have equal preſſures; and, 5. That equal preſſures in equal times produce equal moving *forces*; from which he deduces his ſecond propoſition, that moving *forces* are proportional to the maſſes and velocities jointly. Thus, if there be two ſprings, of the lengths 1 and 2, but equal in all other reſpects, and bent alike; and the ſpring 1, in unbending itſelf, be made to drive before it a body whoſe maſs is 2, and the ſpring 2 another body of the maſs 1, theſe two ſprings, by what he has elſewhere demonſtrated, will unbend themſelves exactly in the ſame time; and, therefore, the ſpring 2 will unbend itſelf with a velocity double of that of the ſpring 1; and it will give to the body 1 a velocity double of that, which the body 2 will receive from the ſpring 1; conſequently, the two ſprings, during the whole time of their expanſion, will be always bent alike; and, by axiom 4. their preſſures will be conſtantly equal; and by axiom 5. the infinitely ſmall moving *forces* produced by each of theſe ſprings, in every infinitely ſmall part of time, will be equal one to the other; therefore, the ſums of theſe infinitely ſmall moving *forces*, i. e. the whole moving *forces*, produced by the two ſprings, will be equal. And as the maſſes of the two bodies are 2 and 1, and their velocities 1 and 2 reſpectively, the moving *forces* muſt be proportional to the maſſes and velocities jointly. From theſe principles, Dr. Jurin infers, that the Leibnitian opinion about the meaſure of moving *forces* is inconteſtibly overthrown by the firſt propoſition, and the oppoſite opinion evidently eſtabliſhed by the ſecond.

It is a well known theorem in mechanics, that the motions and actions of bodies upon each other, in a ſpace that is carried uniformly forward, are the ſame as if that ſpace were at reſt; and any powers or motions that act upon all the bodies, ſo as to produce equal velocities in them in the ſame or in parallel right lines, have no effect on their mutual actions or relative motions. From this theorem, Mr. Maclaurin has deduced the following argument againſt the new doctrine concerning the *forces* of bodies in motion. Let A and B (*Tab.* III. *Mechanics*, *fig.* 38.) be two equal bodies that are ſeparated from each other by ſprings interpoſed between them in a ſpace E, F, G, H, which in the mean time proceeds uniformly in the direction B A, in which line the ſprings act, with a velocity as 1; and let the ſprings impreſs on the equal bodies A and B equal velocities, in oppoſite directions, that are each as 1. Then the abſolute velocity of A, which was as 1, will be now as 2; and, according to the new doctrine, its *force* as 4; whereas the abſolute velocity, and the *force* of B, which was as 1, will be now deſtroyed; ſo that the action of the ſprings adds to A a *force* as 3, and ſubducts from the equal body B a *force* as 1 only; and yet it ſeems manifeſt, that the actions of the ſprings, on theſe equal bodies, ought to be equal; which Mr. Bernouilli allows: i. e. equal actions of the ſame ſprings on equal bodies would produce very unequal effects, the one being triple of the other according to the new doctrine, than which hardly any thing more abſurd can be advanced in philoſophy or mechanics. In general, if m repreſent the velocity of the ſpace E F G H, in the direction B A, n the velocity added to that of A, and ſubducted from that of B, by the action of the ſprings, then the abſolute velocities of A and B will be repreſented by $m+n$ and $m-n$ reſpectively, the *force* added to A by the ſprings will be $2mn+nn$, and the *force* taken from B will be $2mn-nn$, which differ by $2nn$. Farther, it is allowed that the actions of bodies upon one another are the ſame in a ſpace proceeding with an uniform motion as if the ſpace was at reſt; but if the ſpace E F G H, was at reſt, it is allowed, that the *forces* communicated by the ſprings to A and B had been equal; and, by the new doctrine, the *force* of each had been repreſented by nn; whereas the *force* communicated to A by the ſprings in the ſpace E F G H, is repreſented by $2mn+nn$, and the *force* taken from B will be $2mn-nn$.

It has been farther urged by the advocates for the new opinion, that, ſince a body moving with a velocity proportional to the diagonal of a rectangle is able to balance the reſiſtance of two ſprings proportional to the ſides of the ſame rectangle, the *force* of a body moving with a velocity, as the diagonal, is equal to the ſum of the *forces* of two bodies moving with velocities proportional to the ſides of the rectangle; and, becauſe the ſquare of the diagonal is equal to the ſum of the ſquares of the two ſides, they thence infer, that the *forces* of equal bodies are as the ſquares of their velocities. Mr. Maclaurin has very largely diſcuſſed this argument, and ſhewn that it contradicts not only their own principles but the eſtabliſhed laws of motion. It is well known to thoſe who are acquainted with the COMPOSITION and RESOLUTION of MOTION, that powers acting in the directions AB and AD (*Tab.* III. *Mechanics*, *fig.* 39.) proportional to thoſe right lines, compound a power acting in the direction of the diagonal AC, and meaſured by it; and this compound power muſt be leſs than the ſum of the ſimple powers, becauſe AC is leſs than AB+AD. This is eaſily accounted for by reſolving the power AB into AM and AN, and the power AD into AK and AL, of which AN and AL are oppoſite and equal, and deſtroy each other's effect, ſo that there remains AM+AK or AC, the meaſure of the compounded power. The followers of Leibnitz agree in this manner of arguing concerning powers and preſſures, but not in the compoſition and reſolution of *forces*; for, according to them, when the angle BAD is right, the compounded *force* is equal

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equal to the ſum of the *forces* AB and AD, and no *force* is loſt, notwithſtanding the oppoſite directions of the *forces* AL and AN. When the angle BAD *(fig.* 40.) is acute, the ſquare of the diagonal AC exceeds the ſum of the ſquares of AD and DC, or of AD and AB; and, therefore, the two *forces* in the directions AD and AB muſt, according to the new doctrine, compound a *force* AC greater than their ſum; a conſequence which contradicts their own metaphyſical principle, that the effect is proportional to the cauſe which produces it, becauſe the effect is, in this caſe, greater than the cauſe, and is as abſurd in mechanics, as that two quantities collected together ſhould produce a greater quantity than their ſum in geometry; whereas, it appears from a view of the figure, that AL and AN, parts of AD and AB, deſtroy each other; and, therefore, the whole *forces* AD and AB are not accumulated in the direction AC, but only their parts AM and AN, which taken together are equal to AC, becauſe the triangles ADK and BMC are ſimilar and equal; ſo that the *forces* in the directions AB and AD compoſe a *force* in the directions AC leſs than their ſum, whilſt the ſquares of AB and AD, taken together, exceed the ſquare of AC; conſequently the *forces* are not to be meaſured by the ſquares of the lines. Farther, let the elaſtic body A *(fig.* 41.) receive its *force*, in the direction AB, from the equal elaſtic body H, and its *force*, in the direction AD, from the equal elaſtic body G, at the ſame time. According to the patrons of the new doctrine, the *forces* of H and G are communicated to A by infinitely ſmall degrees, or by an uninterrupted ſucceſſion of preſſures, and the whole *force* communicated to A is the ſum of the effects of theſe preſſures. Now in every inſtant, the preſſure, or infinitely ſmall *force* impreſſed on A, is leſs than the ſum of the preſſures exerted in that inſtant by H and G, in proportion as AC is leſs than AB+AD, as is allowed on all ſides. Therefore the ſum of all the preſſures, or the *force* impreſſed on A, muſt be leſs than the ſum of all the preſſures, or the ſum of the *forces* exerted by H and G, in the ſame proportion of AC to AB+AD; that is, the *forces* of A, H, and G, muſt be as the lines AC, AB, and AD, and not as their ſquares. It is not poſſible to conceive, that while the *force* in A ariſes from the accumulation of the preſſures, or infinitely ſmall *forces*, which it receives every moment from the actions of H and G, and each of theſe preſſures, or infinitely ſmall *forces*, is leſs than the ſum of the actions of H and G that produce them; yet the whole *force* of A ſhould, nevertheleſs, exceed the ſum of the whole actions or *forces* of H and G. If the angle BAD be infinitely acute, the ſame *forces* (according to the new opinion) generate a *force* in A, which exceeds their ſum as much as the ſquare of AB+AD exceeds the ſum of the ſquares of AB and AD; ſo that if AD be equal to AB, they will in that caſe generate at A a *force* double of their ſum, for then the ſquare of AB+AD will be equal to the ſquare of $2AB=4AB^2$; though the two equal *forces*, which are ſuppoſed to produce this, taken together, amount only to $2AB^2$, according to their own computation; and, therefore, in this caſe, a cauſe produces an effect of the ſame kind double of itſelf.

In the reſolution of motion, motion is gained; and as the powers that generate motion are increaſed, the effects of theſe powers, or the *force* of bodies, muſt be increaſed likewiſe. Mr. Maclaurin has illuſtrated and applied this principle in the following manner. Let the body C *(fig.* 42.) moving in the direction DC, the diagonal of the parallelogram, CLDK, ſtrike the equal body A obliquely, ſo as to impel it in the direction CA, the continuation of CK, and at the ſame time the equal body B, in the direction CB, the continuation of CL; the body A will proceed in the right line CA, and the body B will proceed in the direction CB, the continuation of CL, and C having communicated all its *force* to them, will ſtop. It will not appear ſtrange, that the motions and *forces* of A and B exceed the motion or *force* of C, if we conſider that C communicates the whole motion or *force* CK to A, and the whole motion or *force* CL to B, that the reſiſtance or *inertia* of A reacting upon C, not in the direction of its motion CD, but in the direction CK, oblique to it, the abſolute motion or *force* of C, in the direction DC, is not ſo much diminiſhed by this reaction as if it was directly oppoſite to the motion of C; for no power or reſiſtance can produce ſo great an effect in any direction as in that wherein it acts. In like manner, the reaction of B deſtroys the *force* LC in the body C, in the direction in which B reacts; but not ſo great a motion or *force* in the direction DC, to which it is oblique; and thus it appears, that the motion or *force* of C, in the direction DC, muſt neceſſarily be leſs than the ſum of the motions or *forces* of the bodies A and B in their reſpective directions. It may alſo be obſerved, that in conſequence of the *inertia* of body, it not only reſiſts any change of its motion, but likewiſe any change in the direction of its motion; and when the action of bodies upon each other is not in a right line, both theſe are to be taken into the account. Thus, if C ſtrike A, the reaction of A has a twofold effect; it ſubducts ſomewhat from the motion or *force* of C, and produces a change in its direction; and its whole reaction is to be eſtimated by both theſe effects conjointly. After the body C has ſtruck A, it proceeds in the right line CB with a motion or *force* as CL, and, impinging on B directly, it communicates its whole motion or *force* to B, which reacts directly againſt it; the bodies C, A, and B, are ſuppoſed to be perfectly elaſtic. If ſprings be ſubſtituted, inſtead of the bodies A and B, and their reſiſtances meaſured by CK and CL, the reſiſtances of thoſe ſprings are not the proper meaſures of the *force* of the body C, but, taken together, they muſt exceed it; becauſe the ſpring A acts at a diſadvantage againſt the motion or *force* of C. It has its whole effect in the direction CK, in which it reſiſts; but not ſo great an effect in the direction CD, oblique to that in which it acts. If the ſpring A acted with the ſame advantage as B, they would together produce a greater effect than in the ſituation they have in the figure; and, therefore, the greateſt reſiſtances which they are able to exert taken together, muſt exceed the *force* of the body C. Thus, ſays Mr. Maclaurin, it appears, that this argument, inſtead of overthrowing the old doctrine, confirms it, and that they who advanced it, ſuppoſed thoſe *forces* to be equal, which, according to the known principles of mechanics, are unequal. In other inſtances, the followers of M. Leibnitz neglect the conſideration of time, in reaſoning concerning the *forces* of bodies; in this caſe they do not duly regard the directions of motions and *forces*, in eſtimating and comparing their effects. Mr. Eames has likewiſe ſhewn, that the argument drawn from the compoſition and reſolution of *forces*, equally proves both ſides of the queſtion, and by thus proving too much, proves nothing. Another argument advanced in favour of the new opinion, has been founded on the learned and ingenious Mr. Poleni's experiment, in which equal cavities are formed in ſoft ſubſtances, by equal bodies falling from heights reciprocally proportional to their maſſes; whence it has been inferred, that the bodies ſtrike with equal *force*, and, therefore, that the *force* of the ſame body in deſcending is proportional, according to Mr. Leibnitz's principle, to the height from which it falls, or, in all motion, proportional to the ſquare of the velocity. Dr. Jurin has ſet this argument aſide, as inſufficient, ſince the times of forming theſe equal cavities are unequal, and unequal cauſes may produce equal effects in unequal times. Mr. Poleni, indeed, maintains, that the formation of theſe cavities ſeems to be inſtantaneous; but Dr. Jurin has ſhewn the contrary, even from a poſition allowed of by Poleni himſelf. Dr. Pemberton aſſerts and proves, that this experiment of Poleni is not only reconcileable to the common doctrine of motion, but that it manifeſts the great unreaſonableneſs, if not the abſolute abſurdity, of Mr. Leibnitz's opinion; and Dr. Deſaguliers obſerves, that Poleni's miſtake lies in this; that he eſtimates the *force* of the ſtroke of the falling balls, by the depth of the impreſſion made in the yielding ſubſtances; but this is not the whole effect; for when two bodies move with equal *forces*, but different velocities, that which moves the ſwifteſt muſt make the deepeſt impreſſion, whilſt the ſloweſt body communicates its motion to the ſubſtance round about, and, therefore, does not ſtrike in ſo deep as the ſwifter body, which puts in motion few parts of the clay, beſides thoſe that are before it, and which have ſo much leſs time to oppoſe this body's motion, as its velocity is greater.

The ingenious Mr. Graham, in confirmation of the old opinion, prepared a pendulous body, with a cavity in it, capable of receiving another body of an equal weight, at the loweſt point of its vibration; and when the body was dropped into it, he found, by the ſubſequent vibration, that the velocity of the double maſs was preciſely one half of the velocity of the pendulum before; from which it appears, that the ſame *force* produces in a double quantity of matter one half of the velocity only; which is agreeable to the common doctrine, but directly repugnant to the new one, concerning the *forces* of bodies in motion.

The advocates for the new opinion have produced in favour of it ſome experiments in hydraulics, the reſult of which is, that the velocities of any fluid, iſſuing out at equal orifices made in the ſides of veſſels filled up to different heights, and kept full at thoſe heights, above the orifices, are found to be as the ſquare roots of thoſe heights reſpectively; whence they infer, that the *forces* of equal maſſes, or moving bodies, are proportional to

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the ſquares of their velocities. Every ſingle particle, they ſay, iſſuing out with two degrees of velocity, muſt move with four times the *force* of any other ſingle particle that moves with only one degree of velocity; becauſe the *force* with which it moves is the effect of a cauſe four times greater, or the preſſure of a column of water four times higher, &c. The preſſures are as the altitudes, and the altitudes as the ſquares of the velocities of every ſingle particle; therefore the preſſures are as the ſquares of the velocities; but the preſſures being the cauſes of the *forces*, with which the ſeveral particles iſſue out or move, and effects being proportional to their cauſes, the *forces* muſt be as the ſquares of the velocities. On this reaſoning, Mr. Eames has remarked, that the entire effect of any of theſe preſſures is not barely a certain number of degrees of velocity, in any ſingle particle, but certain degrees of velocity in a certain number of particles, which number of particles, in a given time, is, confeſſedly, as the degrees of velocity. Beſides, it is acknowleged, that the quantities of the fluid, preſſed out in equal times, are as the velocities. See s'Graveſ. Epit. Elem. Phyſ. Math. part ii. cap. 4. p. 665.

If this be true, the *forces* cannot be as the quantities of matter multiplied by the ſquares of the velocities; for then the effects would be more than in proportion to their cauſes. E. gr. the effect of a preſſure of a column of water, nine inches high, inſtead of being nine times greater than that of one inch above the orifice, would be no leſs than twenty-ſeven times greater; for the velocity being at this height triple, the quantity of matter, in a given time, will be alſo triple; which multiplied by the ſquare of the velocity gives 27 for the *force* communicated by a preſſure of 9 inches in altitude, while the *force* communicated by the preſſure of 1 inch, is but as 1; ſo that the moving *forces* produced will be as 27 to 1, while the cauſes producing theſe *forces* are but as 9 to 1, i. e. three times too little for ſuch a purpoſe. In reality, the common rule of eſtimating the *forces* of moving bodies by the quantities of matter multiplied by their velocities, is confirmed by theſe experiments; for, effects being proportional to their cauſes, the *forces* communicated will be as the *forces* communicating, or preſſures. Thus, let the altitude, and conſequent preſſure of any column of water, be nine times greater than the altitude of another; then the velocity of every ſingle particle of water preſſed out will be triple, and the number of particles iſſuing out in a given time will likewiſe be triple; therefore, the *force* reſulting from theſe 2, multiplied together, according to the common rule, will be 9, proportional to the preſſure, as it ought to be, &c. And univerſally, the *forces* communicated, according to the old rule, are in a ratio compounded of two others, viz. the quantities of matter and the velocities; the ratio of the velocities, by the experiments, is the ſubduplicate ratio of the heights, and the ratio of the quantities of matter is, confeſſedly, likewiſe the ſubduplicate of the heights; therefore, the compound of theſe two is the ratio integra, or ſimple ratio of the heights; in which ratio are the preſſures themſelves, which produce theſe moving *forces*; ſo that, according to the common rule, the effects are always proportional to their cauſes. After this manner profeſſor s'Graveſande reaſons in parag. 355 of his Phyſ. El. Math. ed. 1.

Many of the experiments and reaſonings, that have been urged on both ſides in this controverſy, have been founded in the different ſenſes applied to the term *force*. The Engliſh and French philoſophers mean by the word *force* the ſame thing as they do by momentum, motion, quantity of motion, or inſtantaneous preſſure, which is meaſured by the maſs multiplied into the velocity, and may be known by its effect; and when they conſider bodies as moving through a certain ſpace, they allow for the time in which that ſpace is deſcribed; whereas the Dutch, Italian, and German philoſophers, who have eſpouſed the new opinion, mean by the word *force*, or *force* inherent in a body in motion, that which it is able to produce; or, in other words, the *force* is always meaſured by the whole effect produced by the body in motion, until its whole *force* be entirely communicated or deſtroyed, without any regard to the time employed in producing this total effect. Thus, ſay they, if a point runs through a determinate ſpace, and preſſes with a certain given *force* or intenſity of preſſure, it will perform the ſame action whether it move faſt or ſlow, and therefore the time of the action in this caſe ought not to be regarded. s'Graveſande, lib. cit. § 723–728.

Leibnitz himſelf aſſumed it as certain, that the action is as the effect by the velocity with which it is produced; and hence he deduces, that the power is as the maſs by the ſquare of the velocity: his words, as quoted by Wolfius, are, *Calculum virium purarum ſeu actionum talem inſtituo. Sit ſpatium s, tempus t, velocitas v, corpus c, effectus e, potentia p, actio a, in motu æquabili erit tv ut s, e ut cs, tp ut a. Atque hæc quidem ſine demonſtratione aſſumi poſſunt. Accedit quod demonſtrandum, ev ut a. Huic porro plurima theoremata demonſtrari poſſunt, e. gr. p ut cv². Nam tp ut ev: ſed e ut cs & s ut tv. Ergo fit tp ut ctv², ſeu p ut cv².* Vide Act. Petrop. tom. i. p. 232.

Mr. Euler obſerves, with reſpect to this diſpute concerning the meaſure of vivid *force*, that we cannot abſolutely aſcribe any *force* to a body in motion, whether we ſuppoſe this *force* proportional to the velocity, or to the ſquare of the velocity: for the *force* exerted by a body, ſtriking another at reſt, is different from that which it exerts in ſtriking the ſame body in motion; ſo that this *force* cannot be aſcribed to any body conſidered in itſelf, but only relatively to the other bodies it meets with. There is no *force* in a body, abſolutely conſidered, but its inertia, which is always the ſame, whether the body be at reſt or in motion. But if this body be forced by others to change its ſtate, its inertia then exerts itſelf as a *force*, properly ſo called, which is not abſolutely determinable; becauſe it depends on the changes that happen in the ſtate of the body. Suppoſe, for inſtance, a body A forced to move in an incurvated tube, or along the curve ſurface E *a* F (*Tab. Mechanics, fig.* 43.) the body in this caſe will preſs the ſurface wherever it touches it in a direction *a α* normal to the curve; and with a certain *force* commonly determined in mechanics, by the maſs of the body, its velocity, and by the radius of curvature O *a*. Now the body exerts a preſſure, or *vis mortua*; yet it would be abſurd to aſcribe a certain and determinate *force* of preſſure to this body conſidered in itſelf, ſince this preſſure may vary very much, according to the difference of the curvature of E *a* F. In like manner it ſeems unreaſonable to place a certain abſolute *force* of percuſſion in bodies, ſince it principally depends on the external circumſtances accompanying the ſhock.

A ſecond obſervation which has been made by ſeveral great men, is, that the effect of a ſhock of two or more bodies is not produced in an inſtant, but requires a certain interval of time. If this be ſo, the heterogeneity between the *vires vivæ* and *mortuæ* vaniſhes; ſince a preſſure may always be aſſigned, which in the ſame time, however little, ſhall produce the ſame effect. If then the *vires vivæ* be homogeneous to the *vires mortuæ*, and ſince we have a perfect meaſure and knowlege of the latter, we need require no other meaſure of the former than that which is derived from the *vires mortuæ* equivalent to them.

Now that the change of the ſtate in the ſhock of two bodies does not happen in an inſtant, appears evidently from the experiments made on ſoft bodies: in theſe, percuſſion forms a ſmall cavity, viſible after the ſhock, if the bodies have no elaſticity. Such a cavity cannot certainly be made in an inſtant. And if the ſhock of ſoft bodies require a determinate time, we muſt certainly ſay as much of the hardeſt, though this time may be ſo ſmall as to be beyond all our ideas. Neither can any inſtantaneous ſhock agree with that conſtant law of nature, by virtue of which nothing is performed *per ſaltum*. But it is needleſs to inſiſt farther on this, ſince the duration of any ſhock may be determined from the moſt certain principles.

There can be no ſhock or colliſion of bodies, without their making mutual impreſſions on each other: theſe impreſſions will be greater or leſs, according as the bodies are more or leſs ſoft, other circumſtances being the ſame. In bodies called hard, the impreſſions are ſmall; but a perfect hardneſs, which admits of no impreſſion, ſeems inconſiſtent with the laws of nature; ſo that while the colliſion laſts, the action of bodies is the reſult of their mutually preſſing each other. This preſſure changes their ſtate; and the *forces* exerted in percuſſion are really preſſures, and truly *vires mortuæ*, if we will uſe this expreſſion, which is no longer proper, ſince the pretended infinite difference between the *vires vivæ* and *mortuæ* ceaſes. See HARD *bodies*.

The *force* of percuſſion, reſulting from the preſſures bodies exert on each other while the colliſion laſts, may be perfectly known, if theſe preſſures be determined for every inſtant of the ſhock.

The mutual action of the bodies begins the firſt moment of their contact, and is then leaſt; after which this action increaſes, and becomes greateſt when the reciprocal impreſſions are ſtrongeſt. If the bodies have no elaſticity, and the impreſſions they have received remain, the *forces* will then ceaſe. But if the bodies be elaſtic, and the parts compreſſed reſtore themſelves to their former ſtate, then will the bodies continue to preſs each other till they ſeparate. To comprehend therefore perfectly the *force* of percuſſion, it is requiſite to define, firſt, the time the ſhock laſts, and then to aſſign the preſſure correſpond-

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responding to each instant of this time; and as the effect of pressures in changing the state of any body may be known, we may thence come at the true cause of the change of motion arising from collision. The *force* of percussion, therefore, is no more than the operation of a variable pressure during a given time; and to measure this *force* we must have regard to the time, and to the variations according to which the pressure increases and decreases.

Mr. Euler has given us some calculations with respect to these particulars. It will be sufficient here only to illustrate their tendency by the instance he brings. Suppose two bodies A and B; that the hardness of these bodies is equal; and such, that being pressed together with the *force* of 100 lb. the impression made on each is of the depth of $\frac{1}{1000}$ part of a foot. Suppose, farther, B to be at rest, and fixed, and that A strikes it with the velocity of 100 feet in a second; according to Mr. Euler, the greatest *force* of compression will be equivalent to 4000 lb. and this *force* will produce in each of these bodies an impression equal to $\frac{2}{3}$ of a foot; and the duration of the collision, that is, till the bodies arrive at their greatest compression, will be about $\frac{1}{800}$ of a second. Mr. Euler, in his calculations, supposes the hardness of a body to be proportional to the *force* or pressure requisite to make a given impression on it; so that the *force* by which a given impression is made on a body, is in a compound ratio of the hardness of the body and of the quantity of the impression. But he observes, that regard must be had to the magnitude of the bodies, as the same impression cannot be made on the least bodies as on the greatest, from the defect of space through which their component particles must be driven: he, therefore, only considers the least impressions, and that the bodies are of such magnitudes, that with respect to them the impressions may be looked upon as nothing. What he supposes about the hardness of bodies, neither implies elasticity nor its defect, elasticity only producing a restitution of figure and impression when the pressing *force* ceases; but this restitution needs not be here considered. It is likewise supposed, that the bodies striking each other have plane and equal bases, by which they touch each other in the collision; so that the impression hereby made diminishes the length of each body. It is farther to be observed, that in Mr. Euler's calculations, bodies are supposed so constituted, that they may not only receive impressions from the *forces* pressing them, but that a greater *force* is requisite to make a greater impression. This excludes all bodies fluid or solid, in which the same *force* may penetrate farther and farther, providing it have time, without ever being *in equilibrio* with the resistance. Thus a body may continually penetrate farther into soft wax, although the *force* impelling it be not increased. In these, and the like cases, nothing is required but to surmount the first obstacles; which being once done, and the connexion of parts broken, the penetrating body always advances, meeting with the same obstacles as before, and destroying them by an equal *force*. But Mr. Euler only considers the first obstacles which exist before any separation of parts, and which are, no doubt, such, that a greater impression requires a greater *force*. This, indeed, principally takes place in elastic bodies; but it seems likewise to obtain in all bodies when the impressions made on them are small, and the contexture of their parts is not altered.

These things being premised, let the mass or weight of the body A be expressed in general by A, and let its velocity before the shock be that which it might acquire by falling from the height a. Farther, let the hardness of A be expressed by M, and that of B by N, and let the amplitude of the base, by which the impression is made, be cc; then will the greatest compression be made with a *force* $\sqrt{\frac{MNcc}{M+N}} \times Aa$. Therefore if the hardness of the two bodies, and the plane of their contact during the whole time of their collision be the same, this *force* will be $\sqrt{Aa}$, that is, as the square root of the *vis viva* of the striking body A. And as $\sqrt{a}$ is proportional to the velocity of the body A, the *force* of percussion will be in a compound ratio of the velocity and of the subduplicate ratio of the mass of the body striking; so that in this case neither the Leibnitian nor the Cartesian proportions take place. But this *force* of percussion depends chiefly on the hardness of the bodies; the greater this is, the greater will the *force* of percussion be. If M=N, this *force* will be as $\sqrt{Mcc \times Aa}$, that is, in a compound subduplicate ratio of the *vis viva* of the body striking, of the hardness, and of the plane of contact. But if M, the hardness of one of the bodies, be infinite, the *force* of percussion will be as $\sqrt{Ncc \times Aa}$; at the same time, if M=N, this *force* will be as $\sqrt{\frac{1}{2}Ncc \times Aa}$. Therefore all other things being equal, the *force* of percussion, if the striking body be infinitely hard, will be to the *force* of percussion, if both the bodies be equally hard as $\sqrt{2}$ to 1. Mr. Euler farther deduces from his calculation, that the impression received by the body A will be as $\sqrt{\frac{N \times Aa}{M+N \times Mcc}}$; and the impression on B will be as $\sqrt{\frac{M \times Aa}{M+N \times Ncc}}$. If, therefore, the hardness of A, that is M, be infinite, it will suffer no impression, whereas that on B will extend to the depth of $\sqrt{\frac{Aa}{Ncc}}$. But if the hardness of the two bodies be the same, or M=N, they will each receive equal impressions of the depth $\sqrt{\frac{Aa}{2Ncc}}$. So that the impression received by the body B, in this case, will be to the impression it receives in the former as 1 to $\sqrt{2}$.

Mr. Euler has likewise considered and computed the case when the striking body has its anterior surface convex, with which it strikes an immoveable body whose surface is plane. He has also examined the case when both bodies are supposed immoveable; and from his formulæ he deduces the known laws of the collision of non-elastic and elastic bodies. He has also determined the greatest pressures the bodies receive in these cases; and likewise the impressions made on them. In particular he shews, that the impression received by the body struck, or B, if moveable, is to the impression received by the same body when immoveable as $\sqrt{B}$ to $\sqrt{A+B}$.

This doctrine of Mr. Euler may serve to shew, that the dispute about the measure of *forces* is very needless in physics; since the laws of motion may, independently of any hypothesis about the measure of the *vis viva*, be deduced from the most uncontested principles of pressure and time. But we doubt whether we shall be enabled hereby to settle the metaphysical part of this dispute to the satisfaction of both parties, each of which may assent to all that Mr. Euler says, and yet adhere either to the Cartesians or Leibnitians. But whatever may be said of the metaphysical part of the dispute, it is certain, from experience,

That the number of equal springs requisite to produce any velocity in a given body, is always proportional to the square of the velocity to be produced. Thus if one spring can, by unbending half, produce one degree of velocity in a body, it will require four equal springs to produce two degrees of velocity in that body; nine springs to produce three degrees of velocity, &c. See SPRING. Also, if a portion of a yielding substance, as clay, tallow, &c. be just sufficient to stop the motion of a body moving with a certain degree of velocity, it will require four times the quantity of the same resisting substance to stop it, if the velocity of the moving body be double, &c. The same holds in the resistance of wood against musquet-balls, as Mr. Robins observes in his New Principles of Gunnery; so that a ball moving with twice the velocity of another, will penetrate four times as deep into earth, clay, tallow, wood, &c. And in like manner if the action of one man, one horse, or other animal, can give a certain degree of velocity to a given mass, it will require the action of four equal men, horses, &c. to give the same mass two degrees of velocity; nine men, horses, &c. to give it three degrees of velocity; and so on.

These practical points have been put out of all question by the experiments of Poleni, s'Gravesande, Desaguliers, and others, and are of great use, although they do not decide the controversy about the measure of the *force* of bodies in motion.

FORCE, *accelerating*. See VIS *acceleratrix*, and ACCELERATION.
FORCE, *attractive*. See ATTRACTION.
FORCE, *central*. See CENTRAL.
FORCE, *centrifugal*. See CENTRIFUGAL.
FORCE, *centripetal*. See CENTRIPETAL.
FORCE *of cohesion*. See COHESION.
FORCE, *contractile*. See CONTRACTILE.
FORCE, *elastic*. See ELASTIC, and ELASTICITY.
FORCE, *electrical*. See ELECTRICITY.
FORCE *of gravity*. See GRAVITY.
FORCE *of the heart*. See HEART.
FORCE *of inactivity*. See VIS *inertiæ*.
FORCE, *innate*. See VIS *insita*.
FORCE, *magnetic*. See MAGNETISM.
FORCE, *moving*. See VIS *motrix*, and preceding article, FORCE.
FORCE, *repelling*. See REPULSION.
FORCE, *resisting*. See RESISTANCE.
FORCE, *retarding*. See RETARDATION.
FORCE *of wind*. See WIND, &c.

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FORCE, in *Common Law*, ſignifies an offence, by which violence is uſed either to perſons, or things.

Force is either *ſimple*, or *compound*.

FORCE, *mixed*, or *compound*, is violence committed with ſome fact, which of itſelf alone were criminal: as if any man by *force* enter into another man's poſſeſſion, and there kill a man, or raviſh a woman, &c.

FORCE, *ſimple*, is that which has no other crime adjoined to it: if one, by *force*, enter into another man's poſſeſſion, without doing any other unlawful act.

FORCE is alſo divided into *true force*, or *force after a ſort*.

There are other branches; as FORCIBLE entries, *forcible* detaining, or holding unlawful aſſembly, routs, riots, rebellions, &c.

FORCE, *freſh*. See FRESH.

FORCE, in *Grammar*, and ſome other arts, is applied to a thing which ſtands in lieu of, or has the ſame effect, as another. In our language, the *ſ* between two vowels has the *force* or power of a *z*, and is ſometimes put for a *z*: as in horiſon, baptiſing, &c.

In Hebrew, the dageſh; and in Arabic, the teſdid; have the *force* of a letter ſuppreſſed. An unit before a cypher, has the *force* of ten.

FORCE, in *practical Mechanics*. We have ſeveral curious as well as uſeful obſervations in Deſagulier's Experimental Philoſophy, concerning the comparative *forces* of men and horſes, and the beſt way of applying them. A horſe draws with the greateſt advantage when the line of direction is level with his breaſt; in ſuch a ſituation, he is able to draw 200 ℔. eight hours a day, walking about two miles and an half an hour. And if the ſame horſe is made to draw 240 ℔. he can work but ſix hours a day, and cannot go quite ſo faſt. On a carriage, indeed, where friction alone is to be overcome, a middling horſe will draw 1000 ℔. But the beſt way to try a horſe's *force*, is by making him draw up out of a well, over a ſingle pully or roller; and in ſuch a caſe, one horſe with another will draw 200 ℔. as already obſerved.

Five men are found to be equal in ſtrength to one horſe, and can, with as much eaſe, puſh round the horizontal beam of a mill, in a walk forty feet wide; whereas three men will do it in a walk only nineteen feet wide.

The worſt way of applying the *force* of a horſe, is to make him carry or draw up hill: for, if the hill be ſteep, three men will do more than a horſe, each man climbing up faſter with a burden of 100 ℔. weight, than a horſe that is loaded with 300 ℔. a difference which is owing to the poſition of the parts of the human body being better adapted to climb than thoſe of a horſe.

On the other hand, the beſt way of applying the *force* of a horſe, is an horizontal direction, wherein a man can exert leaſt *force*: thus a man, weighing 140 ℔: and drawing a boat along, by means of a rope coming over his ſhoulders, cannot draw above 27 ℔. or exert above one ſeventh part of the *force* of a horſe employed to the ſame purpoſe.

The very beſt and moſt effectual poſture in a man, is that of rowing; wherein he not only acts with more muſcles at once for overcoming the reſiſtance, than in any other poſition; but as he pulls backwards, the weight of his body aſſiſts by way of lever. Deſaguliers, Exp. Phil. vol. i. p. 241. where we have ſeveral other obſervations relative to *force* acquired by certain poſitions of the body, from which that author accounts for moſt feats of ſtrength and activity. See alſo a Memoire on this ſubject by M. de la Hire, in Mem. Roy. Acad. Sc. 1629; or in Deſaguliers, Exp. &c. p. 267, &c. who has publiſhed a tranſlation of part of it with remarks.

FORCEPS, a ſurgeon's inſtrument, wherewith dead and corrupt parts are ſeized, cut, or pulled off, &c. As alſo foreign bodies extracted out of wounds, &c.

The word literally denotes a pair of tongs.

They are of divers forms; long, crooked, with teeth, with beaks, half-mooned, &c. See *Tab. Surgery*, *fig.* 14. *Tab.* III. *fig.* 31.

Mr. Monro deſcribes and gives a figure of a *forceps*, the mouth of which has on each ſide two ſmall ſharp teeth, which apply cloſe to one another when it is ſhut. This *forceps*, when ſhut, may be ſafely introduced into a gun-ſhot wound, and the blades being immediately opened behind the bullet, the teeth will pierce into the lead, and hold it faſt enough to bring it out, though they are not advanced ſo far as the largeſt part of it. Med. Eſſ. Edinb. vol. v. art. 41.

Dr. Le Cat has contrived a new *forceps* for the extirpation of tumours, the extraction of ſtones, &c. for an account of which, ſee Phil. Tranſ. N° 491. or vol. xlvi. p. 80, &c.

The *forceps* is alſo uſed for extracting the fœtus in caſes of preternatural delivery. The inſtrument uſed for this purpoſe is either ſtrait or curved. The ſtrait *forceps* is uſed for bringing the head of the child forward, when on account of its ſize, or the want of pains, it cannot otherwiſe be protruded; but the uſe of them requires great care: and it is obſerved, that inſtruments of this kind are never neceſſary, whilſt the head is above the brim of the pelvis, and rarely when it hath deſcended lower. Dr. Hunter abſolutely forbids the uſe of them, if they can poſſibly be avoided. Thoſe improved by Smellie are the beſt, who has reduced their length, in order to prevent their being uſed before the head is low enough. The long curved *forceps* was invented by Smellie, with a view to ſaving the life of the child, when the body being delivered, the head could not be brought away in the uſual manner. Theſe are longer than the ſtrait ones, becauſe they are applied, when the head of the child is above the brim of the pelvis. The ſtrait and curved *forceps*, as well as the blunt hook, are uſed to expedite and facilitate delivery; whereas the crotchet, which has a hook at its point that is forced into the part to which it is applied, wounds, and generally kills the child.

FORCER, in *Mechanics*, is properly a PISTON, without a valve.

There are ſeveral ways of making *forcers*: the moſt common of all conſiſts of a braſs cylinder, a very little leſs in diameter, at its bottom and top, than the bore of the barrel of the pump, and turned ſtill leſs at the middle, in order to let in a leathern ring or collar (made of a thick leather put round the braſs cylinder), which makes it juſt equal to the bore of the barrel, ſo as to fit it quite when it is put into it.

The ſecond ſort of *forcers* conſiſts of three braſs cylinders, which can be ſcrewed together. The middle one ought to be almoſt equal in diameter to the bore of the pipe, ſo as to ſlide in it without any friction. The upper cylinder and the lower muſt be a little leſs, and equal to one another. There are two leathers which muſt be put between them when they are unſcrewed: then it is evident, that if the cylinders be ſcrewed together, and the leathers, which ought to be a little bigger than the braſs cylinders, apply themſelves folding upwards round the upper cylinder, and downwards round the lower, they will become juſt equal to the bore of the barrel; and conſequently they will hinder any air from getting through the ſides of the *forcer*, when it moves up and down in the barrel. The uſe of the middle braſs cylinder is to hinder the leathers from turning themſelves back by the motion.

This kind of *forcer* has, above the other, the advantage of having a great deal leſs friction; and beſides, as the leathers, which are applied to it, may be thin ones, they are much ſmoother than thick ones, which are uſed in the other.

But the beſt way of making *forcers*, is to have a plunger, or ſolid braſs cylinder, equal in length to the barrel of the pump, and a little leſs in the diameter than the bore; ſo that it may move freely in it without any friction. There muſt be two hollow, ſhort, braſs cylinders, or rather rings, at the top of the barrel, which can be ſcrewed together; the upper one muſt be equal in bore to the barrel, and the lower a little leſs: there are two leathers, both having in the middle a leſs hole than in the bore of the pipe; the one muſt be applied between the barrel and the lower ring, and the other between the ſame ring and the upper one; and the whole muſt be ſcrewed together. Then if the ſolid cylinder or *forcer* be put into it, and moved up and down, it is evident that the two before mentioned leathers, which are applied the one to the barrel and the other to the inſide of the hollow cylinder, will hinder any air from getting between them and the ſolid cylinder.

The advantage of this kind of *forcer* is, that it has no other friction but at the top of the barrel, and that the inſide of the barrel need not be ſmooth, as in other kinds of pumps; but only the outſide of the *forcer* muſt be turned true and poliſhed, which can be done with much more eaſe, and the lower part muſt be turned a little conical, that it may be brought into the barrel, without any reſiſtance of the upper leather of the collar or jack-head. See Deſaguliers, Courſe of Experim. Philoſ. vol. ii. p. 161, 162.

FORCIBLE *Entry*, a violent, actual entry into houſes, or lands, &c. with menaces or weapons, whether violence or hurt be offered to any perſon therein, or not.

FORCIBLE *holding*, or *detaining*, a with-holding by violence, and with a ſtrong hand, of the poſſeſſion of land, &c. whereby he who has a lawful right of entry is barred or hindered. See ENTRY.

This was formerly allowable to every perſon diſſeiſed, or turned out of poſſeſſion, unleſs his entry was taken away or barred by his own neglect, or other circumſtances. But this being found very prejudicial to the public peace, it was thought neceſſary, by ſeveral ſtatutes, to reſtrain

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all perſons from the uſe of ſuch violent methods even of doing themſelves juſtice: ſo that the entry now allowed by law is a peaceable one. By the ſeveral ſtatutes of 15 Ric. II. cap. 2. 8 Hen. VI. cap. 9. 31 Eliz. cap. 11. and 21 Jac. I. cap. 15. upon any *forcible* entry, or *forcible* detainer after peaceable entry into any lands or benefices of the church, one or more juſtices of the peace, taking ſufficient power of the county, may go to the place, and there record the force upon his own view, as in caſe of riots; and upon ſuch conviction, may commit the offender to gaol, till he makes fine and ranſom to the king. And the juſtice or juſtices have power to ſummon a jury, to try the *forcible* entry or detainer complained of; and if the ſame be found by that jury, then, beſides the fine on the offender, the juſtices ſhall make reſtitution by the ſheriff of the poſſeſſion, without inquiring into the merits of the title; for the force is the only thing to be tried, puniſhed, and remedied by them; and the ſame may be done by indictment at the general ſeſſions. But this proviſion does not extend to ſuch as endeavour to maintain poſſeſſion by force, where they or their anceſtors have been in the peaceable enjoyment of the lands and tenements for three years immediately preceding.

FORCIBLE *abduction* and *marriage*, vulgarly called ſtealing an heireſs. By ſtat. 3 Hen. VII. cap. 2. it is enacted, that if any perſon ſhall, for lucre, take any woman, maid, widow, or wife, having ſubſtance either in goods or lands, or being heir apparent to her anceſtors, contrary to her will, and afterwards ſhe be married to ſuch miſdoer, or by his conſent to others, or defiled; ſuch perſon, and all his acceſſaries, ſhall be deemed principal felons: and by ſtat. 39 Eliz. cap. 9. the benefit of clergy is taken away from all ſuch felons, except acceſſaries after the offence. See MARRIAGE.

FORCING, in the *Wine-trade*, a term uſed by the wine-coopers for the FINING down wines, and rendering them fit for immediate draught.

The principal inconvenience of the common way of FINING down the white-wines by iſinglaſs, and the red by whites of eggs, is the ſlowneſs of the operation; theſe ingredients not performing their office in leſs than a week, or ſometimes a fortnight, according as the weather proves favourable, cloudy, or clear, windy or calm: this appears to be matter of conſtant obſervation. But the wine-merchant frequently requires a method that ſhall, with certainty, make the wines fit for taſting in a few hours. A method of this kind there is, but it is kept in a few hands a valuable ſecret. Perhaps it depends upon a prudent uſe of a tartarized ſpirit of wine, and the common *forcing*, as occaſion is, along with gypſum, as the principal; all which are to be well ſtirred about in wine, for half an hour before it is ſuffered to reſt. Shaw's Lectures, p. 208.

FORCING, among *Gardeners*, is uſed for producing ripe fruits from trees before their natural ſeaſon. The method of doing it is this: a wall ſhould be erected ten foot high; a border muſt be marked out on the ſouth ſide of it, of about four foot wide, and ſome ſtakes muſt be faſtened into the ground all along the edge of the border; theſe ſhould be four inches thick. They are intended to reſt the glaſs-lights upon, which are to ſlope backwards to the wall, to ſhelter the fruit as there ſhall be occaſion; and there muſt be at each end a door to open either way, according as the wind blows. The frame ſhould be made moveable along the wall, that when a tree has been *forced* one year, the frame may be removed to another, and ſo on, that the trees may be each of them *forced* only once in three years, at which rate they will laſt a long time. They muſt be always well-grown trees that are choſen for *forcing*, for young ones are ſoon deſtroyed, and the fruit that is produced from them is never ſo well taſted. The fruits moſt proper for this management are the avant, or ſmall white nutmeg, the albermarle, the early Newington, and the brown nutmeg peaches; Mr. Fairchild's early, and the elrugo and Newington nectarins; the maſculine apricot, and the May-duke and May-cherry. For grapes, the white and black ſweet-water are the propereſt; and of gooſeberries, the Dutch white, the Dutch early green, and the walnut gooſeberry; and the large Dutch white, and large Dutch red currants.

The dung, before it is put to the wall, ſhould be laid together on a heap for five or ſix days, that it may heat uniformly through; and when thus prepared, it muſt be laid four foot thick at the baſe of the wall, and go ſloping up, till it is two foot thick at the top. It muſt be laid at leaſt within three or four inches of the top of the wall, and when it ſinks, as it will ſink two or three feet, freſh dung muſt be laid; for the firſt heat will do little more than juſt ſwell the bloſſom-buds. The covering of the trees with glaſſes is of great ſervice, but they ſhould be taken off to admit the benefit of gentle ſhowers to the trees, and the doors at the ends ſhould be either left entirely open, or one or both of them opened, and a mat hung before them, at once to let the air circulate and to keep out the froſts.

The dung is never to be applied till toward the end of November, and three changes of it will be ſufficient to ripen the cherries, which will be very fine in February. As to the apricots, grapes, nectarines, peaches, and plums, if the weather be milder, the glaſſes are to be opened to let in ſunſhine or gentle ſhowers.

If a row or two of ſcarlet ſtrawberries be planted at the back of the frame, they will ripen in February, or the beginning of March; the vines will bloſſom in April, and the grapes will be ripe in June.

It ſhould be carefully obſerved not to place early and late ripening fruits together, becauſe the heat neceſſary to force the late ones will be of great injury to the early ones, after they have fruited.

The maſculine apricot will be ripe in the beginning of April, the early nectarines will be ripe about the ſame time, and the forward ſort of plums by the latter end of that month. Gooſeberries will have fruits fit for tarts in January or February, and will ripen in March, and currants will have ripe fruit in April.

The trees need not be planted ſo diſtant at theſe walls as at others, for they do not ſhoot ſo freely as in the open air: if they are nine feet aſunder it is ſufficient. They ſhould be pruned about three weeks before the heat is applied. See HOT-*Bed*.

FORCING *pump*. See PUMP.

FORDICIDIA, in *Antiquity*, a religious feaſt among the Romans, held on the fifteenth of April: thus called from the Latin *forda*, *a cow big with calf*; and *cædo*, *I ſlay*, or *ſacrifice*; becauſe ſuch cows were herein ſacrificed to the goddeſs Tellus, or the earth.

Forda, *a cow with calf*, is formed, according to Ovid, from *fero*, *I bear*; or rather, as Scaliger and Salmaſius imagine, from the Greek φορας, φορα, the ſame.

Varro writes, that there were ſeveral of theſe cows ſacrificed in the Curiæ. And Livy and Halicarnaſſeus relate, that there was one in each Curia; ſo that there were thirty in all; which is confirmed by Ovid. Faſtor. lib iv. ver. 631.

The *fordicidia* were firſt inſtituted by Numa, on occaſion of a general barrenneſs among the cattle. Ovid gives a particular deſcription of the ceremony, in the paſſage above quoted: he adds, that part of theſe cows were ſacrificed in the temple of Jupiter; that is, in the Capitol.

FORE, applied to a ſhip, denotes all that part of a ſhip's frame and machinery which lies near the ſtem.

FORE *and aft* is uſed for the whole ſhip's length, or from end to end.

FORE *bowline* is the BOWLINE of the *fore*-ſail.

FORE-*caſtle of a ſhip*, is a ſhort deck placed in the *fore* part of the ſhip, above the upper deck. See *Tab. Ship*, *fig.* 2, *let.* BC, N° 23.

It is uſually terminated, both before and behind, by a breaſt-work in veſſels of war; the foremoſt end forming the top of the BEAK-*head*, and the hind-part reaching to the after-part of the fore-chains.

FORE-*cat-harpings* are thoſe that are uſed to brace in the upper part of the *fore*-ſhrouds. See CAT-*harpings*.

FORECLOSED, in our *ancient Law-books*, ſignifies barred, ſhut out, or excluded for ever: as, when the equity of redemption on MORTGAGES is barred.

FOREFANG, or FOREFENG, in *our old Writers*, is the taking of proviſion from any one in fairs or markets, before the king's purveyors are ſerved with neceſſaries for him.

The word is Saxon, compounded of *fore*, *ante*, and *fangen*, *prendere*.

FORE-*foot of a ſhip*, is a piece of timber that terminates the keel at the *fore* end. It is connected by a ſcarf to the extremity of the keel, of which it makes a part; and the other end of it, which is bent upwards into a kind of knee or crotch, is faſtened to the lower end of the ſtem, of which it makes a part, being alſo called the *gripe*.

FOREFOOT, in the *Sea-language*, is when one veſſel ſails, or lies acroſs another's way.

As if two ſhips being under ſail, and in ken of one another, one of them lies in a courſe, with her ſtern ſo much weather of the other, that if both hold on, the windward ſhip will run a-head of the other: ſuch ſhip is ſaid to lie with the other's *forefoot*.

Though, as ſoon as ſhe has paſſed, they ſay, ſhe is gone out a-head.

FOREGAVEL, *forgabulum*, in *our old Writers*, is uſed for a ſmall reſerved rent in money, or quit-rent.

FOREGOERS, in *our old Writers*. The king's ſurveyors were thus called from their *going before*, to provide for his houſhold. 36 Edw. III. 5.

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FOREHEAD. *Wounds of the* FOREHEAD. After a wound in this part is cleanſed from grumous blood and extraneous bodies, if any were left there, it ſhould be dreſſed with balſam of Peru, or ſome other vulnerary balſam; the lips of the wound are then to be kept together by long ſlips of ſticking plaſter, and over this a vulnerary plaſter is to be laid. Where the wound is large, theſe plaſters will not be ſufficient to bring on an even cicatrix; therefore, to forward this end, the wound ſhould be ſprinkled with a compound powder of comfrey-root and gum tragacanth and arabic, and with gum ſarcocolla in powder; and then the plaſters, compreſſes, and proper bandages, are to be applied. The bloody ſuture is never to be uſed in any wound of the face if it can be avoided, becauſe the ſtitches increaſe the number of the ſcars. If a wound of the *forehead* is made in a ſtraight line, the uniting bandage will be of great ſervice in forming a fine cicatrix: but if the *forehead* is wounded tranſverſely, and the fibres of the frontal muſcle are divided, it occaſions a great deformity; for the power of lifting up the eye-brows, and of contracting the ſkin of the *forehead*, ceaſes. In this caſe, after cleaning the wound, it is beſt to unite it with a ſtitch or two, dreſſing it with a vulnerary balſam, and laying on ſticking plaſters, ſecuring all with a proper bandage, and enjoining the patient to keep himſelf ſtill. In young and healthy perſons, the fibres of the muſcles join and unite when this method is uſed, without coming to a ſuppuration. Heiſter's Surg. p. 78.

FORE-*hooks of a ſhip*. See BREAST-*hooks*.

FORE-*jeers*. See JEERS.

FORE-*jeer-bits*, in a *Ship*. See BITS.

FOREIGN, ſomething extraneous, or that comes from abroad.

The word is formed from the Latin *fores*, *doors*; or *foris*, *out of doors*; or *forum*, *market*, &c.

Foreign miniſter, *foreign* prince, *foreign* goods, &c. are thoſe belonging to other nations. See MINISTER, &c.

Foreign to the purpoſe, ſignifies a thing remote or impertinent.

Matter is *foreign* to the idea of ſpace, i. e. it is not inherent therein, but adventitious thereto.

Foreign plants are particularly called EXOTICS. *Foreign foſſils*; ſee FOSSIL. *Foreign motion*; ſee MOTION. *Foreign canons*; ſee CANON.

In ſome univerſities they give the appellation *foreign doctors*, *doctores forenſes*, to ſuch as do not reſide in the place, or the univerſity; but take degrees to go and live elſewhere, and in other countries.

In the Life of St. Paul, biſhop of Verdun, written by an anonymous author, and publiſhed from a MS. about four hundred years old, by Bollandus, we meet with *forenſis preſbyter*, for a prieſt who lives in another part. The ſame Bollandus notes, that St. Ambroſe uſes the word *forenſis* for exterior.

FOREIGN, or FORAINE *Traitte*, is a duty belonging to the king of France, of one-twentieth of the value of all goods imported, or exported out of the kingdom.

FOREIGN, is uſed in *Law*, in ſeveral ſenſes, and joined with divers ſubſtantives. Thus,

FOREIGN *anſwer*, is ſuch an anſwer as is not triable in the country where it is made.

FOREIGN *attachment*. See ATTACHMENT.

FOREIGN *bill of exchange*. See BILL.

FOREIGN *matter*, in *Law*, is matter triable in another county; or matter done in another county.

FOREIGN *oppoſer*, or *appoſer*, is an officer in the exchequer, to whom all ſheriffs or bailiffs do repair to be appoſed by him of their green wax, after they are appoſed of their ſums out of the pipe-office; and who from thence draws down a charge upon one of them to the clerk of the pipe.

His buſineſs is to examine the ſheriff's eſtreats with the record, to aſk the ſheriff what he ſays to every particular ſum therein.

FOREIGN *plea*, is a refuſal of the judge as incompetent, becauſe the matter in hand was not within his precinct.

FOREIGN *ſeamen*, ſerving two years on board Britiſh ſhips, whether of war, trade, or privateers, during the time of war, ſhall be deemed natural born ſubjects. But the perſons ſo naturalized are not capable of being of the privy council, or members of parliament, or of taking any place of truſt, civil or military, or to have any grant from the crown of lands. Stat. 13 Geo. II. cap. 3. ſect. 2.

FOREIGN *ſervice*, is ſuch ſervice whereby a mean lord holdeth of another, without the compaſs of his own fee; or that which a tenant performeth, either to his own lord, or to the lord paramount, out of his own fee.

FOREIGN *ſervice* is alſo uſed to denote military ſervice performed to *foreign* ſtates. The ſtat. 3 Jac. I. cap. 4. makes it felony for any perſon to go out of the realm to ſerve any *foreign* prince, without having firſt taken the oath of allegiance before his departure: and it is alſo felony for any gentleman, or perſon of higher degree, who hath borne any office in the army, to go out of the realm to ſerve ſuch *foreign* prince or ſtate, without previouſly entering into a bond with two ſureties, not to be reconciled to the ſee of Rome, or enter into any conſpiracy againſt his natural ſovereign. And by ſtat. 9 Geo. II. cap. 30. enforced by 29 Geo. II. cap. 17. if any ſubject of Great Britain ſhall enliſt himſelf, or any perſon ſhall procure him to be enliſted, in any *foreign* ſervice, or detain or embark him for that purpoſe, without licence under the king's manual, he ſhall be guilty of felony without benefit of clergy; but if the perſon ſo enliſted or enticed, diſcover his ſeducer within fifteen days, ſo that he may be apprehended and convicted of the ſame, he ſhall be indemnified. By ſtat. 29 Geo. II. cap 17. to ſerve under the French king, as a military officer, is felony without benefit of clergy; and to enter into the Scotch brigade, in the Dutch ſervice, without taking the oaths of allegiance and abjuration, incurs a forfeiture of five hundred pounds.

FOREIGNERS are the natural born ſubjects of ſome foreign prince. *Foreigners* reſiding ſeven years in the Britiſh plantations, without any longer abſence than two months at one time, and taking the oaths, are to be deemed natural born ſubjects. But, excepting Quakers and Jews, all other perſons muſt receive the ſacrament in ſome proteſtant or reformed congregation in Great Britain, or the colonies; a certificate whereof muſt be produced at the time of taking the oaths. 13 Geo. II. cap. 7. ſect. 2. See NATURALIZATION.

FOREJUDGED *the court*, is when an officer of any court is baniſhed, or expelled the ſame, for ſome offence; or for not appearing to an action by bill filed againſt him: in which latter caſe, he is not to be admitted to officiate, till he appear to the bill. Anno 2 Hen. IV. cap. 8.

He ſhall loſe his office, and be *forejudged* the court, &c. *Forejudicare*, *interdum eſt male judicare*. Spel.

FOREJUDGER, in *Law*, ſignifies a judgment, whereby a man is deprived, or put by a thing in queſtion.

FORELLA, in *Ichthyology*, a name given by Figulus and others to the trout.

FORE-*knight*, in the *Sea-language*, a piece of wood, carved in figure of a man's head, and faſt bolted to the beams upon the ſecond deck.

FORELAND, or FORENESS, in *Navigation*, a point of land jutting out into the ſea.

FORELAND, in *Fortification*, is a ſmall ſpace of ground between the wall of a place, and the moat; called alſo BERME, and *liziere*.

FORELOCKS, in a *Ship*, are little flat wedges, like pieces of iron, uſed at the ends of bolts, to keep them from flying out of the holes.

FORELOIN, among *Hunters*, is when a hound going before the reſt of the cry, meets chace, and goes away with it.

FORELORN *hope*, in an *Army*, an almoſt obſolete expreſſion. See ENFANS *perdus*.

FORE-*maſt of a ſhip*, is a round large piece of timber, ſeated in her fore-part, on which is borne the fore-ſail, and fore-top-ſail yard. See *Tab. Ship*, *fig.* 1. N° 81. See MAST.

FORE-*maſt-men*, in a *Man of War*, thoſe on board that take in the top-ſails, ſling the yards, furl the ſails, browſe, triſe, and take their turn at the helm, &c.

FORENSIC *ſervice*. See SERVICE and FOREIGN.

FORENSIS *toga*. See TOGA.

FORE-*rake*, in *Sea-language*. See RAKE.

FORE-*reach*, in *Sea-language*. The ſeamen ſay one ſhip *fore-reaches* upon another, when both ſailing together, ſhe ſails better, or outgoes the other.

FORE-*ſail*, the ſail of the fore-maſt. See SAIL.

FORESCHOKE, *derelictum*, anciently ſignified as much as *forſaken* in modern language.

It is eſpecially uſed in one of our ſtatutes, for land or tenements ſeized by the lord, for want of ſervices due from the tenant; and ſo quietly held and poſſeſſed beyond the year and day.

As if we ſhould ſay, that the tenant, who ſeeing his lands or tenements taken into the lord's hand, and poſſeſſed ſo long, takes not the courſe appointed by law to recover them, does, in due preſumption of law, diſavow or forſake all the right he has to them. In which caſe, ſuch lands ſhall be called *foreſchoke*, ſays the ſtat. 10 Ed. II. cap. 1.

FORE-*ſhrouds*. See SHROUDS.

FORESKIN. See PREPUCE.

FORE-*ſtay*. See STAY.

FOREST, *ſylva*, in *Geography*, a great wood; or a large extent of ground covered with trees.

The word is formed of the Latin *foreſta*, which firſt occurs in the Capitulars of Charlemagne, and which itſelf is derived from the German *forſt*, ſignifying the ſame thing.

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thing. Spelman derives it from the Latin *foris reſtat*, by reaſon *foreſts* are out of towns. Others derive *foreſta a feris*, q. d. *foreſta, quod ſit tuta ſtatio ferarum*, as being a ſafe ſtation, or abode, for wild beaſts.

The Caledonian and Hercynian *foreſts* are famous in hiſtory. The firſt was a celebrated retreat of the ancient Picts and Scots: the latter anciently poſſeſſed the greateſt part of Europe; particularly Germany, Poland, Hungary, &c. In Cæſar's time it extended from the borders of Alſatia and Switzerland to Tranſylvania, and was computed ſixty days journey long, and nine broad: ſome parts or cantons thereof are ſtill remaining. The *foreſt* of Dean in Glouceſterſhire, is famous for the iron works therein.

The ancients adored *foreſts*, and imagined a great part of their gods to reſide therein: temples were frequently built in the thickeſt *foreſts*, the gloom and ſilence whereof naturally inſpired ſentiments of devotion, and turned men's thoughts within themſelves.

For the like reaſon, the ancient Druids made *foreſts* the place of their reſidence, and performed their ſacrifices, inſtructed their youth, and gave laws therein. See DRUIDS.

FOREST, in a *Law-ſenſe*, is defined a certain territory of woody grounds and fruitful paſtures, privileged for wild beaſts, and fowls of *foreſt*, chace, and warren, to reſt and abide in, under the protection of the king, for his recreation and delight; bounded with unremoveable marks and meres, either known by matter of record or preſcription; repleniſhed with wild beaſts of venery, or chace, and with great coverts of vert for ſuccour of the ſaid beaſts; for preſervation and continuance whereof, with the vert and veniſon, there are certain peculiar laws, privileges, and officers.

The properties and characters of a *foreſt* are, firſt, that it cannot be in the hands of any but the king; becauſe none elſe had power to conſtitute ſuch commiſſions as are neceſſary to the being of a *foreſt*, beſide the king; as, particularly, that of juſtice in eyre of the *foreſt*.

And yet the abbot of Whitby had a *foreſt* by grant of king Henry II. and king John, with all officers incident thereto.

The ſecond character, is the courts belonging thereto, which are, the *juſtice-ſeat*, and the *regard*, held every third year; the *ſwanimote*, held thrice every year; and the *attachment*, once every forty days.

The third characteriſtic is the officers belonging thereto, for preſervation of the vert and veniſon; as the juſtices of the *foreſt*, the warder or keeper, ranger, verderers, foreſters, agiſtors, regarders, bailiffs, beadles, &c. See each under its proper article, JUSTICE *of the foreſt*, KEEPER, &c.

But the moſt eſſential mark of a *foreſt* is the ſwanimote, which is no leſs incident thereto, than the court of pye-powder to a fair. If that fail, it ceaſes to be a *foreſt*, and commences a chace. See SWANIMOTE.

The way of making a *foreſt* is thus: certain commiſſioners, appointed under the great ſeal, view the ground intended, and fence it round; this being reported in chancery, the king cauſes it to be proclaimed throughout the county where the land lies, that it is a *foreſt*, and is thenceforth to be governed by the laws of the *foreſt*; and prohibits all perſons from hunting therein, without his leave.

New *Foreſt* in Hampſhire, hiſtory tells us, was made by the deſtruction of twenty-two pariſh-churches, and all the villages, manors, chapels, &c. for the ſpace of thirty miles together. Beſide New *Foreſt*, there are now ſubſiſting ſixty-eight *foreſts* in England, thirteen chaces, and eight hundred parks.

Our ancient Norman kings were the firſt who incloſed *foreſts*, and ſettled the juriſdiction thereof. In the courſe of a few reigns from the Conqueſt, no leſs than ſixty-eight *foreſts* were incloſed; the ſtricteſt laws were made to ſecure them, and the ſevereſt penalties inflicted on all treſpaſſers thereon.

William the Conqueror decreed the eyes of any perſon to be pulled out, who took either a buck or boar: William Rufus made the ſtealing of a doe a hanging matter; the taking of a hare was fined at 20*s*. and a coney at 10*s*. Eadmer adds, that fifty perſons of fortune, being apprehended by that laſt prince for killing his bucks, were forced to purge themſelves by the fire of ordeal, &c.

Henry I. made no diſtinction between him who killed a man, and him who killed a buck; and puniſhed thoſe who deſtroyed the game, though not in the *foreſt*, either by forfeiture of their goods, or loſs of limbs; though Henry II. remitted it for a temporary impriſonment.

Richard I. revived the old diſcipline of gelding and pulling out the eyes of thoſe convicted of hunting in the *foreſt*: but he afterwards relaxed a little, and was contented to make ſuch convicts abjure the realm, or be committed, or pay a fine.

FOREST, *aſſize of the*. See ASSIZE.
FOREST, *charter of the*. See CHARTER *of the foreſt*.
FOREST, *drift of the*. See DRIFT.
FOREST, *foot of the*. See FOOT.
FOREST, *keeper of the*. See KEEPER.
FOREST, *perambulation of the*. See PERAMBULATION.
FOREST, *repoſition of the*. See REPOSITION.
FOREST, *waſte of the*. See WASTE.

FOREST is alſo uſed adjectively. The *foreſt* cities of the empire are four cities ſituate in the ancient Black *Foreſt*, or Sylva Nigra, a part of the ancient Hercynian *Foreſt*, viz. Rhinfield, Waldhuſt, Seckingen, and Lauffembourg. But, now ſince the bounds of the Black *Foreſt* are contracted, theſe cities are out of the limits thereof.

FOREST-*law*. The *foreſt* laws are peculiar laws, different from the common law of England.

Before the making of Charta de *Foreſta*, in the time of king John and his ſon Henry III. confirmed in parliament by 9 Henry III. offences committed therein were puniſhed at the pleaſure of the king, in the ſevereſt manner. By this charter, many *foreſts* were diſafforeſted and ſtripped of their oppreſſive privileges, and regulations were made for the government of thoſe that remained; particularly, killing the king's deer was made no longer a capital offence, but only puniſhed by fine, impriſonment, or abjuration of the realm: yet even in the charter there were ſome grievous articles, which the clemency of later princes have ſince by ſtatute thought fit to alter *per aſſiſas* foreſtæ.

And to this day, in treſpaſſes relating to the *foreſt*, *voluntas reputabitur pro facto*; ſo that if a man be taken hunting a deer, he may be arreſted, as if he had taken a deer. The foreſter may take and arreſt a man, if he be taken either at dog-draw, ſtable-ſtand, back-bear, or bloody-hand, notwithſtanding that three of theſe be only preſumptions. See DOG-*draw*, STABLE-*ſtand*, &c. See alſo BLACK-*act*.

FOREST-*trees*. Many are wholly averſe to pruning *foreſt*-trees; but though it is to be done with care, and under proper regulations (ſee LOPPING), yet it is by no means to be wholly omitted. It may be obſerved in *foreſts* and large woods, that for one tree which thrives well, there are twenty that grow faulty, and all this is owing to the want of pruning or lopping in a proper manner; for this, when wiſely executed, is a renewal of their age, and of their growth too; the want of it being what occaſions trees to run out into ſuckers, and to load themſelves with uſeleſs boughs, which draw away the ſap from the upper part, and make it grow knotty and diſtempered, and uſually covered with moſs.

If a tree grow crooked, the buſineſs of the owner is to cut it off ſloping at the crooked place, and nurſe up ſome young bough that grows upright from that part, and it will make it a ſtraight body. This is not to be done when trees are very large, but the careful owner will not ſuffer them to grow very large without doing it. Mortimer's Huſbandry, vol. ii. p. 84.

There is alſo another caution, which is, that ſoft woods do not bear this heading ſo well as the harder, and the beech in particular is leſs able to bear it than any other.

If young trees grow but a little crooked, they may be cured by only ſhreding up the branches while young, all the way up the body, till paſt the crooked part. When cattle have cropped any of the ſhoots of young trees, they ſhould be cut off cloſe to the body, for they not only never grow well after it, but the cattle uſually leave a drivel where they have bitten, which ſometimes occaſions a rot of the branch, and endangers the whole tree. The beſt time for pruning young *foreſt*-trees is in February; and it ſhould be done where there is occaſion every year, or at the utmoſt every ſecond year, ſo that the tree may be able to overgrow the knot, and the place not liable to put out ſuckers, becauſe the ſap has had no great recourſe to it. When it is neceſſary to cut off a bough of any bigneſs, there muſt always be given a chop or two underneath, oppoſite to the part where it is cut above, otherwiſe the weight of the bough, in its fall, is apt to ſtrip off the bark from the remaining ſtump, to the great detriment of the tree. When trees are kept for pollards, they muſt be regularly lopped every two years; for if the branches are ſuffered to grow longer than that, they are apt to be faulty at the wound when cut off, and to let in water, the conſequence of which will be the decay of the tree, and it can no more bear any great quantity of branches or top.

The general growth of trees in thickneſs of the body, is from one inch to two inches in a year. The large and ſmall increaſe much in the ſame proportion in this reſpect, if they are in a like thriving condition. The goodneſs of ſoil will make a great difference in this growth, as has been experienced by Mortimer, who obſerved, that the common increaſe of the oak is about an inch and a quarter in thickneſs in the body in a year; but a large

oak

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oak that grew in one of his own ploughed fields, where the earth was tilled and manured every year, and that often had cattle lying under it, and dunged about its roots, grew annually no leſs than four inches in thickneſs. This ſhews the great advantage of digging about the roots of trees, and dunging them, and may ſerve as a hint for a very practicable method of increaſing the growth of trees on occaſion. The killing of weeds that grow about the roots of trees, is one great method of haſtening their growth; but there is an error which ſome have run into on this principle, that is to be carefully avoided. Theſe people obſerving the great damage that weeds do the trees, have ſuppoſed that ſhrubs and underwood in hedges and coppices do the ſame; but this is a miſtake. Experience ſhews, that *foreſt*-trees thrive better and grow faſter in coppices than when they ſtand ſingle; and it is certain that, next to digging and dunging about the roots, the growth of underwood about the tree is the beſt method of promoting its increaſe; theſe ſhrubs keeping the earth moiſt about the roots of the tree, and manuring all the earth about with their falling leaves and rotten branches, which break off at times, and which are the richeſt of all manure: a little rotten wood blended among even a bad ſoil converting it into the nature of garden-mould. Mortimer's Huſbandry, vol. ii. p. 86. See TREES and TIMBER.

FOREST-*trees, tranſplanting of.* See TRANSPLANTING.

FORE-*ſtaff*, an inſtrument uſed at ſea, for taking the altitudes of heavenly bodies.

The *fore-ſtaff*, called alſo *croſs-ſtaff*, takes its denomination hence, that the obſerver, in uſing it, turns his face towards the object, in contradiſtinction to the back-ſtaff, where he turns his back to the object.

The *fore*, or croſs-ſtaff, repreſented in *Tab. Navigat. fig.* 12. conſiſts of a ſtrait, ſquare ſtaff, A B, graduated like a line of tangents, and four croſſes, or vanes, F F, E E, D D, C C, which ſlide thereon. The firſt and ſhorteſt of theſe vanes, F F, is called the *ten croſs*, or *vane*, and belongs to that ſide of the inſtrument, whereon the diviſions begin at three degrees, and end at ten. The next longer vane, E E, is called the *thirty croſs*, belonging to that ſide of the ſtaff, wherein the diviſions begin at ten degrees, and end at thirty, called the *thirty ſcale*. The next vane, D D, is called the *ſixty croſs*, and belongs to the ſide where the diviſions begin at twenty degrees, and end at ſixty. The laſt, and longeſt, C C, called the *ninety-croſs*, belongs to the ſide whereon the diviſions begin at thirty degrees, and end at ninety.

FORE-*ſtaff, uſe of the.* The great uſe of this inſtrument is to take the height of the ſun, and ſtars, or the diſtance of two ſtars: and the ten, thirty, ſixty, or ninety croſſes, are to be uſed according as the altitude is greater, or leſſer; that is, if the altitude be leſs than ten degrees, the ten croſs is to be uſed; if above ten, but leſs than thirty, the thirty croſs is to be uſed, &c.

Note, For altitudes greater than thirty degrees, this inſtrument is not ſo convenient as a quadrant, or ſemicircle.

FORE-*ſtaff, to obſerve an altitude by the.* Apply the flat end of the ſtaff to your eye, and look at the upper-end of the croſs for the center of the ſun, or ſtar, and at the lower end for the horizon. If you ſee the ſky, inſtead of the horizon, ſlide the croſs a little nearer the eye; and if you ſee the ſea, inſtead of the horizon, ſlide the croſs farther from the eye: and thus continue moving, till you ſee exactly the ſun or ſtar's center by the top of the croſs, and the horizon by the bottom thereof.

Then the degrees and minutes, cut by the inner edge of the croſs upon the ſide of the ſtaff, peculiar to the croſs you uſe, give the altitude of the ſun or ſtar.

If it be the meridian altitude you want, continue your obſervation as long as you find the altitude increaſe, ſtill moving the croſs nearer to the eye.

By ſubtracting the meridian altitude thus found, from ninety degrees, you will have the zenith diſtance.

To work accurately, an allowance muſt be made for the height of the eye above the ſurface of the ſea, viz. for one Engliſh foot, 1 minute; for five foot, $2\frac{1}{2}$; for ten foot, $3\frac{1}{2}$; for twenty foot, 5; for forty foot, 7, &c.

Theſe minutes ſubtracted from the altitude obſerved, and added to the zenith diſtance obſerved, give the true altitude, and zenith diſtance.

FORE-*ſtaff. To obſerve the diſtance of two ſtars, or the moon's diſtance from a ſtar, by the* Fore-*ſtaff.* Apply the inſtrument to the eye, and looking to both ends of the croſs, move it nearer, or farther from the eye, till you ſee the two ſtars; the one on the one end, and the other on the other end of the croſs: then the degrees and minutes cut by the croſs on the ſide proper to the vane in uſe, give the ſtars diſtance.

FORESTAGE, FORESTAGIUM, in *our ancient cuſtoms*, an obſolete duty, or ſervice, paid by the foreſter to the king. In Britany, Lobineau obſerves, the office of foreſters was held by gentlemen of the firſt rank, who for their *foreſtage* were obliged to furniſh the lord, when he kept open houſe, with cups and ſpoons.

FORESTAGE alſo ſeems to have been uſed for a duty payable to the king's foreſters. *Et ſint quieti de thelonio, & paſſagio, & de* foreſtagio, &c. Chart. Edw. I.

It may likewiſe be taken for a right to uſe the foreſt, or a taking of reaſonable ESTOVERS.

FORESTAL, or FORSTAL, in Domeſday wrote FORISTEL, is an intercepting in the highway; or ſtopping, or even inſulting a paſſenger therein.

The word is formed of the Saxon *fore, before*; and *ſtal, ſtation.* In the laws of Henry I. the ſenſe of the word is thus explained: foreſtal *eſt, ſi quis ex tranſverſo incurrat, vel in viam expectet, & aſſaliet inimicum ſuum.*

FORESTALLER, a perſon who *foreſtalls* the market, or buys up goods upon the road.

FORESTALLING, the buying or bargaining for corn, cattle, or other merchandize, by the way, before it reaches the market, or fair, to be ſold; or by the way, as it comes beyond the ſeas, or otherwiſe, toward any city, port, haven, or creek, of this realm, with deſign to take advantage thereof, and ſell it again at a more advanced and dear rate.

Fleta ſays, it ſignifies *obſtructionem viæ, vel impedimentum tranſitus & fugæ averiorum.*

By the 5th and 6th Edw. vi. cap. 14. any buying or contracting for merchandize, victuals, or other things whatſoever, in the way, coming by land or water to any fair or market, or to any port, &c. to be ſold, or cauſing the ſame to be bought; or diſſuading people by word, letter, or meſſage, or otherwiſe, from bringing ſuch things to market; or perſuading them to enhance the price after they are brought thither; is *foreſtalling*: and the party guilty of any offence of *foreſtalling*, &c. upon conviction at the quarter-ſeſſions by two witneſſes, on bill, information, preſentment, &c. ſhall, for the firſt offence, loſe the goods ſo bought, or the value of them, and ſuffer two months impriſonment; for the ſecond offence, he ſhall forfeit double the value, and be impriſoned ſix months; and for the third offence, he ſhall loſe all his goods, be ſet upon the pillory, and be impriſoned at the king's pleaſure.

FORESTALLING is particularly uſed, in Crompton, for ſtopping a deer broken out of the foreſt, and preventing its returning home again; or, a lying between him and the foreſt in the way he is to return.

FORESTER, a ſworn officer of the foreſt, appointed by the king's letters patent to walk the foreſt, and watch the vert and veniſon; as alſo to attach and preſent all treſpaſſes againſt both, within his bailiwick or walk, to the foreſt-courts, to be puniſhed according to their offences.

Though the letters patent of a *foreſter* be ordinarily only granted *quamdiu bene ſe geſſerit*; yet they are granted to ſome and their heirs, who are hereby called *foreſters in fee.*

Sir William Temple relates, that the Franks having ſubdued all Gaul, their princes reduced Flanders into a kind of government, and gave the quality of *foreſter*, with part of the province, to the braveſt of their captains.

This quality of lord *foreſter* held till the time of Charlemagne, or, according to others, of Charles the Bald, in whoſe time Flanders being erected into a county, the title of *foreſter* was changed into that of count.

FORESTID *ore*, in *Mining*, is ore got out of earth and dirt that has been waſhed, and ore taken from it before.

FORE-*top of a ſhip.* See TOP.

FORE-*top-maſt* is half the length of the fore-maſt (ſee *Tab. Ship, fig*, 1. 11. 102.) and the fore-top-gallant-maſt half the length of the *fore-top-maſt.* See TOP-*maſt* and MAST.

FORE-*tooth.* Striking out the *fore-tooth* is a *mayhem.*

FORE-*yard.* See YARD.

FORFEITURE orignally ſignifies a tranſgreſſion or offence againſt ſome penal law.

The word is formed of the baſe Latin *foriſfactura*; whence *forfaitura*, and *forfaicture*, and the French *forfait. Foriſfactura* comes of *foriſfacere*, which, according to Iſidore, ſignifies *to hurt*, or *offend*, *facere contra rationem*; and which is not improperly derived of *foris, out*, and *facere, to do*, q. d. an action out of rule, or contrary to the rules.

But with us, it is now more frequently uſed for the effect of ſuch tranſgreſſion, or the loſing ſome right, privilege, eſtate, honour, office, or effects, in conſequence thereof, than for the tranſgreſſion itſelf: as *forfeiture of eſcheats, forfeiture of goods*, &c. A fee becomes vacant by the *forfeiture* or rebellion of the vaſſal.

Goods *forfeited*, and goods confiſcated, differ: thoſe which have a known owner, who has committed ſome offence, whereby he loſes his goods, are ſaid to be *forfeited*: thoſe which an offender diſavows, as not his own, and which are not claimed by any other, are ſaid to be confiſcated,

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confiſcated, ſtat. 25 Edw. III. Add, that *forfeiture*, or *forfeit*, is more general; and confiſcation more particular, being principally uſed for ſuch as *forfeit* only to the king's exchequer.

FORFEITURE, *full*, *plena forisfactura*, called alſo *plena vita*, is a *forfeiture* of life and member, and all elſe that a man has.

This obtains in criminal caſes, as where a perſon is attainted of treaſon, felony, &c. There is alſo a *forfeiture* of lands, &c. in civil caſes. There are various degrees and various means, whereby lands, tenements, and hereditaments, may be *forfeited*. 1. By crimes and miſdemeanors: of theſe, the principal offences that induce a *forfeiture* of lands and tenements to the crown, are treaſon, felony, miſpriſion of treaſon, præmunire; drawing a weapon on a judge, or ſtriking any one in the preſence of the king's principal courts of juſtice, and popiſh recuſancy or non-obſervance of certain laws enacted in reſtraint of papiſts. 2. By ALIENATION, contrary to law, which may be in MORTMAIN; to an alien, on account of his incapacity to hold the lands ſo alienated; and by particular tenants, when the alienations are greater than the law entitles them to make, and diveſt the remainder or reverſion; in which caſe they become *forfeitures* to to him whoſe right is hereby injured: there is alſo an alienation by DISCLAIMER. 3. By non-preſentation to a benefice, when the *forfeiture* is denominated a LAPSE. 4. By SIMONY. 5. By breach or non-performance of CONDITIONS, annexed to eſtates, either expreſſed or legally implied. 6. By WASTE. 7. By breach of COPYHOLD cuſtoms. 8. By BANKRUPTCY. Goods and chattels, likewiſe, are totally *forfeited* by conviction of high treaſon, or miſpriſion of treaſon; of petit treaſon; of felony in general, and particularly of felony *de ſe*, and of man-ſlaughter; nay, even by conviction of excuſable homicide; by outlawry for treaſon or felony; by conviction of petit larceny; by flight in treaſon or felony, even though the party be acquitted of the fact; by ſtanding mute, when arraigned of felony; by pretended prophecies, upon ſecond conviction; by owling; by the reſiding abroad of artificers; and by challenging to fight on account of money won at gaming. This *forfeiture* commences from the time of conviction, and not the time of committing the fact, as in *forfeitures* of real property. However, a fraudulent conveyance of chattels, between the time of committing the fact and conviction of the offender, to defeat the intereſt of the crown, is made void by ſtatute 13 Eliz. cap. 5. There are alſo various other *forfeitures* inflicted, by ſpecial ſtatutes, for particular crimes and miſdemeanors; ſome of which are *mala in ſe*, or offences againſt the divine law, either natural or revealed; but by far the greateſt part are *mala prohibita*, or ſuch as derive their guilt merely from their prohibition by the laws of the land: ſuch as the *forfeiture* of 40*s.* per month by the ſtat. 5 Eliz. cap. 4. for exerciſing a trade without having ſerved ſeven years apprenticeſhip to it; and the *forfeiture* of 10*l.* by 9 Ann. cap. 23. for printing an almanac without a ſtamp. Blackſt. Com. vol. ii. p. 267, &c. 420, &c. vol. iv. p. 370, &c. 416, &c.

The true reaſon of any *forfeiture* for crimes, ſays judge Blackſtone, is this: that all property is derived from ſociety, being one of thoſe civil rights which are conferred upon individuals, in exchange for that degree of natural freedom, which every man muſt ſacrifice when he enters into ſocial communities: if, therefore, a member of any national community violates the fundamental contract of his aſſociation, by tranſgreſſing the municipal law, he *forfeits* his right to ſuch privileges as he claims by that contract; and the ſtate may very juſtly reſume that portion of property, or any part of it, which the laws have before aſſigned him. Hence, in every offence of an atrocious kind, the laws of England have exacted a total confiſcation of the moveables or perſonal eſtate; and in many caſes a perpetual, in others only a temporary, loſs of the offender's immoveables or landed property; and have veſted them both in the king, who is the perſon ſuppoſed to be offended, being the one viſible magiſtrate in whom the majeſty of the public reſides. Blackſt. Com. vol. i. p. 299.

FORFEITURE *of marriage*, *forisfactura maritagii*, a writ, which formerly lay againſt him, who, holding by knight's ſervice, and being under age, and unmarried, refuſed her whom the lord offered him, without his diſparagement, and married another.

FORFEX, in *Surgery*, a pair of ſciſſars wherewith things may be cut.

The word is ſometimes alſo uſed for pincers, nippers, or pliers; and is often confounded with *forceps*. Blanchard, and, after him, Quincy, deſcribes a *forfex* as an inſtrument for drawing teeth.

FORFICULA. See EAR-*wig*.

FORFICULA *marina*, the *ſea-ear-wig*, a name given by authors to an inſect frequently found about the ſea-ſhores, and having ſome ſort of external reſemblance to the common *ear-wig*. It is of the ſize of the common *ear-wig*, and is of a mixed colour, of a deep black and a ſilvery white. The ſhoulders are ſomewhat gibboſe, the eyes ſtanding cloſe to one another on the ſummit of the head; the antennæ are long and very ſlender. It has eight pair of legs on the anterior part of the body, and eight pair more at the hinder part, and there are three or four briſtles at the tail. It moves about very ſwiftly, and lives on rocks and among ſtones.

FORFIELD, in *Mining*, is the fartheſt place that a man has wrought in his ground; or the end of a meer above ground.

FORGE properly ſignifies a little furnace, wherein ſmiths, and other artificers in iron or ſteel, &c. heat their metals red-hot, in order to ſoften and render them more malleable and manageable on the anvil, &c.

We ſay, a farrier's *forge*, ſilverſmith's *forge*, cutler's *forge*, lockſmith's *forge*, &c. The *forge* uſed by the ſeveral operators in iron is very ſimple; we ſhall inſtance in that of the blackſmith, to which all the reſt are reducible.

The hearth, or fire-place, is a maſs of brick, about two feet ſix inches high: the back of the *forge* is built upright to the cieling, and is incloſed over the fire-place with a hovel, which leads into a chimney, to carry away the ſmoke. In the back of the *forge*, againſt the fire-place, is a thick iron plate, with a taper pipe fixed therein, about five inches long, called the *tewel*, into which the noſe or pipe of the bellows is received: the uſe of this plate and tewel is, to preſerve the pipe of the bellows, and the back of the hearth from being burnt. Right before the back, at about two feet diſtance, is the trough, filled with water, to wet the coals with, and thereby increaſe their force, as alſo to quench the iron in. Behind the back of the *forge* is placed the bellows, one of whoſe boards is fixed ſo, that it moves not, either upward or downward; and to the other is fitted a rope, chain, or even a rod, which riſing perpendicularly, is fixed to a croſs piece, called the *rocker*, which moving on a kind of fulcrum near the middle, ſerves as a handle. By drawing down this handle, the moveable board of the bellows riſes, and, by a conſiderable weight at the top of its upper ſide, it ſinks down again; and, by this alternate agitation, performs the neceſſary motions of a pair of bellows. See BELLOWS.

Braziers and copperſmiths *forge* differs but little from that already deſcribed; only that it is much leſs, and that nothing is burnt in it but charcoal, the metals uſed by theſe operators not working well with pit-coal.

FORGE is alſo uſed for a large furnace, wherein iron ore, taken out of the mine, is melted down.

But this is not ſo properly called a *forge* as a furnace.

FORGE is more properly uſed for another kind of furnace, wherein the iron ore, melted down and ſeparated in a former furnace, and there caſt into ſows and pigs, is heated, and fuſed over again, and beaten afterwards with large hammers, and thus rendered more ſoft, pure, ductile, and fit for uſe.

Of theſe *forges* there are two kinds, which the iron ſucceſſively paſſes through, before it comes to the ſmith. The firſt is called the FINERY, where the pigs are worked into groſs iron, and prepared for the ſecond, which is called the CHAFERY, where it is farther wrought into bars fit for uſe.

FORGE-*mills*. See MILL.

FORGE, *travelling*, in the *Train of Artillery*, is a kind of portable ſmith's ſhop, by means of which any neceſſary work may be performed on a march, as well as in camp. This kind of *forge* has been formerly fixed in a carriage with two wheels, and wooden ſupporters, to prop the *forge* when uſed; but they are now commonly made with four wheels, ſo that they ſtand more firmly, and are more eaſily removed.

FORGE *for red-hot balls*, is a place where the balls are made red hot before they are fired off: it is conſtructed about five or ſix feet below the ſurface of the ground, of ſtrong brick-work, and an iron grate, upon which the balls are laid with a large fire under them.

FORGER *of falſe deeds*, ſignifies either him that fraudulently makes and publiſhes falſe writings, to the prejudice of any man's right, or elſe the writ that lies againſt him who commits this offence.

Fitz. Nat. Br. fol. 69. b. ſays, that a writ of deceit lies againſt him who commits this offence; and the penalty of it is declared in the ſtat. 5 Eliz. cap. 14.

FORGERY, in *Law*, is where a perſon fraudulently makes and publiſhes falſe writings, to the prejudice of another man's right: and *forgery* is either at common law, or by ſtatute, puniſhable by indictment, information, &c. But there can be no *forgery* where no one can be prejudiced

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by it, but the perſon doing it. 1 Salk. 375. *Forgery*, by common law, extends to a falſe and fraudulent making or altering of a deed or writing, whether it be matter of record, or any other writing, deed, or will. 3 Inſt. 169. 1 Roll. abr. 65. Not only where a falſe deed is made, but where a fraudulent alteration is made of a true deed in a material part of it, it is *forgery*.

By a late act, an offender, *forging* or counterfeiting any deed, will, bond, bill of exchange, note, or acquittance for money, or any indorſement or aſſignment of a bill, &c. with intent to defraud any perſon, or publiſhing ſuch falſe deed, &c. to be true, knowingly, ſhall be guilty of felony, and ſuffer death as a felon; but not to work any corruption of blood, &c. Stat. 2 Geo. II. cap. 25. 7 Geo. II. cap. 22.

By an act paſſed in 1778, explaining the former laws on the ſubject of *forgeries*, it is enacted, that making or forging, &c. or cauſing to be made or forged, &c. or aſſiſting in making or forging, &c. any acceptance of any bill of exchange, or the number or principal ſum of any accountable receipt for any note or bill, or any warrant or order for payment of money or delivery of goods, with intention to defraud any corporation, or publiſhing as true any ſuch forged acceptance, &c. incur the guilt of felony, and the puniſhment of death, without benefit of clergy. 18 Geo. III.

FORGING, in the *Mechanic Arts*, the act of beating or hammering iron on an anvil, after having firſt made it red-hot in the *forge*, in order to extend it into various forms, and faſhion it into works.

Iron is hammered and forged two ways; either by the force of the hand, in which there are uſually ſeveral perſons employed, one of them turning the iron, and hammering likewiſe, and the reſt only hammering.

Or, it is done by the force of a water-mill, which raiſes and works ſeveral huge hammers, beyond the force of man, under the ſtrokes whereof the workmen preſent large lumps or pieces of iron, which are ſuſtained, at one end, by the anvils, and, at the other, by iron chains faſtened to the cieling of the forge.

This laſt way of *forging* is only uſed in the largeſt works, as anchors for ſhips, &c. which uſually weigh ſeveral thouſand pounds. For the lighter works, a ſingle man ſuffices to hold, heat, and turn, with one hand, while he ſtrikes with the other. Each purpoſe for which the work is deſigned, requires its proper heat. If it be too cold, it will not feel the weight of the hammer, as the ſmiths call it, i. e. it will not ſtretch or give way; and, if it be too hot, it will red-ſear, i. e. it will break or crackle under the hammer.

The ſeveral heats the ſmiths give to their irons are, 1. A blood-red heat. 2. A white-flame heat. 3. A ſparkling or welding heat.

FORGING *over*, in *Sea-language*, denotes the art of forcing a ſhip violently over a ſhoal, by the effort of a great quantity of ſail.

FORK-*tail*, among the *Fiſhermen of England*, a name given to the ſalmon, while in the fourth year's growth, and not yet come to what they call a SALMON.

FORKED *beard*, *great*, in *Ichthyology*, a name given on the coaſt of Cornwall to the BLENNIUS *phycis* of Linnæus.

FORKED *heads*, among *Hunters*, thoſe horns of deer which bear two croches on the top, or which have their croches doubled.

FORLANA, in the *Italian Muſic*, a ſort of dance much in uſe among the Venetians. See SALTARELLA.

FORLET *land*, ſuch land in the biſhoprick of Hereford, as was granted or leaſed, *dum epiſcopus in epiſcopatu ſteterit*, that the ſucceſſor might have it for his preſent income. But now that cuſtom is diſuſed, and the ſame lands are granted, as others, by leaſe; yet they ſtill retain the name.

FORLORN, or FORELORN-*hope*. See ENFANS *perdus*.

FORM, FORMA, in *Phyſics*, denotes the manner of being peculiar to each body; or that which conſtitutes it ſuch a particular body, and diſtinguiſhes it from every other.

Mr. Harris uſes the term *form* likewiſe in another ſenſe, as an efficient animating principle; to which he ſuppoſes Ovid to refer in the firſt lines of his Metamorphoſis,

> *In nova fert animus mutatas dicere* formas
> *Corpora*——

Theſe animating *forms* are of themſelves no objects either of the ear, or of the eye; but their nature or character is underſtood in this, that were they never to exert their proper energies on their proper ſubjects, the marble on which the ſculptor exerciſes his art would remain for ever ſhapeleſs, and the harp from which the harper calls forth ſounds would remain for ever ſilent.

Thus, alſo, the animating *form* of a natural body is neither its organization, nor its figure, nor any other of thoſe inferior *forms*, which make up the ſyſtem of its viſible qualities; but it is the power, which is yet able to produce, preſerve, and employ theſe. It is the power, which firſt moves, and then conducts that latent proceſs, by which the acorn becomes an oak, and the embryo becomes a man; by which digeſtion is performed in plants and animals, and, which departing, the body ceaſes to live, and its members putrefy; and by which every being produces another like itſelf, and every ſpecies is continued. In animals, it is that higher faculty, which, by employing the organs of ſenſe, peculiar to them as animals, diſtinguiſhes them as ſenſitive beings from vegetables; and it is alſo that more noble faculty, which, by its own divine vigour, unaſſiſted perhaps with organs, makes and denominates him a being intellective and rational. So that Mr. Harris reckons two ſorts of *forms*, thoſe which are paſſive elements, and thoſe which are efficient cauſes. And all of them agree in this, that they give to every being its pecular and diſtinctive character: and on the whole he concludes, that *form* appears in part to be an element, and in part an efficient cauſe, i. e. a cauſe which aſſociates the conſtituent elements of natural ſubſtance, and which employs them, when aſſociated, according to their various and peculiar characters. Harris's Phil. Arrangements, chap. vi.

The philoſophers generally allow two principles of bodies: *matter*, as the common baſis, or ſubſtratum of all; and *form*, as that which ſpecifies and diſtinguiſhes each; and which, added to a quantity of common matter, determines or denominates it this, or that; wood, or fire, or aſhes, &c.

Subſtantial *forms* ſeem to have been firſt broached by the followers of Ariſtotle, who thought matter, under different modes or modifications, not ſufficient to conſtitute different bodies; but that ſomething ſubſtantial was neceſſary to ſet them at a greater diſtance: and thus introduced ſubſtantial *forms*, on the footing of ſouls, which ſpecify and diſtinguiſh animals.

The conſiderations which the Peripatetics principally inſiſt on, in confirmation of this doctrine, are: 1. That, without ſubſtantial *forms*, all natural things would be of the ſame ſpecies, nature, and eſſence; which is ſuppoſed to be an abſurdity.

2. That every thing has its peculiar power, motion, and operation; as the magnet, e. gr. has that of attracting iron; but that this power does not flow from the matter of the body, which is only paſſive; nor from the accidents: and therefore that it muſt ariſe from a ſubſtantial *form*.

3. That, without ſubſtantial *forms*, there would be no generation: for a production of accidents is only an alteration.

4. That, without ſuch *form*, the nature of a man and of a lion would not differ.

What contributed much to their error, was the circumſtances of life and death: for obſerving, that, as ſoon as the ſoul was departed out of a man, all motion, reſpiration, nutrition, &c. immediately ceaſed, they concluded, that all thoſe functions depended on the ſoul, and conſequently that the ſoul was the *form* of the animal body, or that which conſtituted it ſuch: that the ſoul was a ſubſtance, independent of matter, nobody doubted; and hence the *forms* of other bodies were concluded equally ſubſtantial.

But to this it is anſwered, that though the ſoul be that by which a man is man, and conſequently is the *form* of the human body, as human; yet it does not follow, that it is properly the *form* of this body of our's, as it is a body; nor of the ſeveral parts thereof, conſidered as diſtinct from each other.

For thoſe ſeveral parts have their proper *forms* ſo cloſely connected with their matter, that it remains inſeparable therefrom, long after the ſoul has quitted the body: thus, fleſh has the *form* of fleſh; bone of bone, &c. long after the ſoul is removed, as well as before.

The truth is, the body does not become incapable of performing its accuſtomed functions, becauſe the ſoul has deſerted it; but the ſoul takes its leave, becauſe the body is not in a condition to perform its functions.

The ancient and modern corpuſcular philoſophers, therefore, with the Carteſians, exclude the notion of ſubſtantial *forms*; and ſhew, by many arguments, that the *form* is only the modus or manner of the body it is inherent in.

And as there are only three primary modes of matter, viz. figure, reſt, and motion, with two others ariſing therefrom, viz. magnitude, and ſituation, the *forms* of all bodies they hold to conſiſt therein; and ſuppoſe the variations theſe modes are capable of, ſufficient to preſent all the variety obſervable in bodies. See MODE.

Many varieties we actually ſee reſult from changes in theſe modes, which may very well paſs for differences of *form*: thus, an awl only differs from a needle in magnitude; a

globe

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globe from a cube in figure: and transparent glass, being pulverized, will reflect the light, and appear white; and yet all the alteration consists in the order and arrangement of the parts: when wheat is ground into flour, all the change consists in a separation of the contiguous parts; and when the flour is baked into bread, what is it but the same particles associated again in another manner? By agitating water, a froth is formed; if the agitation be increased, the particles will exhale, and form clouds; which being congregated again, return in dew, snow, hail, or rain: and the same water, by the accession of cold, might have been formed into ice. So many different bodies, endued with different qualities, and which the Peripatetics themselves allow specifically different, arise from one and the same body, by mere motion and rest!

The philosophy of substantial *forms*, its rise, use, and extent, are set in an excellent light by F. Malebranche.

The way of thinking, that first introduced it, is this: every thing I perceive in tasting, seeing, and handling this honey and salt, is in the honey and salt; but it is certain, that the things I perceive in the honey, e. gr. the colour, taste, &c. differ essentially from those I perceive in the salt; consequently there is an essential difference between the two.

Hence it follows, that they are grossly deceived, who take all the differences between those bodies to consist in the different configurations of the component parts; since the different figure is not at all essential to the different bodies: for, change the figure of the parts of the honey how you will, and even give them those of the parts of salt, yet it is honey still.

There must, therefore, be some substance added to the common matter of all bodies, to make them essentially different. And thus are substantial *forms* hooked in; those fertile substances, which perform every thing that we see in all nature. Since then, in every natural body, there are two substances; the one common to honey, salt, and all other bodies; and the other, that which makes the honey, honey; the salt, salt; and all other bodies what they are; it follows that the first, viz. matter, having no contrary, but being indifferent to all *forms*, must remain without force and action, as having no occasion to defend itself.

But, for the others, viz. the substantial forms, there is a necessity of their being accompanied and invested with faculties and qualities, for their defence and subsistence. These must be always on their guard, for fear of being surprised: they are in possession of a thing, which they are to hold against numerous pretenders; and therefore they must be continually at work to fortify themselves, and extend their dominion over the neighbouring matters, and push their conquests as far as they can: were they to remain unactive, and unprepared, other *forms* would lay hold of them, and banish and destroy them for ever. To guard against this, they keep constant watch, and entertain mortal enmities and antipathies against those other *forms*, which only wait to destroy them.

If now it happen, that one *form* seize the matter or receptacle of another, that the *form* of a carcase, for instance, seize the body of a dog, it is not enough that this new *form* annihilate the former; but its hatred must be farther gratified with the destruction of all the qualities, that took its enemy's part.

The hair of the carcase, then, must be turned white, by a creation of a new colour: its blood must become red, but of such a red, as is not to be suspected in the interest of the enemy; and the whole body to be invested with qualities, trusty to their new master, whom they are to defend with all the power the qualities of a carcase can have, till such time as, being overpowered, this *form* gives way too, in its turn, to the *form* of maggots, worms, &c.

But as nothing can be in perpetual war, but every thing has its place of rest, it follows, that even the fire must likewise have its centre, whither its natural levity always prompts it, that it may remain at rest, cease to burn, and even quit its heat, which it only maintains here below for its defence.

These may serve as a taste of the consequences drawn from that important principle, *substantial forms*; which is infinitely fertile, and furnishes every philosopher with all sorts of solutions, according to his ability, address, inclination, &c.

Forms are usually distinguished into *essential* and *accidental*.

FORMS, *Essential*. Though the five modes above mentioned, generally taken, be adventitious; yet, to this or that body, e. gr. to fire, or water, they are essential: thus, it is *accidental* to iron, to have this or that magnitude, figure, or situation, since it might exist in different ones; yet, to a knife, or hammer, the figure, magnitude, and position of parts, which constitute it a hammer, or knife, are *essential*; and they cannot exist, or be conceived, without them.

Hence it is inferred, that, though there be no *substantial*, there are *essential forms*, whereby the several species of bodies become what they are, and are distinguished from all others.

FORMS, *Accidental*, are those really inherent in bodies, but in such manner as that the body may exist in all its perfection without them. Such is whiteness in a wall; heat in water; a figure of a man in wax, &c.

FORM, *Metaphysical*, is nothing else but specific difference; as metaphysical matter is nothing else but the genus. Thus, *rational* is the metaphysical *form* of man.

Forms, again, are distinguished into *simple* and *compound*.

FORMS, *Simple*, are those of simple bodies, i. e. of such as have but few properties.

FORMS, *Compound*, are those of more compound bodies; or of such as have more properties.

Thus, e. gr. if the *form* of a hard body be compared with the *form* of wood, the former may be accounted *simple*, and the latter *complex*: inasmuch as a hard body, considered only as hard, has fewer properties than wood. Absolutely speaking, however, simple *forms* are those of the elements; and compound, those of mixt bodies.

Some distinguish *forms* into *natural* and *artificial*.

FORMS, *Natural*, are those inherent in bodies, without any thing contributed thereto on the part of man. Such is the *form* of marble.

FORMS, *Artificial*, are those arising from human industry. Such is that of a statue. But this distinction is useless, and does not imply any intrinsic difference in the *forms* themselves.

Others, again, distinguish *forms* into *primary* and *secondary*.

FORMS, *Primary* or *universal*, are those which originally belong to physical or natural body; and these, they say, are extension, figure, and organization; figure having respect to its external, organization to its internal, and extension being common to both.

FORMS, *secondary*, are the same with sensible qualities and arise, for the most part, from the primary *forms*. Harris's Philos. Arrangements, p. 88.

FORM *of concord*, in *Ecclesiastical History*. See CONCORD.

FORM *of Corporeity*, according to Avicenna, and the Scotists, is that which constitutes body in the generical esse of body.

That there is such a thing, they prove thus: the human body is a natural body, which cannot be placed in the esse of body, but by the *form* of corporeity: for it is either so placed by this, or by the rational soul; not by the soul, since that is spiritual; therefore by the *form* of corporeity. And the same may be understood of other bodies: but the later philosophers set this aside as a chimera.

FORM *of a series*, in *Algebra*. See SERIES.

FORM, *Syllogistic*, is a just disposition, both of the terms, in respect of predicate and subject; and of the propositions, in respect of quantity and quality.

By just disposition, we mean such an one, wherein the conclusion follows duly and legitimately from the two premises, there being no *form* where there is no conclusion. See SYLLOGISM.

The disposition of the several terms, being, as it were, so many steps or degrees of a *syllogistic form*, is called the *figure of the syllogism*.

The disposition of the premises alone, being, as it were, another degree, is called the *mode of the syllogism*.

FORM, in *Theology*, denotes one of the essential parts of the sacraments, being that which gives them their sacramental nature and efficacy.

The *form* consists in certain words, which the priest pronounces in administering them. In some of the Romish sacraments, the form is deprecative; in our's it is absolute, or indicative.

The fathers and ancient divines held, that the sacraments consisted of things and words, *rebus & verbis*. William of Auxerre was the first, who, about the beginning of the 13th century, introduced the terms, *matter* and *form*, in lieu thereof.

FORM is also used, in a *moral sense*, for a manner of being, or doing a thing according to rules.

This republic has frequently changed its *form* of government; that is, its constitution. Pardons generally express a remission or abolition of a crime, in what *form* or manner soever it were committed. He was admitted doctor in *form*. Put your argument in *form*.

FORM, in *Law*, is applied to certain established rules to be observed in processes or judiciary proceedings.

In which sense the word stands opposed to the ground or matter in dispute, or the merits of a cause.

Contra FORMAM *collationis*, *feoffamenti*, and *statuti*. See CONTRA.

Modo

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Modo & Forma: See Modo.

Form, in *Joinery*, &c. is applied to the long ſeats or benches in the choirs of churches, for the prieſts, canons, prebends, religious, &c. to ſit on.

Du-Cange takes the name to be derived from hence, that the backs of the ſeats were anciently enriched with figures of painting and ſculpture, called in Latin *formæ & typi*. In the life of St. William of Roſchild, we meet with *forma* as ſignifying a ſeat for an eccleſiaſtic, or religious, in a choir; and in that of St. Lupicin, we have *formula* in the ſame ſenſe. In the rule of the monaſtery of St. Cæſarea, the nun who preſides over the choir is called *primiceria, vel formari*.

Form is alſo uſed in the ſame ſenſe with class.

Form alſo denotes the external appearance or ſurface of a body; or the diſpoſition of its parts, as to length, breadth, and thickneſs,

In which ſenſe it coincides with figure.

Form is alſo uſed, in the *Mechanic Arts*, for a kind of mould, whereon a thing is faſhioned or wrought.

Such are the hatters *form*, the paper-makers *form*, &c.

Form, *Hatters*, is a large block or piece of wood of a cylindrical figure; the top thereof being rounded, and the bottom quite flat.

Its uſe is, to mould or faſhion the crown of the hat, after the matter thereof has been beaten and fulled.

To *form* a hat, it is neceſſary the wool, hair, &c. be very hot, juſt reeking out of the copper.

Form, *Paper-makers*, is the frame or mould wherein the ſheets are faſhioned. See Paper.

Form, *Printers*, is an aſſemblage of letters, words, and lines, arranged in order, and diſpoſed into pages, by the compoſitor; from which, by means of ink and a preſs, the printed ſheets are drawn.

Every *form* is incloſed in an iron chaſe, wherein it is firmly locked by a number of pieces of wood, ſome long and narrow, and others in *form* of wedges.

There are two *forms* required for every ſheet; one for each ſide; and each *form* conſiſts of more or fewer pages, according to the volume of the book. See Press, and Printing.

Form, in *Hunting*, denotes the ſeat of a hare; or the place and time when and where ſhe ſquats.

FORMA *Pauperis*, or *in* Forma *Pauperis*, is when any perſon has cauſe of ſuit, but is ſo poor that he cannot diſpend the uſual charges of ſuing at law, or in equity.

In this caſe, upon his making oath that he is not worth 5*l.* his debts being paid, and bringing a certificate from ſome lawyer, that he has juſt cauſe of ſuit, the judge admits him to ſue *in forma pauperis*; that is, without paying fees to the counſellor, attorney, or clerk. This cuſtom has its beginning from ſtat. 11 Hen. VII. cap. 12. See Dispauper.

FORMAL, ſomething that regards the *form*; or that gives the manner, or *form*.

The *formal* cauſe, joining itſelf to the material, produces the body, or compound.

The ſchoolmen alſo apply the word to any thing which has a kind of *form*, either eſſential or accidental, at leaſt, in our conception.

Thus, we frequently hear the philoſophers talk of the *formal* object of knowlege; and of the *formal* reaſon of any thing; *formal* unity, &c.

Formal *cauſe* is defined, by certain philoſophers, to be ſomething implanted in one parcel of matter, whereby it is diſtinguiſhed from all other matter.

For matter is ſuppoſed common to all bodies: conſequently, that they are diſtinguiſhable from one another, does not ariſe from their matter, but from the *form* which is peculiar to each: hence, what is produced by ſuch cauſe, is ſaid to be *formed*.

Hence it follows, that the caſualty of matter and *form* is not the ſame: or that the component power, and the actual compoſition, are different; contrary to the opinion of the generality of ſchoolmen, who, maintaining *form* to be a ſubſtance co-extended with matter, make it a real component part, as much as matter itſelf.

Formal *circle*. See Circle.

Formal *notion*. See Notion.

Formal is alſo uſed in a moral ſenſe, importing poſitive, expreſs, and preciſe.

Thus we ſay, a *formal* agreement, a *formal* text, *formal* anſwer, &c. *Formal* evidence. See Evidence.

FORMALITER, Formally, is variouſly uſed in the ſchools.

Sometimes it is underſtood of the ſubject, when a predicate is therein on account of ſome form: thus, white, *formally* taken, diffuſes light; q. d. the form inherent in this ſubject, viz. whiteneſs, is the cauſe why the ſubject diſperſes the light.

Formally has alſo place in ſuppoſitions; a word being *formally* ſuppoſed, when it is taken for the thing it was intended to ſignify: as, *man is an animal.*

Formally is alſo uſed in the ſame ſenſe with *adequately*, and totally: thus, a ſyllogiſm *formally*, i. e. adequately taken, requires three propoſitions.

Sometimes it is alſo uſed for *quidditatively*: thus man, *formally* taken, is a reaſonable animal.

Formally is alſo uſed for *really*, in oppoſition to objectively; thus, a thing is ſaid to be *formally* ſuch, when it is ſuch in the proper notion of the thing ſpoken of.

Formally, again, is uſed in ſpeaking of the manner wherein a thing is contained in another, in oppoſition to virtually, and eminently.

FORMALITY, the quality of a *form*, or *formula*; or that which conſtitutes and denominates them ſuch.

Formality, as defined in the *ſchools*, is any manner, wherein a thing is conceived; or, a manner in any object, importing a relation to the underſtanding, whereby it may be diſtinguiſhed from another object.

Thus, animality and rationality are *formalities*. The Scotiſts make great uſe of *formalities*, in oppoſition to the virtualities of the Thomiſts.

The Scotiſts hold, that the metaphyſical degrees in man are ſo many *formalities*, really diſtinct from each other; as *man*, *living*, *animal*, &c. And the ſame they hold of the attributes of God. The Thomiſts, on the contrary, contend, that they are really and intrinſically the ſame.

Formalities, in *Matters of Law*, are frequently uſed for the formulas themſelves, or the rules preſcribed for judiciary proceedings. In contracts of ſtrict law, all the *formalities* muſt be ſtrictly obſerved: an omiſſion of the leaſt *formality* may ruin the whole convention.

The term is alſo uſed for a certain order, or decorum, to be obſerved.

FORMATION, in *Philoſophy*, &c. the act of forming, faſhioning, or producing, a thing.

The *formation* of the chick in the egg is admirably explained by Malpighi, in an expreſs treatiſe, De Formatione Pulli in Ovo.

The *formation* of the foetus, the embryo, in the womb, is a proceſs of which we have but very dark conceptions. See Generation.

The *formation* of metals is effected in the earth, of fumes or vapours raiſed by the ſubterraneous fire, and fixed or condenſed as they arrive towards the ſurface of the earth.

Formation *of ſtones*. See Stones.

Formation *of the tails of comets*. See Comets.

FORMATRIX, or Formatrice. The ancient philoſophers admitted a *virtus*, or *facultas formatrix*, whereby all bodies had their forms given them.

FORMATUM *punctum*. See Punctum.

FORME, or Formy, in *Heraldry*. A *croſs* forme, or *formy*, is a croſs narrow in the center, and broad at the extremes; ſo called by Leigh and Morgan, though moſt other authors call it *patée*.

FORMED, or Figured *ſtones*, among *Naturaliſts*, are ſuch bodies, as, being either pure ſtone, flint, or ſpar, are found in the earth, ſo *formed*, as that they bear a near reſemblance to the external figure of muſcles, cockles, oyſters, or other ſhells, or to plants, or animals.

Authors have been greatly divided as to their origin: the ſeveral opinions ſee under the articles Fossil, Shell, &c.

Formed *bachelor*. See Bachelor.

Formed, in *Heraldry*, &c. the ſame with *ſeated*.

FORMEDON, *ſecundum formam doni*, in *Law*, a writ which lies for him who has right to lands or tenements by virtue of an entail ariſing from the ſtatute of Weſtm. 2. 13 Edw. I. cap. 1.

The time of limitation in a *formedon*, by ſtat. 21 Jac. I. cap. 16. is twenty years; within which ſpace of time, after his title accrues, the demandant muſt bring his action, or elſe is for ever barred.

There are three kinds, viz. *forma donationis*, or *formedon in the deſcender*; *formedon in the remainder*; and *formedon in the reverter*.

Formedon *in the deſcender* lies for the recovery of lands, &c. given to one and the heirs of his body; or to a man and his wife, and the heirs of their two bodies; or to a man and his wife, being couſin to the donor, in frank marriage, and afterwards alienated by the donee.

After his deceaſe, his heir ſhall have this writ againſt the tenant or alienee.

Fitz. Nat. Br. fol. 211, &c. makes three ſorts of *formedon* in the deſcender: the firſt is that now expreſſed; the ſecond, for the heir of a coparcener that aliens, and dies; the third he calls *inſimul tenuit*, which lies for a coparcener, or heir in gavel-kind, before partition, againſt him to whom the other coparcener or heir has alienated, and is dead.

Formedon *in the remainder* lies, where a man gives land to another for life or in tail, with the remainder to a third perſon in tail or in fee; and afterwards the former

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tenant dies without iſſue, and a ſtranger abates; then he in remainder ſhall have this writ.

FORMEDON *in the reverter* lies for the donor, or his heirs (whoſe land is intailed to certain perſons, and their iſſue, with condition, for want of ſuch iſſue, to revert to the donor, and his heirs), againſt him to whom the donee alienates after the iſſue extinct to which it was intailed.

FORMELLA, a certain weight of about ſeventy pounds, mentioned in the ſtatute of weights and meaſures, 51 Hen. III.

FORMER, in *Gunnery*, a round piece of wood fitted to the diameter of the bore of a gun, on which the paper, parchment, or flannel, which is to make the cartridge, is rolled before it be paſted or ſewed.

FORMICA, in *Zoology*. See ANT.

FORMICA, in *Medicine*, a ſpecies of tumid callous wart, of a blackiſh colour, and broad baſe, which appears like the ſtingings of ants; called alſo *myrmicia*.

And hence the name *formica*, which literally denotes an ant: for the like reaſon it is denominated by the Greeks, μυρμηκια.

The name *ant*, *formica*, is alſo given to thoſe minute varicous intumeſcences of the ſmalleſt blood-veſſels, obſerved either in the anus, or the glans of the penis.

Some alſo give the appellation ant, or *formica*, to the miliary herpes.

FORMICA, among *Sportſmen*, the name of a diſeaſe incident to ſpaniels. See SPANIEL.

FORMICA-*leo*, the *ant-lion*, in *Natural Hiſtory*, the name given by authors to a very remarkable ſpecies of inſect, which is, in its perfect ſtate, a winged creature, approaching to the nature of the *libellæ*, or DRAGON-*flies*; but in its prior ſtate of a creeping animal, has a wonderful art and addreſs in catching its prey. It is in this ſtate that it is known by the name of *formica-leo*, as it chiefly feeds upon ants.

It is ſomewhat of the nature of the ſpider in its way of taking its prey, its manner of ſpinning, and in the figure and ſoftneſs of its body; and has, in its general figure, ſomewhat of the appearance of the millepes, or wood-louſe; ſo that ſome have miſtaken it at firſt ſight for that animal. It is of a dirty greyiſh colour marked with ſome black ſpots, and theſe are alſo many points, which when it is viewed with the microſcope, make it reſemble a hedge-hog or porcupine. Its body is compoſed of ſeveral rings, and has thence a wrinkled look. It has ſix legs; four are joined to the breaſt, and the other two to a long part which may be taken for its neck; its head is ſmall and flat, and it has two remarkable horns; theſe are about a ſixth of an inch long, and as thick as a hair, and are hard, hollow, and hooked at the end, like the claws of a cat; at the origin of each of theſe horns, it has a clear and bright black eye, which ſees very diſtinctly, and gives the creature notice to eſcape on ſight of the ſmalleſt object. Mem. Acad. Par. 1704.

He uſually encamps under an old wall, that he may be ſheltered from the injuries of the weather, and he always chuſes a place where the ſoil is compoſed of a fine dry ſand; in this he makes a pit of the ſhape of a funnel, or an inverted hollow cone.

When he has finiſhed his pit, he buries himſelf at the bottom of it in the ſand, leaving no part above ground, but the tips of his two horns, which he expands to the two ſides of the pit. In this condition he lies and waits for his prey, and never comes up after it. When an ant, or any other ſuch creature, chances to walk over the edges of his pit, his ſteps throw down a little of the ſand, which naturally running down to the bottom of the pit, gives the enemy notice of his prey; he then toſſes up the ſand which covers his head, to bury the ant, and bring him down with its returning force to the bottom; and as one attempt cannot be ſufficient to prevent the ant's eſcape, he throws more and more ſand upon him, till he by degrees brings him down to the bottom. All the endeavours of the ant to eſcape, when once it is within the verge of the pit, are in vain; for, as it attempts to climb, the ſand runs away from under its feet, and it ſinks the lower for every attempt. This motion of the ſand alſo informs the enemy where it is, and directs him to throw up more ſand in the right place, which it does till the poor ant falls to the bottom between its horns. It then plunges their points deep into the ant's body, and having ſucked out all the juices of the prey, it throws out the empty ſkin, as far from the hole as it can. This done, it mounts up the edges of its pit, and if they have ſuffered any injury, repairs them with great care, and immediately buries itſelf again in the center to wait for another meal.

The horns of this creature are its only organs for receiving nouriſhment; it never brings any animal that it has ſeized near to its head, but always holds it at the tip of the horns; they therefore plainly ſerve as ſyringes, to draw into its ſtomach the juices of the bodies of the inſects it feeds on; neither is there any mouth or trunk, or any other organ to be diſcovered about its head, which could ſerve to the purpoſe of eating, the head ſeeming only intended to throw away the ſand in forming the pit. The horns of this animal being ſo neceſſary to its life, nature has provided for the reſtoring them in caſe of accidents, and if cut off they are found to grow again.

When the *formica-leo* has lived a proper time in this ſtate, it leaves its pit, and is only ſeen drawing lines and traces on the ſurface of the ſand; after this it buries itſelf under the ſurface, and there incloſes itſelf in a fine web to paſs its transformation into the winged ſtate. This caſe is made of a ſort of ſilk, which the creature ſpins in the manner of the ſpider, and of a quantity of the grains of ſand cemented together by a glutinous humour which flows from its pores. This caſe, however, would be too harſh and coarſe for the body of the creature, and therefore it ſerves only for the outer covering, to defend it from injuries; the creature ſpinning one of pure and incomparably fine ſilk, of a beautiful pearl-colour within it, which covers its whole body.

When the creature has lain ſome time in this caſe, it throws off its outer ſkin, with the eyes, the horns, and every other part neceſſary to its life before, and becomes an oblong nymph, in which a careful eye may trace the form of the fly it is to become. There may be ſeen through its tranſparent covering, new eyes, new horns, wings, and all the other parts of the animal in its perfect ſtate. This nymph makes its way about half out of the ſhell, and remains in this condition, but without farther life or motion, till the perfect fly makes its way out at a ſlit in the back; in this ſtate it much reſembles the libellæ or dragon-flies common about our waters. The male couples with the female in this ſtate only, and Mr. Poupart, to whom the world is indebted for this curious deſcription, is of opinion that the females lay only one egg; but this is very different from the courſe of nature, in the other animals of the ſame claſs. Mem. Acad. Par. 1704.

The common *formica-leo* moves only backward, but Mr. Rouet has obſerved a ſpecies which moves forward in the common way of other animals, and makes no pit of this kind to intrap its prey, but ſeizes other inſects by force. Philoſ. Tranſ. N° 469. p. 466.

FORMICATION, a term uſed among *Builders*, for arching or vaulting.

FORMING is uſed for the act of giving being or birth to any thing.

The word is alſo ſimply uſed for giving the figure to any thing. The potter *forms* his veſſels as he pleaſes. Geometry teaches how to *form* all kinds of figures.

It is alſo uſed for the producing of a thing: thus, the lineaments of the face began to be *formed*.

FORMING *of a ſiege* is the making lines of circumvallation, to fortify the camp, and diſpoſing things for the attack of a place in *form*.

They alſo ſay, to *form* a ſquadron or battalion; meaning, to range the ſoldiers in *form* of a ſquadron, &c.

The term is alſo uſed in ſpeaking of a body of forces, which being out of any order of ſquadrons, battalions, &c. do halt, range themſelves in order, and put themſelves in a condition for the attack.

Forming the line, is drawing up infantry, cavalry, and artillery, into line of battle. See LINE.

Angle FORMING *the flank*. See ANGLE.

FORMING is alſo uſed in grammar, in ſpeaking of certain tenſes of verbs, which are made from others, by a change of certain letters.

The preſent tenſe is *formed* from the infinitive. Compound and derivative words alſo, and even all that have any etymology, are ſaid to be *formed*.

FORMULA, a rule, or model, or certain terms preſcribed and decreed by authority, for the form and manner of an act, inſtrument, proceeding, or the like.

The Roman law was full of *formulas*. The *Formulas* of Marculphus, with M. Bignon's Comment, are in great eſteem.

FORMULA, in *Church-hiſtory* and *Theology*, denotes a formulary or profeſſion of faith.

FORMULA, in *Medicine*, denotes a little form, or preſcription, ſuch as phyſicians direct in extemporaneous practice, in diſtinction from the greater forms, which are the officinal medicines. See PRESCRIPTION.

FORMULARY, a writing, containing the form or formula of an oath, declaration, atteſtation, or abjuration, &c. to be made on certain occaſions.

There are alſo *formularies* of devotion, of prayers, &c. Liturgies are *formularies* of the public ſervice in moſt churches.

FORNA, in *Ichthyology*, a name given by Hildegard, and others, to the trout.

FORNACALIA, or FORNICALIA, a feaſt held among the ancient Romans, in honour of the goddeſs Fornax, or Fornix. It was ſolemnized with ſacrifices, performed before

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before the mouth of an oven, wherein they dried their corn, baked their bread, &c. The *fornicalia* were moveable: the grand curio proclaimed the time of celebration every year on the twelfth of the calends of March. They were firſt inſtituted by Numa: and the QUIRINALIA were inſtituted for the ſake of ſuch as had not kept the *fornacalia*.

FORNAGE, *fornagium*, in *our old Writers*, ſignifies the fee taken by a lord from his tenants, bound to bake in the lord's oven, or for a permiſſion to uſe their own; this was uſual in the northern parts of England.

The word comes from the French *fournage*, which ſignifies the ſame.

FORNICATION, *whoredom*, the act or crime of incontinency between ſingle perſons; for, if either of the parties be married, it becomes adultery.

St. Thomas labours much to prove ſimple *fornication* contrary to the law of nature.

By the ancient law of England, the firſt offence herein was puniſhed with three months impriſonment: the ſecond was made felony, by an act in the time of the late uſurpation. At preſent, doing public penance is the chief puniſhment. See BASTARD.

FORNICATION is ſometimes uſed as a generical term, including all kinds of offences againſt chaſtity.

Its ſpecies are, 1. *Simple fornication*, which is that committed with a proſtitute. 2. *Stuprum*, that committed with perſons of reputation and ſobriety. 3. That committed with relations, called *inceſt*. 4. That committed with married perſons, *adultery*. 5. That committed with perſons conſecrated to God, *ſacrilege*. 6. That committed between perſons of the ſame ſex, *ſodomy*. 7. That committed by perſons on themſelves, *manuſtupration*. And, 8. That committed with beaſts, *beſtiality*.

FORNIX, in *Anatomy*, the extremity of the corpus calloſum, next the cerebellum; which is ſeparated or divaricated into two legs, forming a kind of arch, or *fornix*. See CORPUS *calloſum*.

FORPRISE, in *Law*, an exception, or reſervation: in which ſenſe the word is uſed in the ſtatute of Exon. 14 Edw. I.

We ſtill uſe it in conveyances and leaſes, wherein excepted and *forpriſed* are ſynonimous terms.

FORPRISE is alſo uſed for an exaction: in which ſenſe it amounts to the ſame with forecapium.

Totum pratum, &c. ſine quacunque forpriſa *in excambium pro placca dedit.*

FORRAGE, or FORAGE, proviſion for cattle, of hay, oats, and ſtraw; particularly in war.

Skinner derives the word from *foras agere*, by reaſon they go abroad to ſeek *forrage*: others from *far*, which anciently ſignified any kind of corn or grain. Menage, from *foderagium*, of *foderum*, or *fodrum*, which the Romans uſed in the ſame ſenſe. Cujas and Du-Cange derive it from the German *futter*, *horſe-meat*; Voſſius, from the German *foden*, or *voeden*, *to feed*; Nicod, from *farrago*, which literally ſignifies what we call *forrage*, and figuratively, a mixture of divers kinds of things; Hicks derives it from the Saxon *fodra*, or the Engliſh *fodder*, or the baſe Latin *fodrum*. See FODDER.

In marching, encamping, &c. care muſt be taken, that the cavalry may find *forrage*.

A ration of *forrage* is the portion of hay, ſtraw, and oats, allowed each horſeman, for the ſubſiſtence of his horſe one day; which is twenty pounds of hay, five of ſtraw, and ten pounds of oats. See RATION.

FORRAGE-*guard*, in *Military Affairs*, a detachment ſent out to ſecure the *forragers*. The *forrage*-guard is poſted at all places, where the enemies parties may come to diſturb the *forragers*. This guard is likewiſe called the *covering party*, and marches generally the night before the *forraging*, that they may be poſted in the morning before the *forragers* come. The guard conſiſts both of horſe and foot, and muſt ſtay at their poſt till the *forragers* be all come off the ground.

FORSES, *cataduꝑæ*, a term uſed in Weſtmoreland for water-falls.

FORSKHOLEA, in *Botany*, a genus of the *decandria pentagynia* claſs, with a five-leaved calyx extending beyond the corolla, ten ſpatulated petals, no pericarpium, and five ſeeds connected by a woolly down.

FORSTAL. } See { FORESTAL.
FORSTALLING. } { FORESTALLING.

FORT, a little caſtle or fortreſs; or a place of ſmall extent, fortified by art, or nature, or both.

A *fort* is a work encompaſſed round with a moat, rampart, and parapet, to ſecure ſome high ground, or paſſage of a river; to make good an advantageous poſt; to fortify the lines and quarters of a ſiege.

FORT, *field*, otherwiſe called *Fortin* or *Fortlet*, and ſometimes *Sconce*, is a ſmall *fort*, built in haſte, for the defence of a paſs or poſt; but particularly conſtructed for the defence of a camp in the time of a ſiege, where the principal quarters are uſually joined, or made to communicate with each other, by lines defended by fortins and redoubts. Their figure and ſize are various, according to the nature of the ſituation, and the importance of the ſervice for which they are intended. Some are fortified with baſtions, and ſome with demi-baſtions. A *fort* differs from a CITADEL, as this laſt is erected to command and guard ſome town; and from a redoubt, as it is cloſed on all ſides; whereas a redoubt is open on one ſide. *Forts* are moſt commonly made ſquare (ſee *Tab. Fortification, fig.* 5.) eſpecially when the paſs they are to guard is of any conſequence, or the place may eaſily be approached: the ſides of this ſquare are a hundred toiſes, the perpendicular ten, and the faces twenty-five; the ditch about this *fort* may be from ten to twelve toiſes; the parapet is to be made of turf, and fraiſed, and the ditch paliſſadoed when dry. There may be made a covert-way about this *fort*, or elſe a row of paliſades might be placed on the outſide of the ditch. A *ſquare fort* may be fortified in the following manner: having inſcribed the ſquare in a circle, divide each of its ſides, A B, B D, &c. into two equal parts in the points F, M, &c. from the center E draw an indefinite line E F; from the center draw alſo the lines E A, E B, E D, E C, to the angles of the ſquare; divide the ſide A B into eight equal parts, and ſet off one of theſe parts from F to G, and from G draw the lines of defence A G, B G; divide another ſide of the ſquare into ſeven equal parts, and ſet off two of thoſe parts from A to K, and from B to L, which will be the faces of the baſtions; take the diſtance K L in your compaſſes, and ſet it off on the lines of defence from K to H, and from L to I, and draw H I, which will be the curtain, and the lines K I, L H, will be the flanks. Or, it may be otherwiſe fortified thus: let the ſide A A (*fig.* 6.) be a hundred and thirty fathoms; the demi-gorge A B, twenty-five fathoms; and with the compaſſes opened to the length of the pinched line B C B, which is the diagonal of two ſides, from each of which there has been taken twenty-five fathoms, upon the extremity oppoſed to the angle which they form, deſcribe two arcs above the angle of the figure, alternately making uſe of the points B for centers; then draw lines from the points of interſection of the arcs D, to the point which ſerved for centers B, upon which points B, raiſe the flanks B E perpendicular to the oppoſed lines of defence B D.

FORT *paine, & dure.* See PAINE.

FORT *royal* is a *fort*, whoſe line of defence is at leaſt twenty-ſix fathoms long.

FORT, *ſtar*, is a ſconce or redoubt, conſtituted by re-entering and ſaliant angles, having commonly from five to eight points, and the ſides flanking each other.

To deſcribe a ſtar-fort. Deſcribe a hexagon *a* B C *d e f*; (*fig.* 7.) divide one of its ſides into four equal parts; and on the center of this ſide raiſe the perpendicular D A equal to one fourth of the ſide B C. From the point A draw the faces A C and A B, and let the ſame operations be performed with reſpect to the other ſides of the hexagon.

FORTS are ſometimes made *triangular*, only with half baſtions, as in *fig.* 8. This, as well as the ſquare and pentagonal *fort*, (*fig.* 9. and 10.) may be deſcribed in the following manner. Parallel to the inner figure, whether it be a triangle, ſquare, or pentagon, whoſe ſide A B may be ſuppoſed about eighteen yards, deſcribe an outward figure at the diſtance of about four or five yards from it, or farther, if neceſſary, whoſe ſides are E D, E F, &c. Divide each ſide, as E D, E F, &c. into three equal parts, one of which is E I, F L, &c. and in theſe ſides prolonged, take D G, E H, &c. each equal to one of thoſe three parts. From the points G, H, &c. thus found, draw the lines of defence to the angles of the outward figure, as H D, &c. and from the points I, L, &c. draw the flanks I K, L M, &c. perpendicular to the ſides E D, E F, meeting the lines of defence in K, M, &c. Or the flanks may be drawn, by continuing the line D I towards E, and taking I P equal to twice I E; from P as a center, with the radius P I, cut the line of defence in K, and draw the flank I K. Then to each face H K, flank K I, and curtin I G, make a parapet of about ſeven feet thick, or more if neceſſary, expreſſed in the figures, by drawing lines at that diſtance on the inſide of the ſeveral parts. Leave a proper berm of about four or five feet broad, and make a ditch about five or ſix yards wide, whoſe outer line or counterſcarp is to be parallel to the faces and curtins only. A *fort* thus conſtructed is more capable of defence than one without flanks; for the curtin I G is defended by the flank I K; and the face H K has ſome defence from the part D G. In the conſtruction of triangular *forts*, (*fig.* 11.) inſtead of making half baſtions at the angles, whole ones are placed in the middle of the ſides. The gorges of theſe baſtions may be from twenty to twenty-four toiſes, when the

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the ſides are from a hundred to a hundred and twenty; the flanks are perpendicular to the ſides, from ten to twelve toiſes long, and the capitals from twenty to twenty-four. If the ſides happen to be greater or leſs, the parts of the baſtions are likewiſe made greater or leſs in proportion: the ditch round this *fort* may be ten or twelve toiſes wide. The ramparts and parapets of theſe works are commonly made of turf, and the outſide of the parapet fraiſed. *Forts* are often made of various figures, regular or irregular, and ſometimes in the form of a ſemi-circle, eſpecially when they are ſituated near a river, ſea, or at the entrance of a harbour; by which figure they are able to fire at the ſhips on all ſides. When a *fort* is to be built on a neck of land, formed by the confluence of two rivers, or in the windings of a river, in order to prevent an enemy from tranſporting any thing by water, or to prevent their ſhips paſſing that way, the figure of the *fort* muſt be adapted to the ſituation, in ſuch a manner, that there may be no place for landing troops out of the reach of the fire of ſome work or other; and the ſide next to the land ſhould always be better fortified than the other parts near the river, as being more liable to an attack. There are two principal errors committed in the conſtruction of *forts* near the ſea, or navigable rivers, which ſhould be carefully guarded againſt; the one is, that of making the parapet too low, ſo that perſons behind it may be fired upon from the round top of a maſt, by which the gunners are obliged to abandon their guns, and to ſave themſelves by flight: to remedy this inconvenience, the parapet ſhould be nine or ten feet high, and the batteries may be covered above by making an arch over every piece left open behind to let out the the ſmoak, or with planks, like ſheds, over which may be ſcattered earth or dung about a foot and a half thick, to prevent the wood from taking fire.

The other fault is, leaving *forts* or batteries open behind, or very little fortified towards the land, ſo that the enemy may land men in the dark and ſurprize them, by which the guns placed in them become not only uſeleſs, but ſerve rather to deſtroy them. A *fort*, or battery, therefore, ſhould be fortified all round with a good rampart and ditch, at leaſt, or with an addition of outworks, if the place is of any importance: the rampart ſhould be fraiſed, and the ditch have a row of paliſades planted in the middle of it, if it be dry. In the conſtruction of all *forts*, it ſhould be remembered, that the figure of feweſt ſides and baſtions, that can probably anſwer the propoſed defence, is always to be preferred; as works on ſuch a plan are ſooner executed, and with leſs expence; beſides, fewer troops will ſerve, and they are more readily brought together in caſe of neceſſity.

FORTAMENTE, in the *Italian Muſic*, the ſame with FORTE.

FORTE, in the *Italian Muſic*, directs to play ſtrong and loud.

FORTE FORTE, or F. F. ſignifies a degree louder or ſtronger than *forte*.

FORTE, *piu*, the ſame as *forte forte*.

FORTERESSE, FORTRESSE, or FORTRESS, a general name for all FORTIFIED *places*, whether made by nature or art. Such are fortified towns, caſtles, citadels, forts, towers, redoubts, ſconces, &c.

FORTIFICATION, called alſo *military architecture*, is the art of *fortifying* or ſtrengthening a place, by making works around the ſame, to render it capable of being defended by a ſmall force, againſt the attacks of a more numerous enemy.

Some authors go back to the beginning of the world, for the author and origin of military architecture. According to them, God himſelf was the firſt engineer; and Paradiſe, or the garden of Eden, was the firſt fortreſs. Cain improved on the hint, in building the firſt city, Gen. iv. 17. After him came Nimrod, Gen. x. 10. Then Semiramis, as Poliænus relates, Stratagem. lib. viii. cap. 27. The Canaanites, Numb. xiii. 19. Deut. i. 28. David, 2 Sam. v. 9. Solomon, 2 Chron. viii. 4. Rehoboam his ſon, 2 Chron. xi. 5. and the other kings of Judah and Iſrael; and at length the Greeks and Romans. Vitruvius, lib. x. cap. ult. and lib. i. cap. 5.

Such is the ſeries of thoſe who *fortified* places; to which might be added Pharaoh, the perſecutor of the Iſraelites, who built the cities of Pithom and Raamſes, Exod. i. 11.

The progreſs of *fortification*, founded firſt in neceſſity, has been, like that of other important and uſeful arts, gradual. When villages and towns were firſt formed, it was found neceſſary, for the common ſafety, to encompaſs them with walls and ditches, in order to prevent all violence and ſudden ſurprizes from their neighbours: when offenſive weapons were invented, walls were made with loop-holes at proper diſtances, in order to ſcreen the defenders againſt the arrows of the aſſailants; but finding, that as ſoon as the enemy got cloſe to the walls, they could from no part be diſcovered or repulſed, they added ſquare towers at proper diſtances from each other, ſo that every part of the wall might be defended by the adjacent ſides of the towers. However, this manner of incloſing towns was found to be imperfect, becauſe there remained ſtill one of the faces of the towers which fronted the field, that could not be ſeen from any other part, and, therefore, could not be defended. To remedy this, they made the towers round inſtead of ſquare, imagining this figure to be the ſtrongeſt for reſiſting the battering engines, and likewiſe to be better defended from the other parts of the wall. Nevertheleſs, part of theſe towers remained unſeen, and incapable of being defended, which made them change them again into ſquares as before; but, inſtead of preſenting a face to the field as formerly, they preſented an angle; and thus they obtained ſuch a diſpoſition of their works, that no part could be attacked without being ſeen or defended by ſome other part.

But how ancient ſoever the ſurrounding of cities with walls, towers, &c. may be, the name *fortification*, and the art now underſtood thereby, are of no very old ſtanding.

Theſe have had their riſe ſince the invention of cannons; the terrible effects whereof rendered it neceſſary to change the ſtructure of the ancient walls, and to add ſo many things thereto, that thoſe changes were thought enough to conſtitute a new art, which was called *fortification*, on account of the ſtrength it afforded thoſe cities, to defend them againſt an enemy.

The period, in which the modern practice of military architecture may be ſuppoſed to have taken its riſe, was that in which the old circular towers were firſt converted into BASTIONS, about the year 1500.

The firſt authors who have written of *fortification*, conſidered as a particular formed art, are La Treille, Alghiſi, Marchi, Paſino, Ramelli, Cataneo, and Speckle, who, as Mr. Robins ſays, was one of the greateſt geniuſes that has applied to this art. He was architect of the city of Straſburgh, and died in the year 1589. He publiſhed a treatiſe of *fortification* in German, which was reprinted at Leipſic in 1736. Robins's Math. Tracts, vol. i. preface, p. 9.

After them Errard, engineer to Henry the Great of France; Stevinus, engineer to the prince of Orange; Marolois, the chevalier de Ville, Lorini, Coehorn, the count de Pagan, and the marſhal de Vauban; which laſt two noble authors have contributed greatly to the perfection of the art. To whom we may add Scheiter, Mallet, Belidor, Blondel, Muller, &c.

From the idea and office of *fortification*, ſome general fundamental rules or axioms may be drawn: as,

1. That the manner of *fortifying* ſhould be accommodated to that of attacking; ſo that no one manner can be aſſured always to hold, unleſs it be aſſured the manner of beſieging be incapable of being altered; and that to judge of the perfection of a *fortification*, the method of beſieging at the time when it was built muſt be conſidered.
2. All the parts of a *fortification* ſhould be able to reſiſt the moſt forcible machines uſed in beſieging, and they ſhould be equally ſtrong on all ſides.
3. A *fortification* ſhould be ſo contrived, as that it may be defended with as few men as poſſible; which conſideration, when well attended to, ſaves a vaſt deal of expence.
4. That the defendants may be in the better condition, they muſt not be expoſed to the enemy's guns and mortars; but the aggreſſors muſt be expoſed to theirs.

Hence, 5. All the parts of a *fortification* ſhould be ſo diſpoſed, as that they may defend each other: in order to this, every part there is to be flanked, i. e. capable of being ſeen and defended from ſome other; ſo that there be no place where an enemy can lodge himſelf, either unſeen, or under ſhelter.

6. All the campaign around muſt lie open to the defendants; ſo that no hills or eminence muſt be allowed, behind which the enemy might ſhelter himſelf from the guns of the *fortification*; or from which he might annoy them with his own.

The fortreſs, then, is to command all the place round about; conſequently the out-works muſt all be lower than the body of the place.

7. No line of defence is to be above point-blank muſquet-ſhot, which is from one hundred and twenty to one hundred and fifty fathom.
8. The acuter the angle at the center, the ſtronger is the place; as conſiſting of the more ſides, and conſequently more defenſible.
9. All the defences ſhould be as nearly direct as poſſible.

Such are the general laws and views of *fortification*: the particular ones, reſpecting each ſeveral work or member thereof, will be delivered under their proper articles. See BASTION, and FORTIFIED *place*.

FORTIFICATION, *the art of*, may be diſtinguiſhed into two parts, viz. the *elementary* or *theoretical*, and *practical*.

FORTI-

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FORTIFICATION, *elementary* or *theoretical*, conſiſts in tracing the plans and profiles of a *fortification* on paper, with ſcales and compaſſes; and in examining the ſyſtems propoſed by different authors, in order to diſcover their advantages and diſadvantages.

FORTIFICATION, *practical*, conſiſts in forming a project of a *fortification* according to the nature of the ground, and other neceſſary circumſtances, tracing it on the ground, and executing the project, together with all the military buildings, ſuch as magazines, ſtore-houſes, bridges, &c.

FORTIFICATION again is either *offenſive* or *defenſive*. *Offenſive fortification* is the ſame with the ATTACK of a place, and is the art of making and conducting all the different works in a SIEGE, in order to gain poſſeſſion of the place.

FORTIFICATION, *defenſive*, or DEFENCE, is the art of defending a town that is beſieged, with all the advantages which the *fortification* of it will admit.

FORTIFICATION is alſo uſed for the place *fortified*; or the ſeveral works raiſed to defend and flank it, and keep off the enemy.

All *fortifications* conſiſt of lines and angles, which have various names, according to their various offices.

The principal angles are thoſe of the *center*, the *flanking* angle, *flanked* angle, angle of the *epaule*, &c.

The principal lines are thoſe of *circumvallation*, of *contravallation*, of the capital, &c. See each in its place.

Fortifications are divided into *regular*, and *irregular*, and again into *durable* and *temporary*.

FORTIFICATION, *regular*, is that wherein the baſtions are all equal; or that which is built in a regular polygon, the ſides and angles whereof are generally about a muſquet-ſhot from each other.

In a regular *fortification*, the parts being all equal, have the advantage of being equally defenſible; ſo that there are no weak places.

FORTIFICATION, *irregular*, is that wherein the baſtions are unequal, and unlike; or the ſides and angles not all equal, and equidiſtant.

In an irregular *fortification*, the defence and ſtrength being unequal, there is a neceſſity for reducing the irregular figure, as near as may be, to a regular one; i. e. inſtead of inſcribing it in a circle, it ſhould be inſcribed in an oval, ſo that one half may be ſimilar and equal to the other half.

And as the irregularity of a figure depends on the quantity of angles and ſides; the irregularity of a *fortification* ariſes either from the angles being too ſmall, or the ſides being too long, or too ſhort.

Conſequently an irregular figure being propoſed to be fortified; all the angles, with the quantity of the ſides, muſt be found, to be able to judge how it is to be fortified. See *Tab.* VI. *Fortification, fig.* 36. which repreſents a *fortification* inſcribed in an oval.

In this caſe the ſides CD, GH, on the flat parts, are ſtronger than the ſides AB, EF, on the narrow parts, ſuppoſing all the exterior ſides equal, and the place equally fortified. When the angles BCD, CDE of the polygon are very great, and the beſieger comes within a ſmall diſtance of the works, he cannot approach nearer, without being ſeen in front, except by a direct ſap, with traverſes; and as this way of approaching preſents but a ſmall front, the beſieged, who have a much larger, may oppoſe with peculiar advantage: whereas, if the angles HAB, ABC of the polygon, are very ſmall, the beſiegers may carry their approaches to the counterſcarp itſelf, and have always a larger front than the beſieged; and, as the beſiegers muſt extend their approaches to three fronts, whether they are ſmall or large, the work of the approaches before the front BCDE will be to the work before the front HABC, as the line BE is to the line HC, nearly, i. e. as the greater axis of the oval is to the leſs; and therefore the front CD, on the flat ſide, is ſtronger than the front AB, on the narrow ſide; conſequently, the longer CD is, ſo that the lines of defence are within the reach of muſket-ſhot, and the angles BCD, CDE, are the ſame, the ſtronger will the front be; ſince the works become more ſpacious, hold more troops to defend them, and the beſiegers are obliged to extend their trenches farther. Moreover, the greater the angles of the polygon BCD, CDE are, the exterior ſides being the ſame, the ſtronger will be the front CD; becauſe the length of the line BE increaſes, and the extent of the beſiegers approaches in proportion; and, therefore, the ſtrength of a *fortification* increaſes in proportion to the number and length of its ſides; ſo that a dodecagon is ſtronger than an octagon, when the length of their ſides is the ſame. However, as it is found difficult to inſcribe a polygon in an ellipſe or oval, the following more eaſy method will anſwer the purpoſe. Reduce the ſpot of ground to be fortified to the figure ACEG (*fig.* 36.) and draw BE, AF, parallel to each other; draw CH, DG, perpendicular to theſe lines, and at equal diſtance from the points B and E, and let their interval be equal to that of the lines BE and AF; then, draw DC, GH, parallel to AF and BE, and equally diſtant from them; and from their interſections C, D, G, H, with DG, CH, as centers, deſcribe arcs, with a radius equal to CD or GH, ſo as to interſect the lines AF, BE, in A, B, E, F; join the points A, B, E, F, and A B C D E F G H, will be an oblong octagon, having one half ſimilar and equal to the other half. If a hexagon be to be deſcribed, inſtead of drawing the two lines CH, DG, one will be ſufficient; in a decagon there muſt be three, and four in a dodecagon. If the ſides cannot eaſily be made equal, then the ſides AB, EF, on the narroweſt part of the polygon, ſhould be the longeſt, becauſe it is the weakeſt. But when the figure cannot in any reſpect be made regular, the ſtrength of each ſide muſt be eſtimated according to the works a beſieger is obliged to make in the attack, and according to the obſtacles he meets with in his approaches. Muller's Elements of Fort. p. 146, &c.

FORTIFICATION, *marine*, is ſometimes uſed by way of diſtinction from *land fortification*, and denotes the art of raiſing works fit for the defence of a harbour againſt the attacks of any kind of ſhipping; but the works proper for this purpoſe depend in a great meaſure on the principles employed in the *fortification* of towns. However, attention ſhould be given to the ſituation of roads or harbours in contriving works for their defence: e. gr. when a town lies open to the ſea, on a curved, or ſtrait bold ſhore, and has before it a ſufficient depth of water and good anchorage, the ſhips, in this ſituation, may be well defended by forts built near the water's edge on each ſide of the anchoring place, ſo contrived as to have two or three batteries, one higher than the other, and furniſhed with a ſufficient number of cannon, carrying ſhot from twenty-four to forty-eight pounds. A town, in this ſituation, may be defended by a rampart, or wall, well flanked, built along the ſhore, beſide the *fortifications* on the land ſide. The works along the ſhore ſhould be carried ſo near to the water's edge, that troops, attempting to land under the cannon of a fleet, might not find ground on which to intrench themſelves. Farther, when a harbour, being a bay, has a ſhoal or ſmall iſland lying before its entrance, a ſtrong fort ſhould be built upon the iſland, in a place where it can command the entrance on both ſides, if the iſland be not too large; otherwiſe two or more forts ſhould be erected in ſuch places as may command the avenues to the bay; other forts ſhould alſo be raiſed on the moſt convenient points of land, forming the mouth of the bay. Again, when the harbour is in a bay, whoſe points, forming the entrance, ſtretch into the ſea, and approach one another within cannon ſhot, ſuch a harbour may be fortified by building on both ſides of its entrance one or more forts; and, if poſſible, a fort ſhould alſo be built within the harbour's mouth in ſuch a manner, that its cannon can rake the ſhipping fore and aft as they come in.

When a harbour is formed by a cluſter of iſlands, it is eaſily fortified, if the channel between the iſlands is not too wide for the command of cannon from one or both ſhores; but if it be too wide, the ſhipping that rides there muſt be defended from the batteries on the ſhore.

When the harbour lies in an inlet, or river, ſome miles above its mouth, a fort built at each point of the entrance, when the paſſage lies ſtrait, and can be commanded from ſide to ſide, and two others between them and the harbour, but not directly oppoſite, unleſs the breadth of the channel requires it, will be a proper ſecurity for the ſhipping in ſuch a harbour; and if the channel or river is winding, the forts ſhould be built where they can command a reach at leaſt, or be ſo placed at the bends, as to command two adjacent reaches. See FORTS, and Robertſon's Treat. of Marine Fort. part ii. § 2. For the *fortification* of harbours by booms, ſee BOOM.

FORTIFICATION, *durable*, is that built with deſign to remain a ſtanding ſhelter for ages. Such are the uſual *fortifications* of cities, frontier places, &c.

FORTIFICATION, *temporary*, is that erected on ſome emergent occaſion, and only for a little time.

Such are field-works, caſt up for the ſeizing and maintaining a poſt, or paſſage; thoſe about camps, &c. as circumvallations, contravallations, redoubts, trenches, batteries, &c.

The methods of *fortifying*, that have been invented, are various; and new methods continue ſtill to be propoſed. We ſhall here ſubjoin ſome of the principal, and of thoſe which chiefly obtain through Europe; ſuch as thoſe of Coehorn, Pagan, Vauban, Scheiter, &c. from which all the reſt are eaſily conceived.

FORTIFICATION, *according to the Dutch method*, or *the ſyſtem of Marolois*, is that which, making the flank perpendicular

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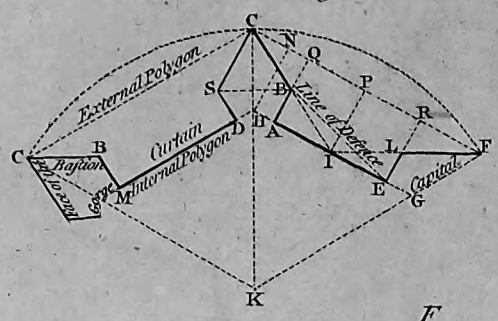
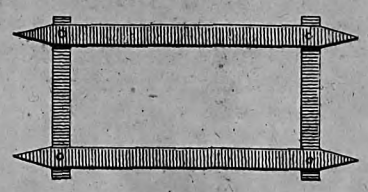
FORTIFICATION.

BASTION Fig. 1.



BLIND Fig. 1, N°. 2.



DEMI-LUNE

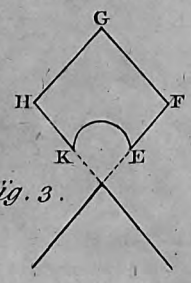


Fig. 3.

FASCINES.

Fig. 4.

F O R T

Fig. 5.

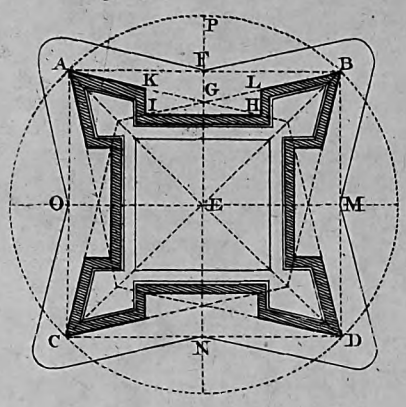


Fig. 6.

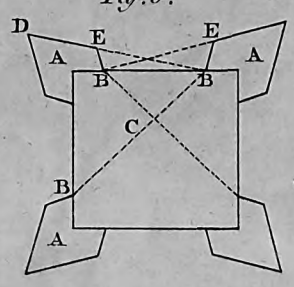


Fig. 7.

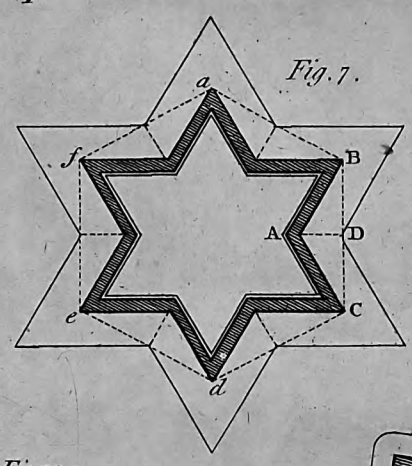


Fig. 11.

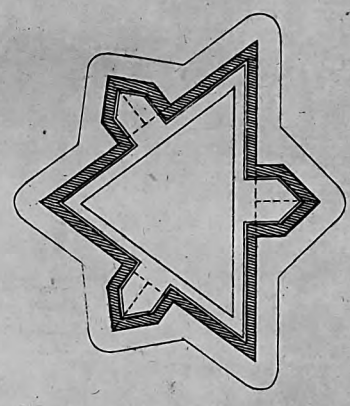
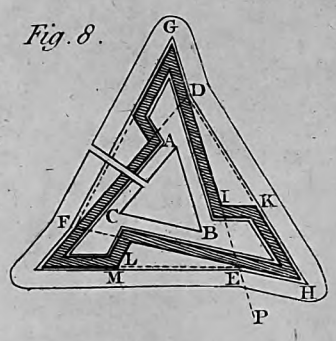


Fig. 8.



MAROLOIS' METHOD

Fig. 9.

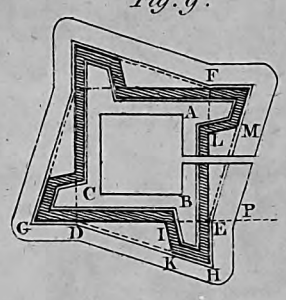
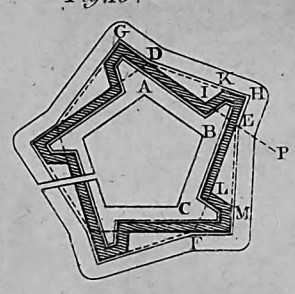
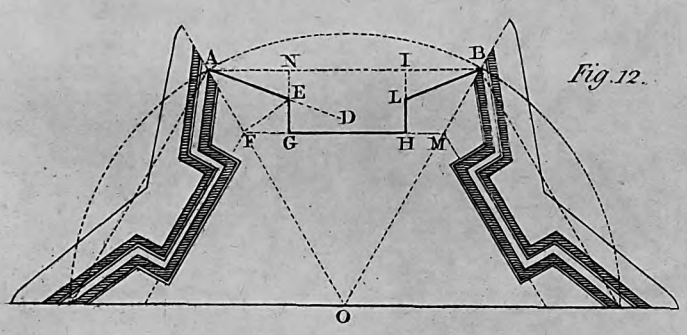


Fig. 10.



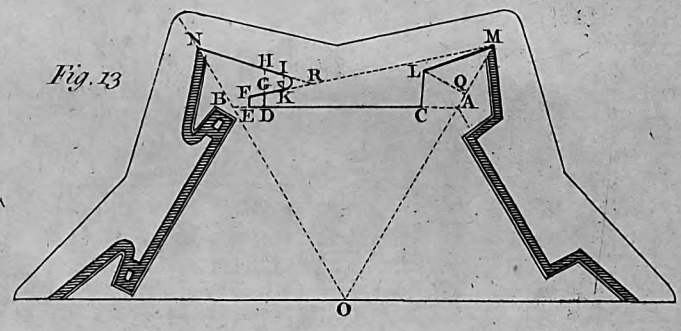
DE VILLE'S METHOD

Fig. 12.



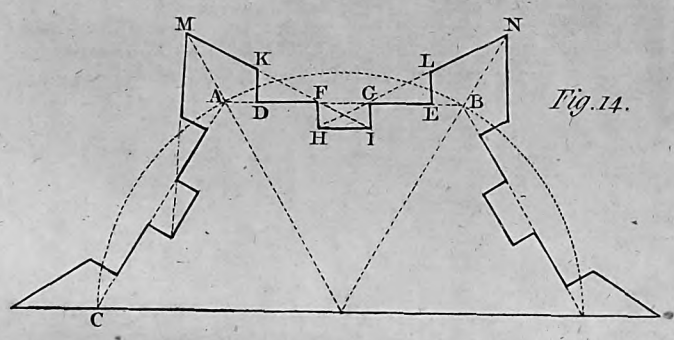
REINFORC'D ORDER

Fig. 13



VAUBAN'S FIRST METHOD

Fig. 14.



CHEVAL de frise.

Fig. 15.

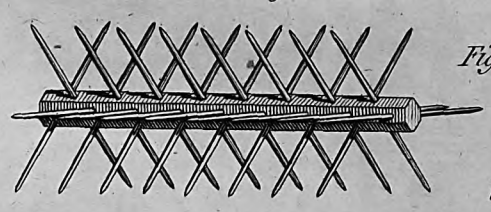
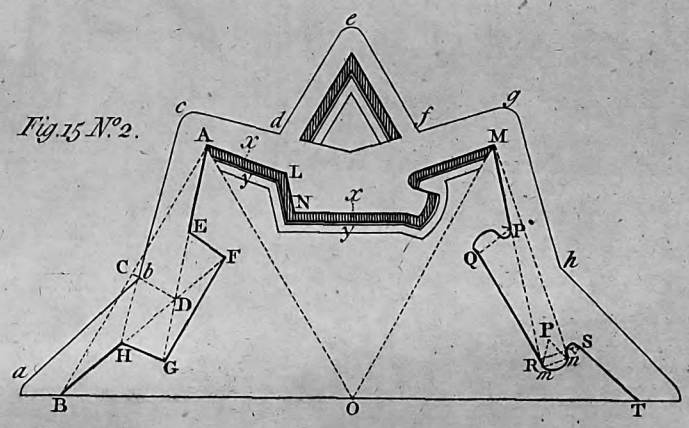


Fig. 15 N°. 2.



VAUBAN'S SECOND METHOD

Fig. 16.

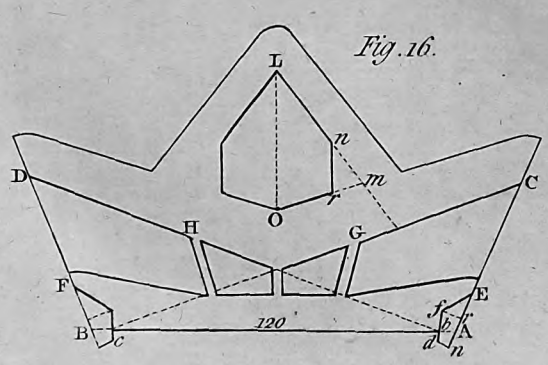
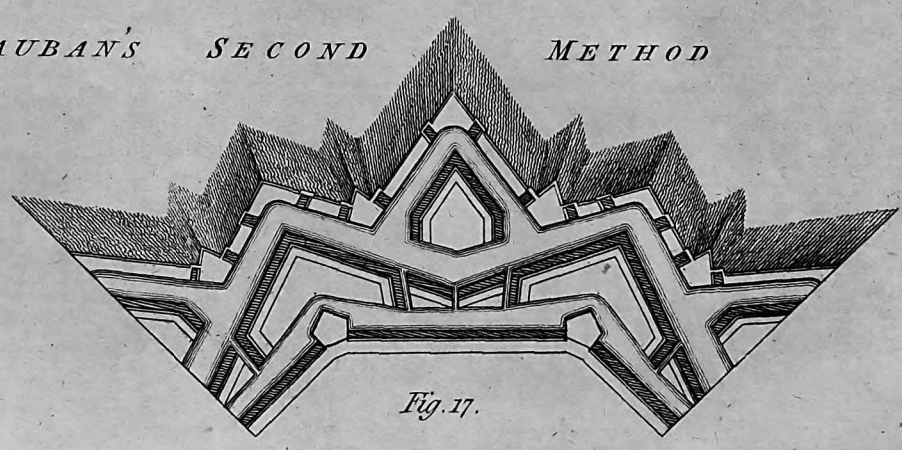


Fig. 17.



I. Taylor sculp.

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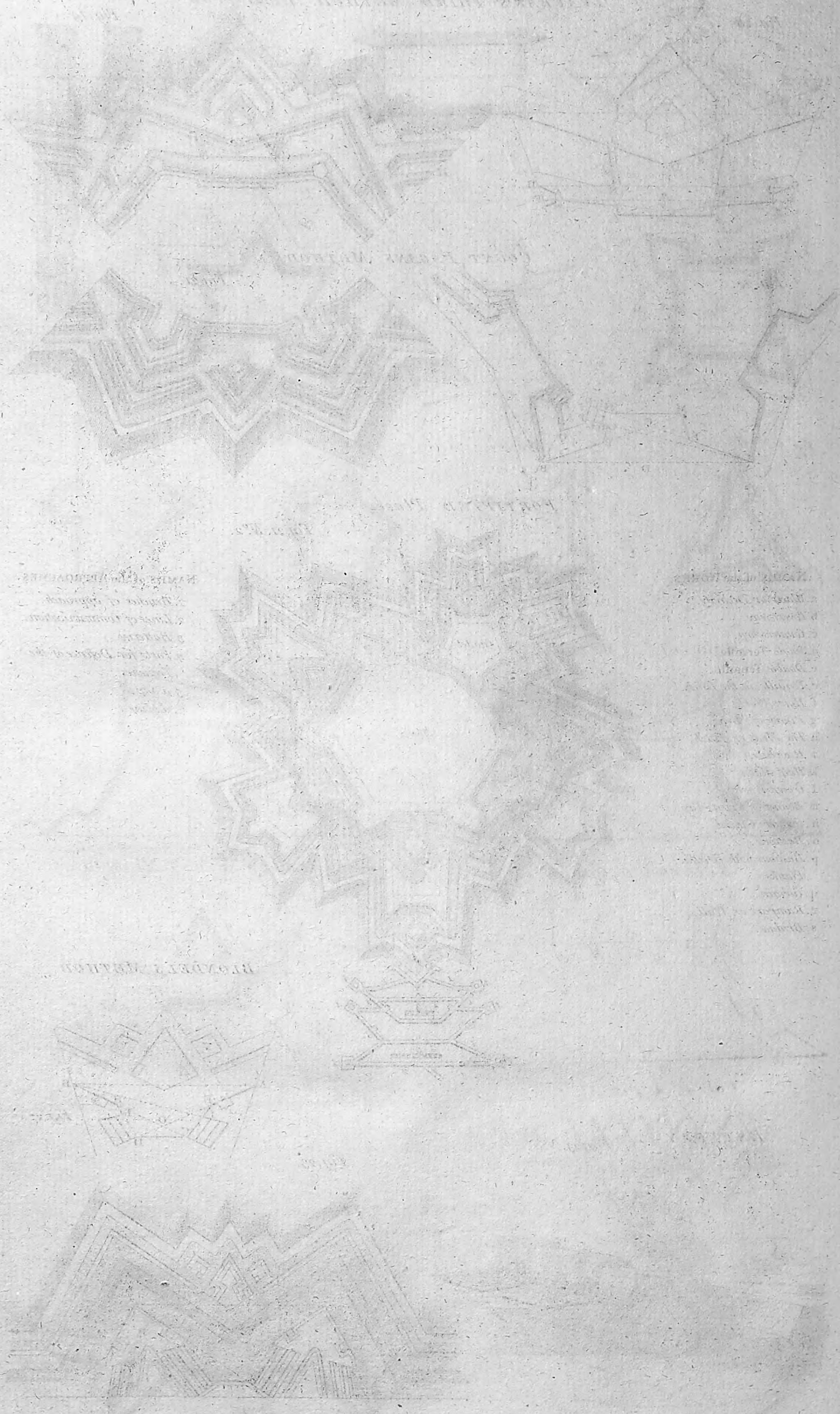

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FORTIFICATION *Tab. II.*

VAUBAN's THIRD METHOD.

Fig. 18.

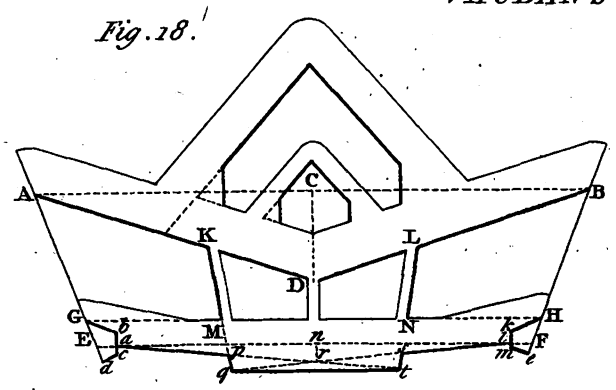
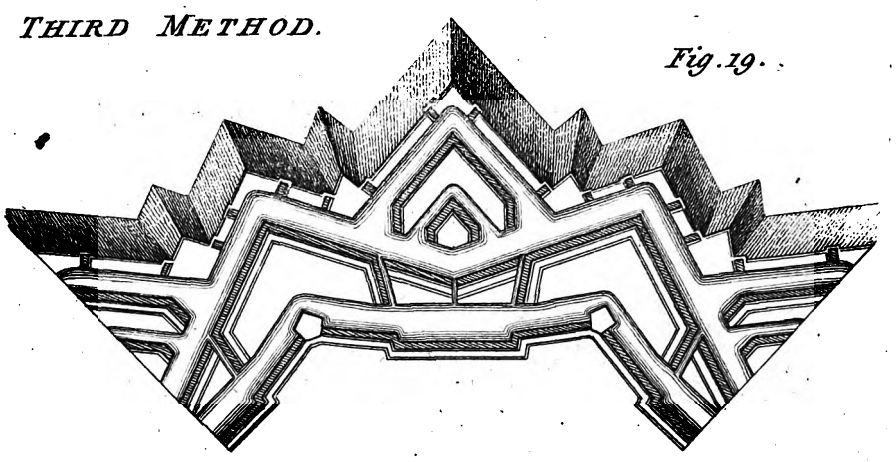


Fig. 19.



COUNT PAGANS METHOD.

Fig. 20.

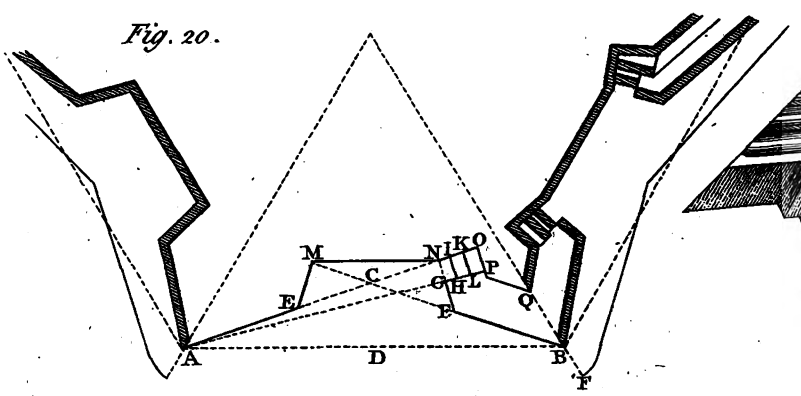
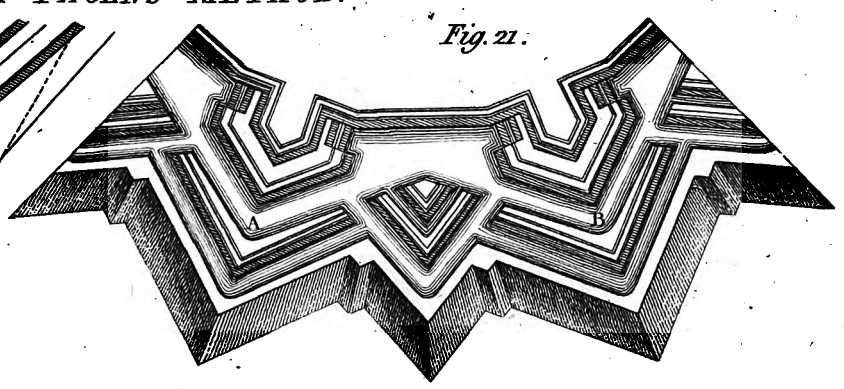
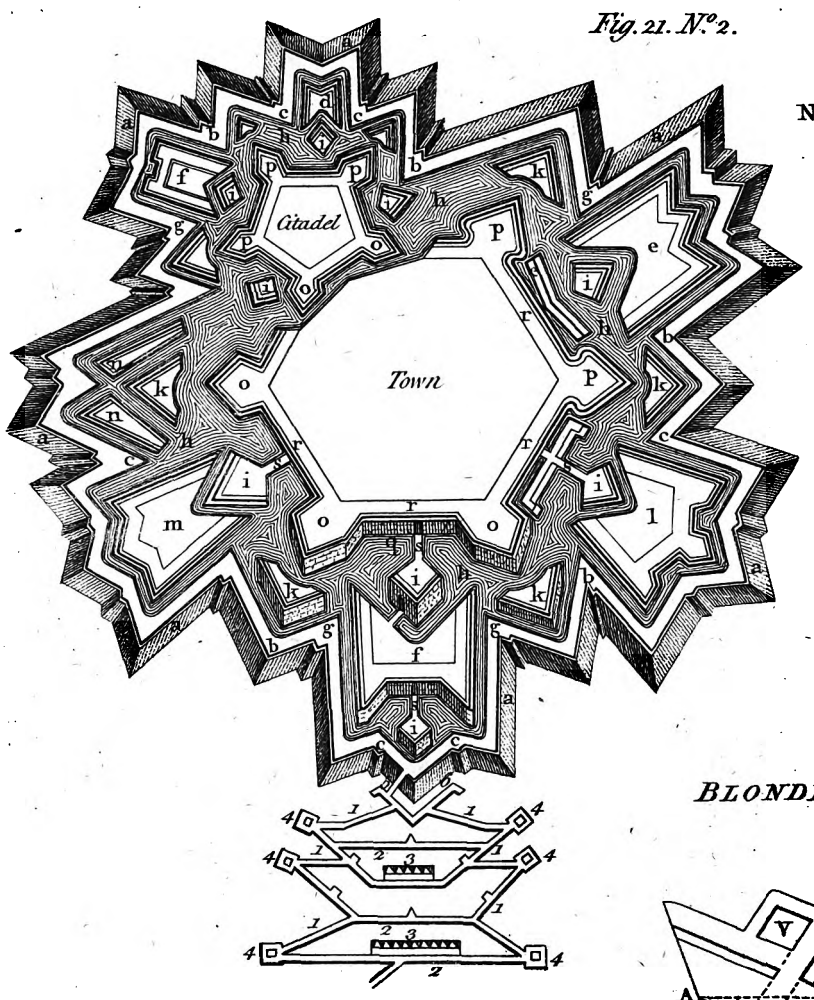


Fig. 21.



FORTIFIED Place

Fig. 21. N°2.



NAMES of the WORKS.

a. *Glacis or Declivity.*
b. *Covert-way.*
c. *Counterscarp.*
d. *Single* Tenaille.
e. *Double* Tenaille.
e. *Tenaille in the Ditch.*
f. *Horn Work.*
g. *Places of Arms.*
h. *The Moat or Ditch.*
i. *Ravelins.*
k. *Half Moons.*
l. *Crown Work.*
m. *Bonnet or Priests Cap.*
n. *Counter Guard.*
o. *Bastions.*
p. *Bastions with Circular Flanks.*
q. *Curtain.*
r. *Rampart or Wall.*
s. *Bridges.*

NAMES of the APPROACHES.

1. *Trenches of approach.*
2. *Lines of Communication.*
3. *Batteries.*
4. *Forts for Defence of the Trenches.*
5. *a Sap.*
6. *a Mine.*

BLONDEL's METHOD.

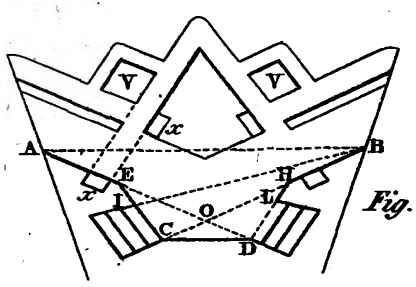


Fig. 22.

BATTERY

Fig. 23. N°2.

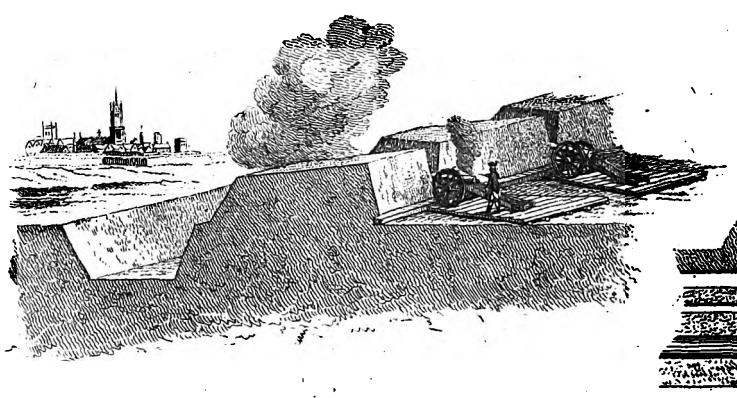
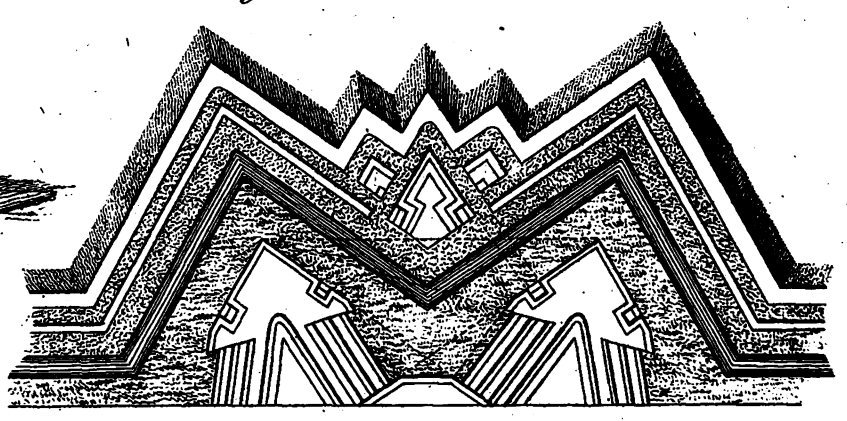


Fig. 23.



I. Taylor sculp.

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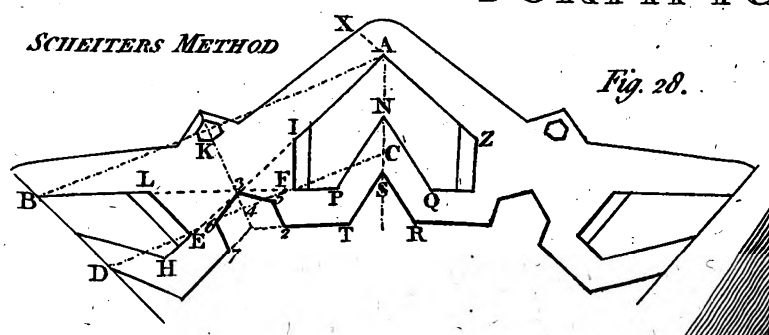
FORTIFICATION. *Tab: IV.*

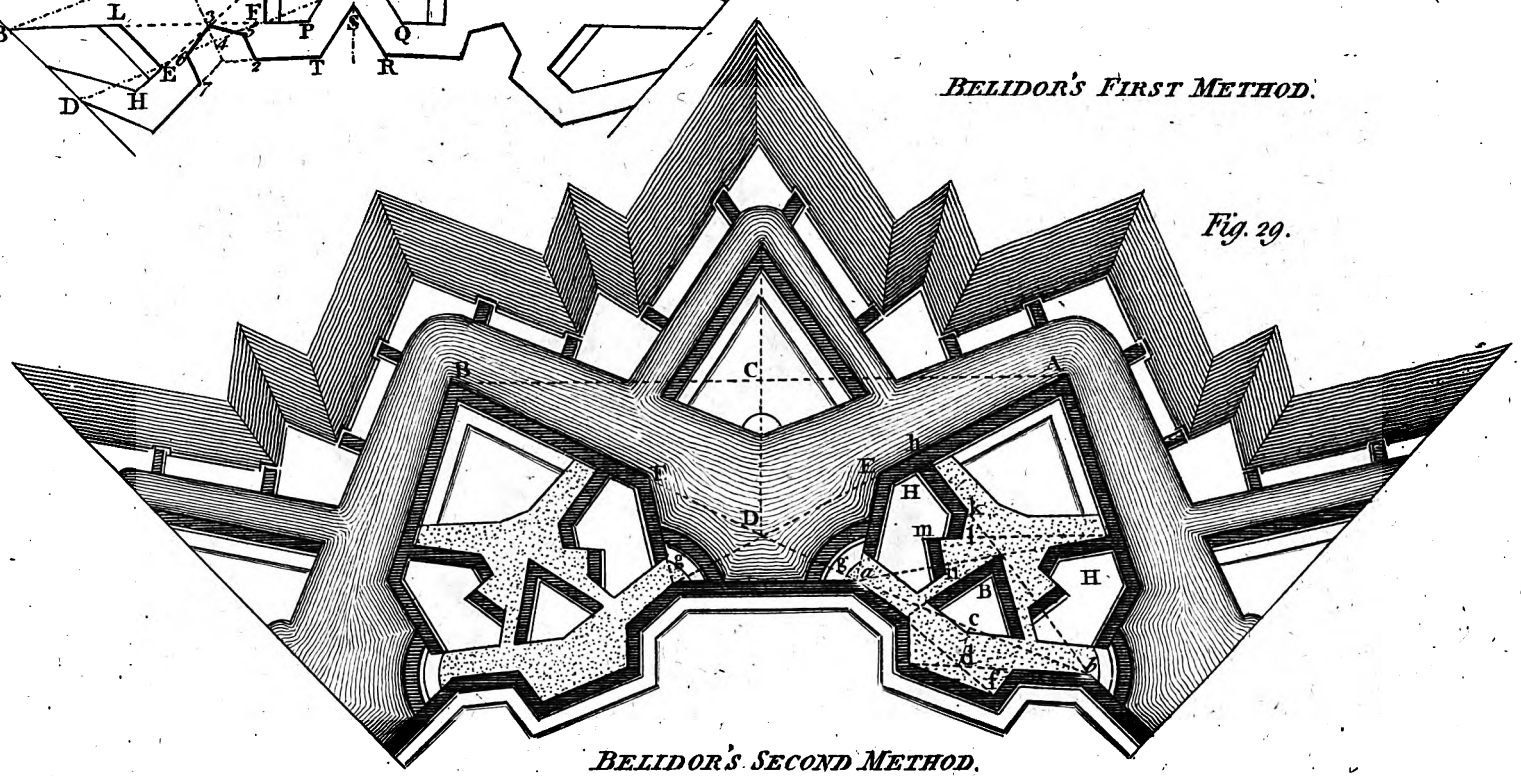
SCHEITERS METHOD

Fig. 28.



BELIDOR'S FIRST METHOD.

Fig. 29.



BELIDOR'S SECOND METHOD.

Fig. 30.

Fig. 31.

BELIDOR'S THIRD METHOD.

I. Taylor Sculp.

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FORTIFICATION *Tab.V.*

General View of FORTIFICATION.

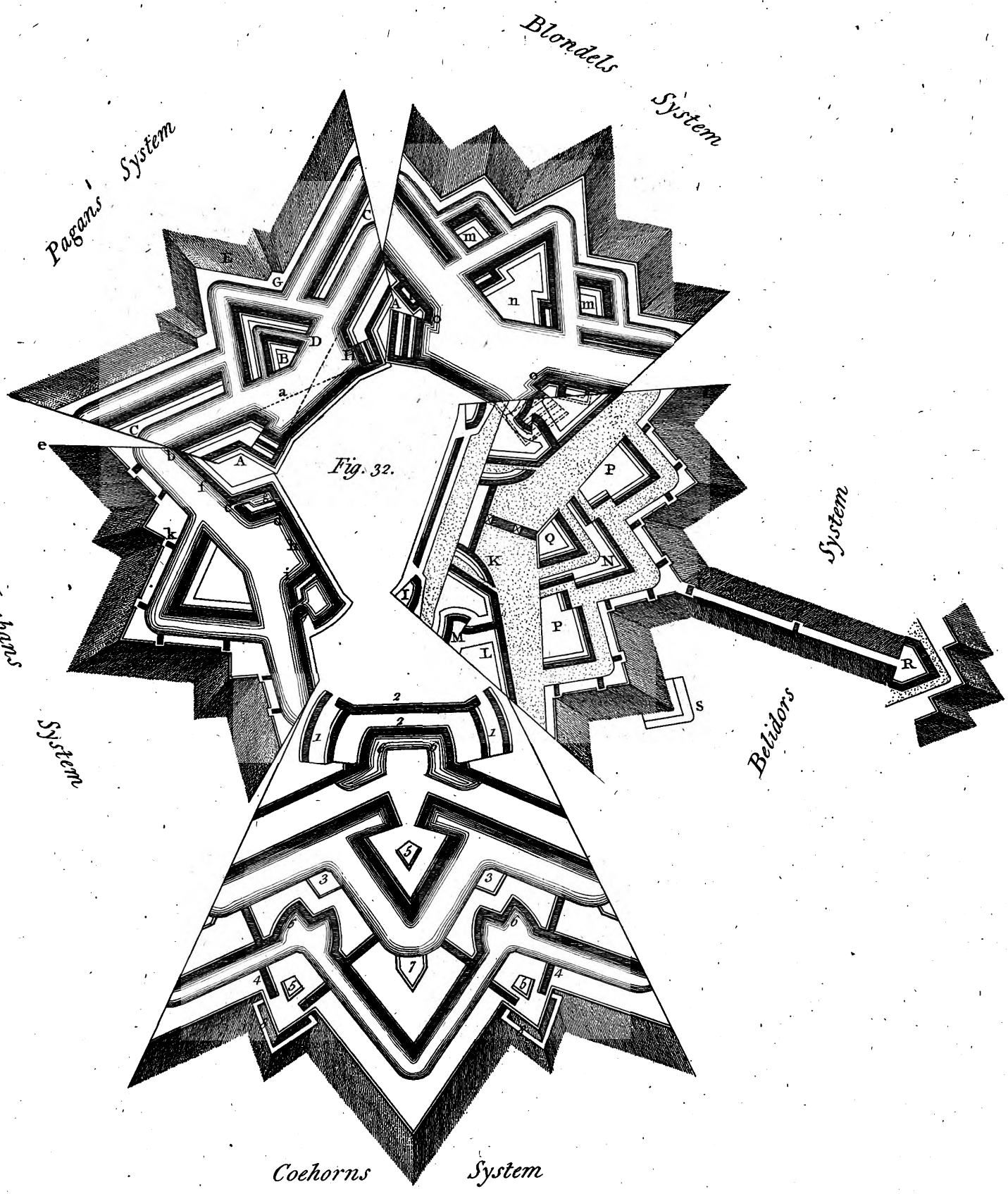

Fig. 32.

Explanation.

Pagans System

A *Half Bastions*
B *Ravelin & Counterguard*
C *Counterguards before the Bastions.*
D *The Ditch*
E *The Glacis*
G *The place of Arms*
H *The Flanks retired*
a *Line of defence*

Vaubans System

b *Angle of the bastion or flanked angle*
c *Angle of the shoulder*
d *Angle of the flank*
e *Saliant angle*
f *Face of the bastion*
g *The flank*
h *The curtain*
i *Tenailles*
k *Traverses in the covert way*

Blondels System

l *Retired Battery in the Bastion & ravelins.*
m *Lunettes.* n *Ravelin with retired bastion.* o *Orillons*

Coehorns System

1 *Concave flanks*
2 *The curtains*
3 *Redoubts in the re-entering angles*
4 *Traverses*
5 *Stone lodgments*
6 *Round flanks*
7 *Redoubt*
8 *Coffers planked on the sides and above cover'd overhead with a foot of earth*

Belidors System

I *Cavaliers*
K *Rams-horns or tenailles*
L *Retrenchments within the detached bastions*
M *Circular curtain*
N *The ravelin*
P *Lunettes with retired batteries*
Q *Redoubt*
R *Detached Redoubt*
S *An Arrow*
p *Small traverses*

I. Taylor sculp.

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FORTIFICATION. *Tab. VI.*

MULLERS FIRST METHOD

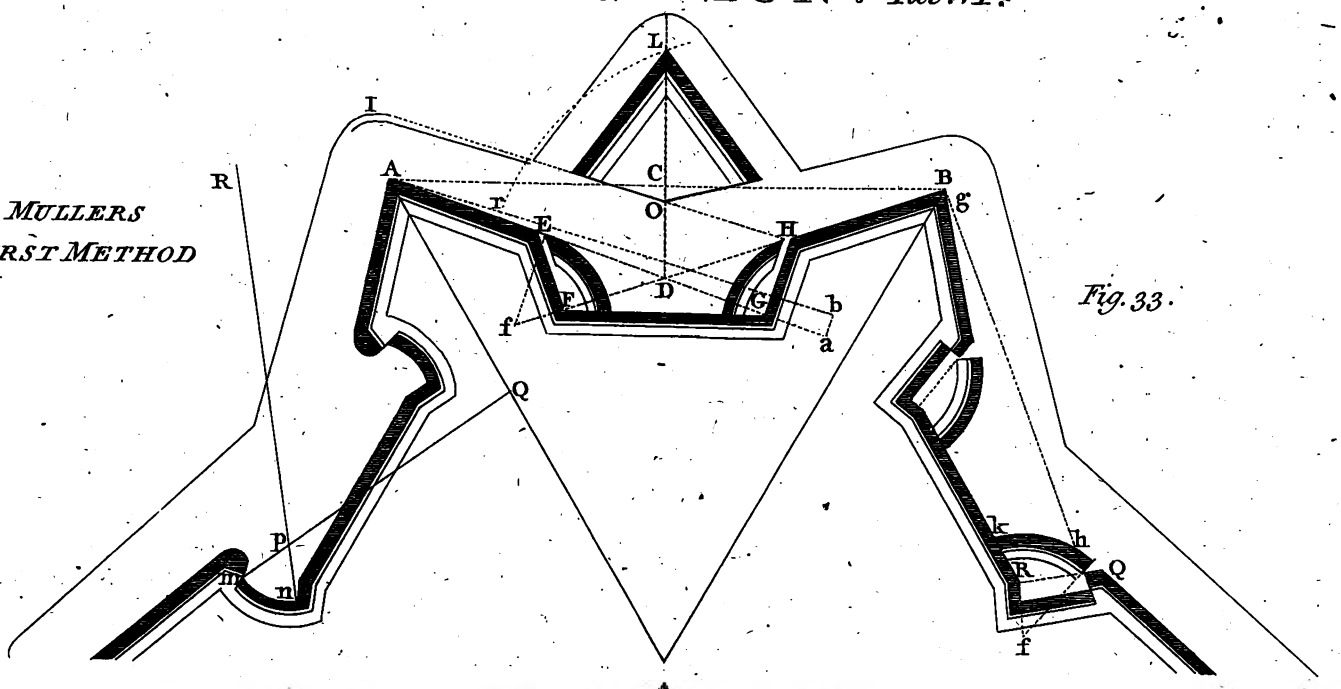

Fig. 33.

MULLERS SECOND METHOD

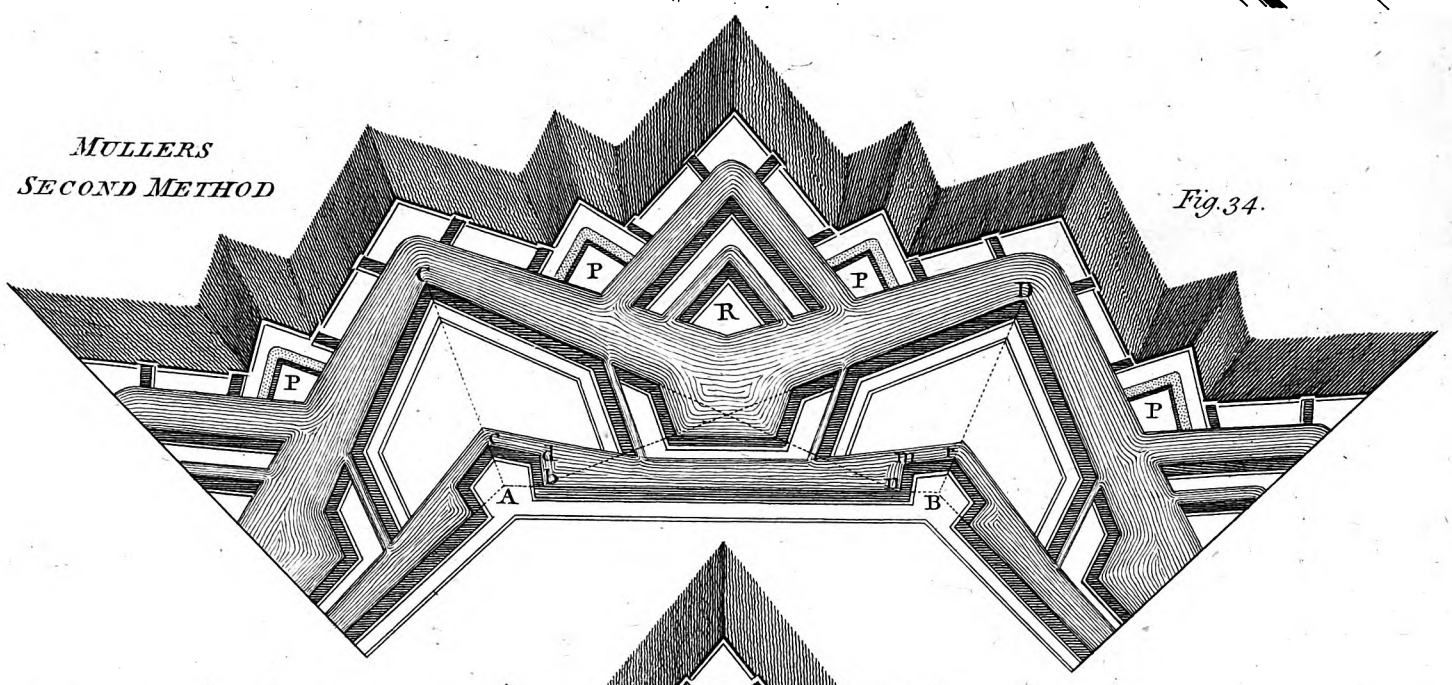

Fig. 34.

MULLERS THIRD METHOD

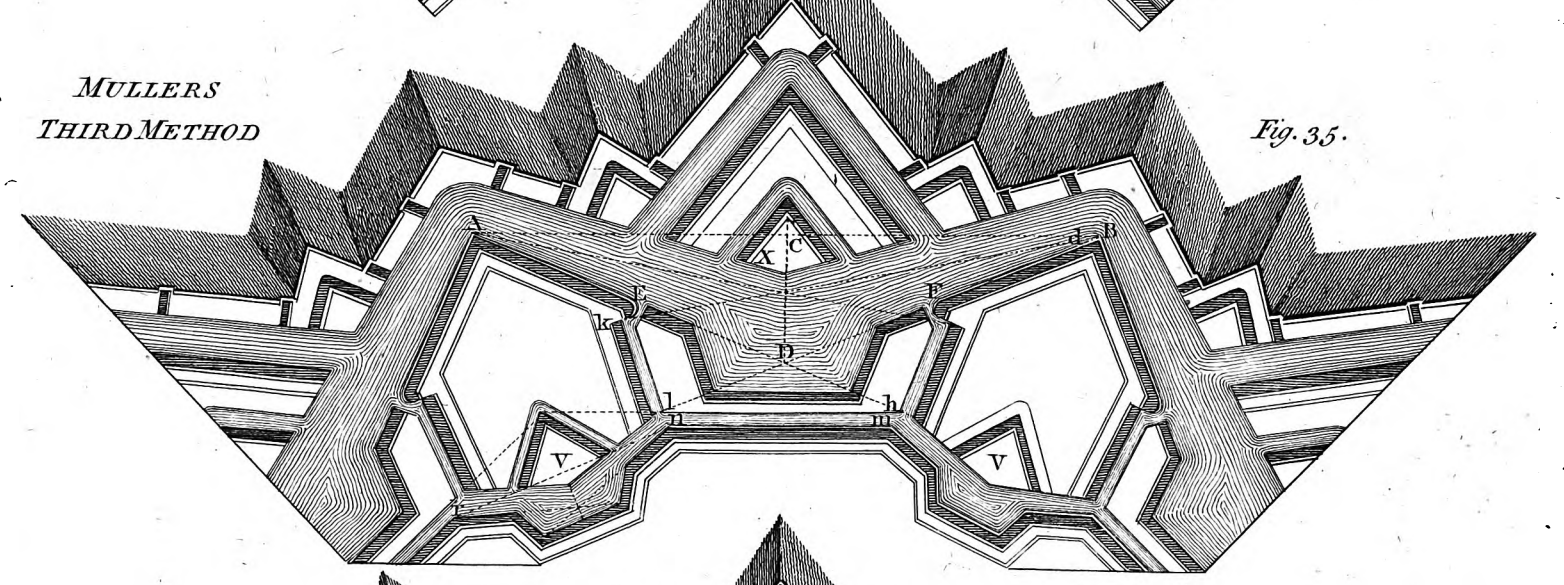

Fig. 35.

FORTIFICATION Irregular.

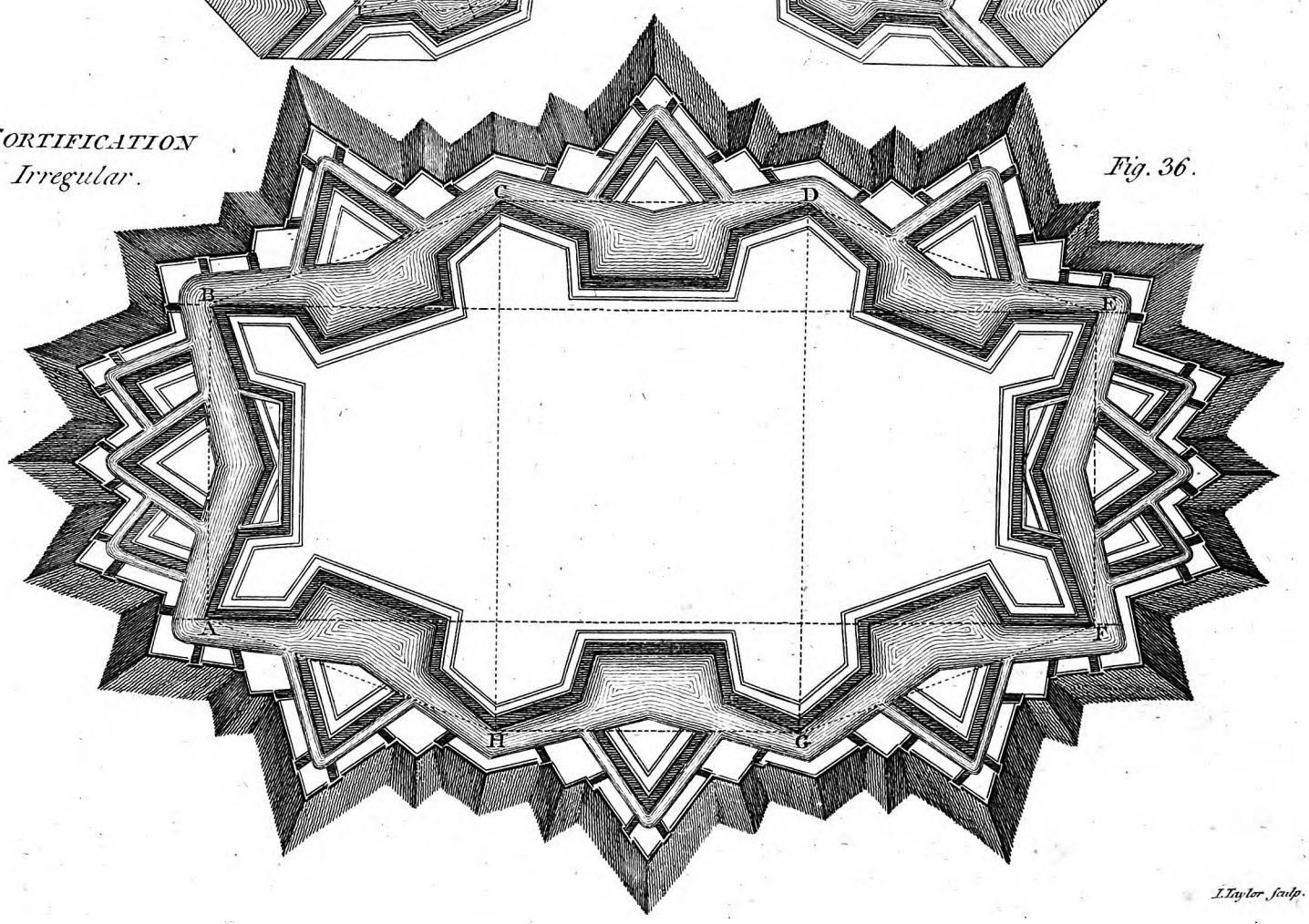

Fig. 36.

I. Taylor sculp.

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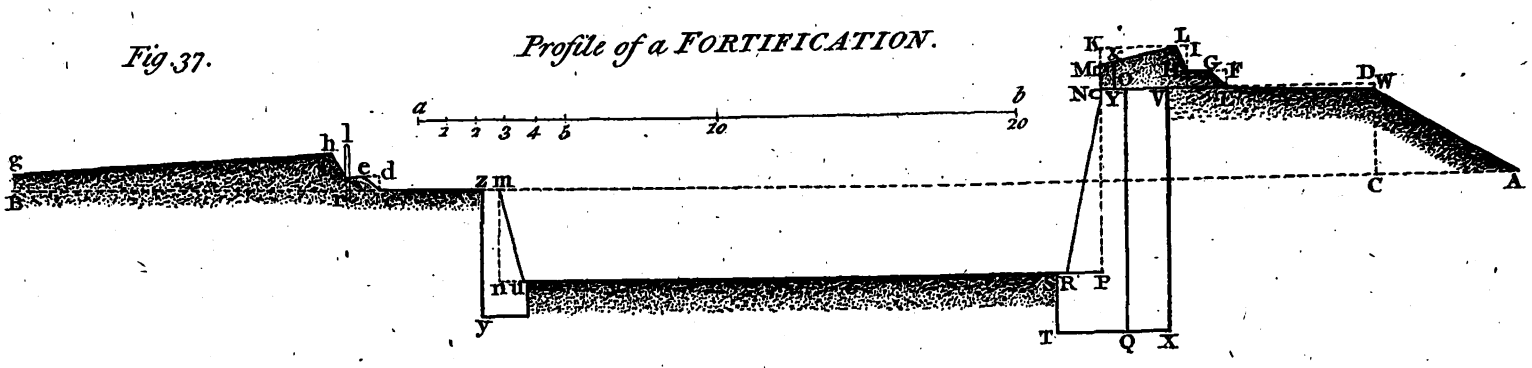
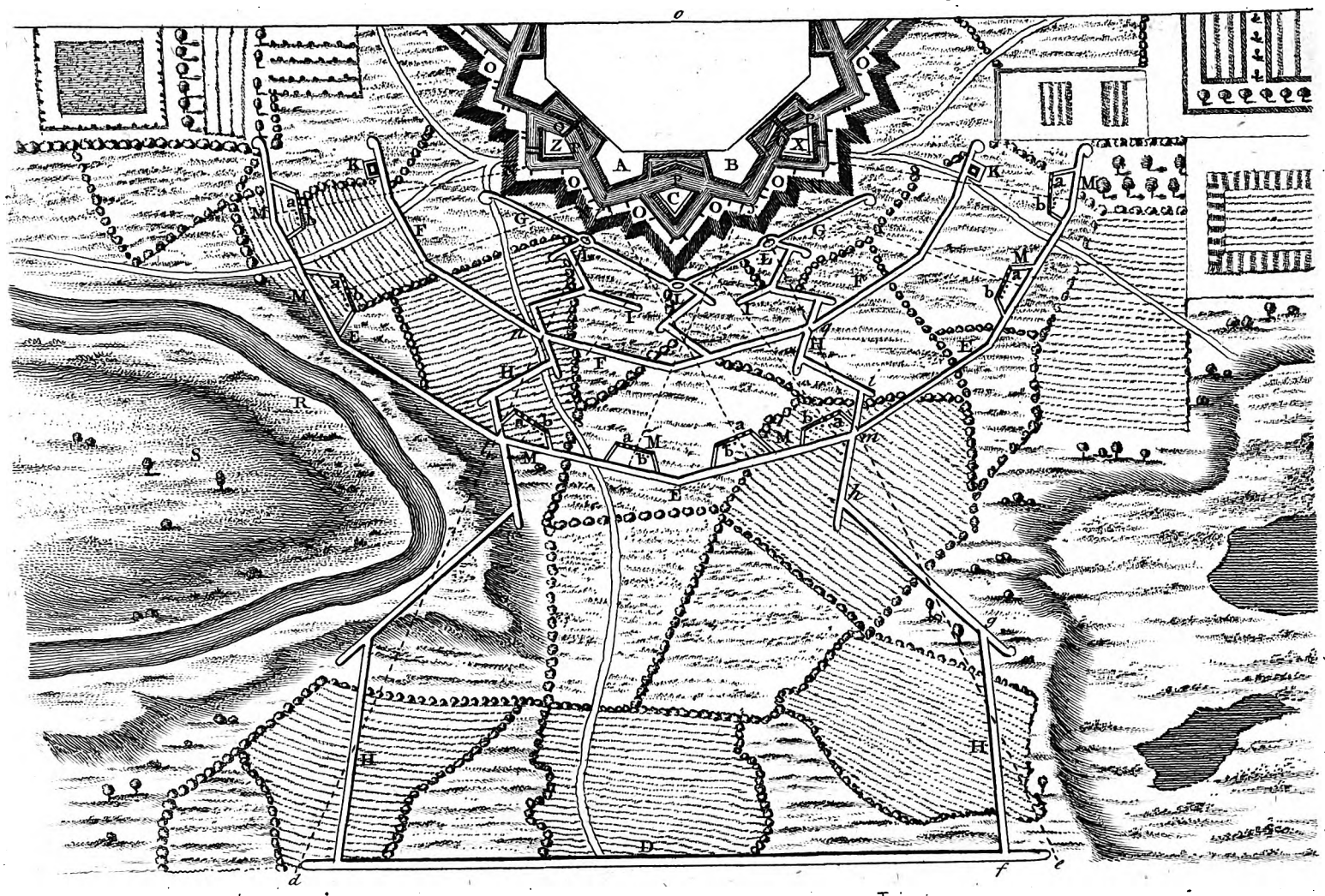
FORTIFICATION. *Tab. VII.*

Fig. 37. *Profile of a FORTIFICATION.*



Regular FORTIFICATION besieged. *Fig. 38.*



A.B. *Bastions.*
C. *Ravelin.*
D. *Line of Communication of the Attacks.*
E. *First Parallel.*
F. *Second Parallel.*
G. *Third Parallel.*

H. *The Approaches.*
I. *Places of Arms.*
K. *Square Redoubts to prevent Sallies.*
L. *Traverses in the 3d Parallel.*
M. *Batteries* {a *Cannon* b *Mortars*}
N. *Glacis.*

O. *Places of Arms in the covert way.*
P. *The Ditch.*
Q. *Bridge of communication.*
R. *A River.*
S. *Rising Ground.*

GABION

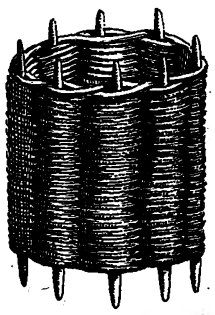


Fig. 39.

GLACIS

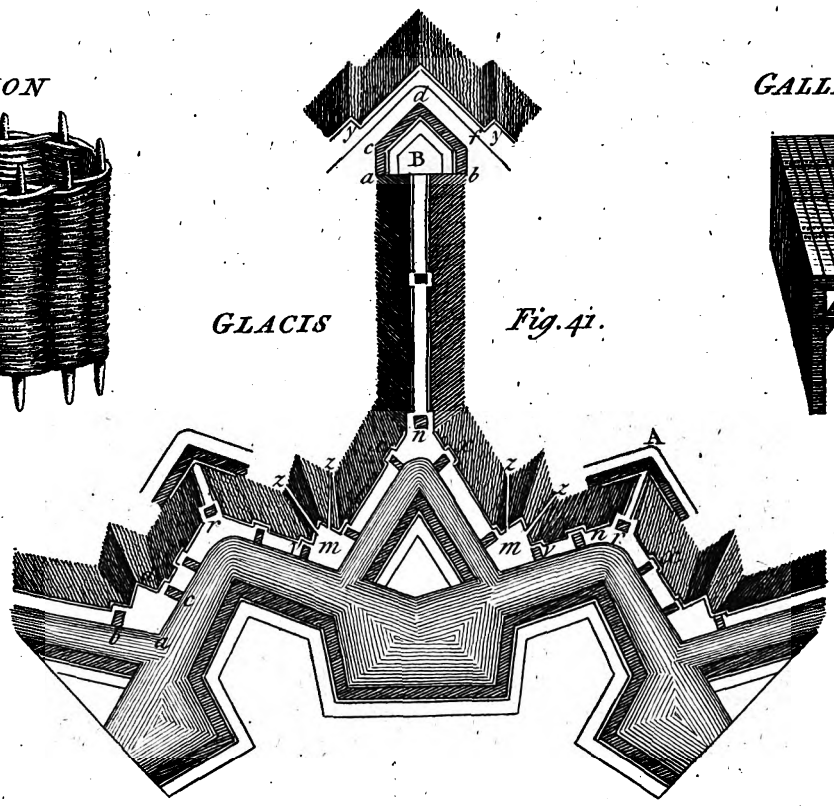


Fig. 41.

GALLERY

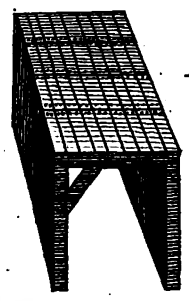


Fig. 40.

I. Taylor sculp.

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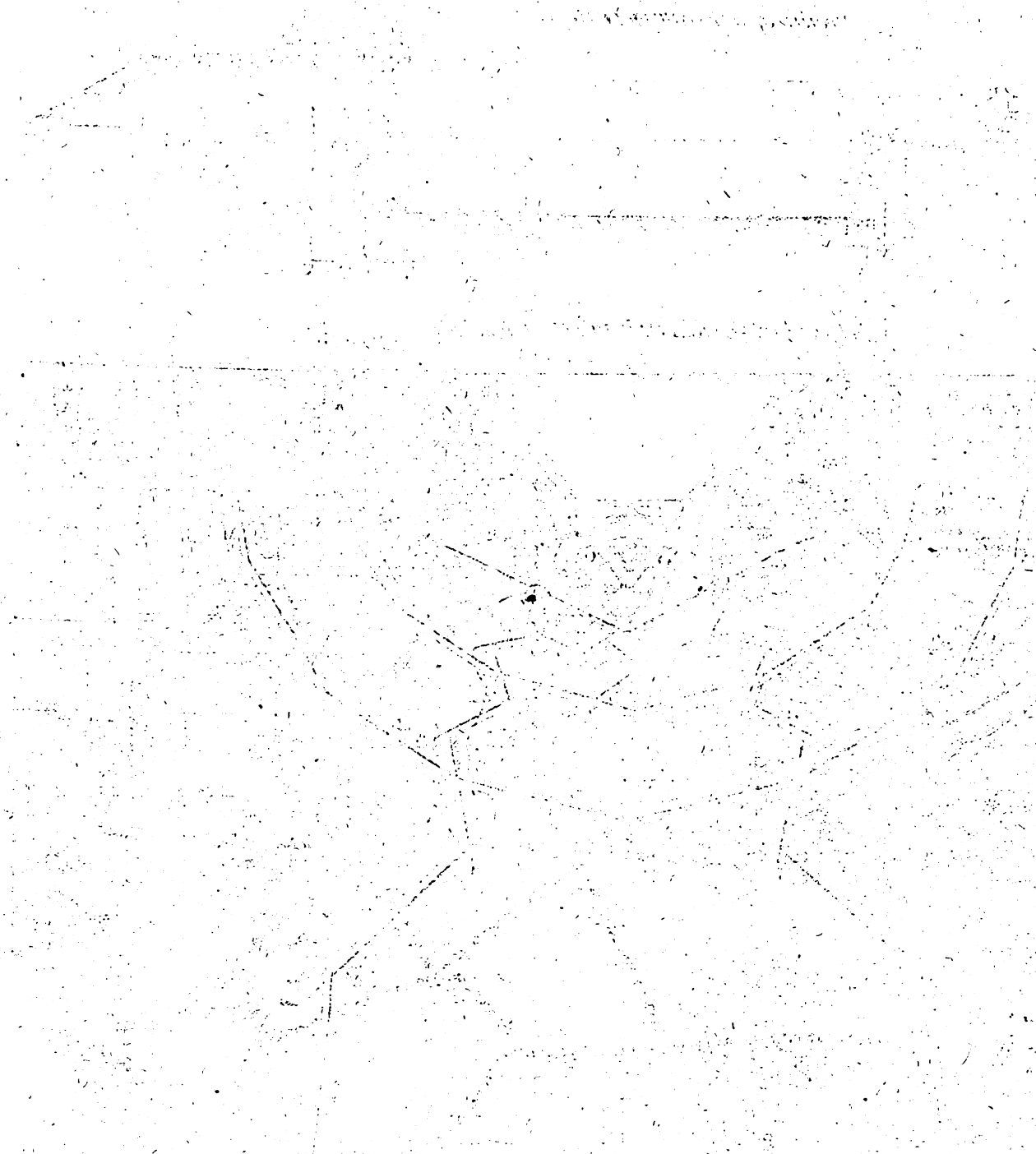

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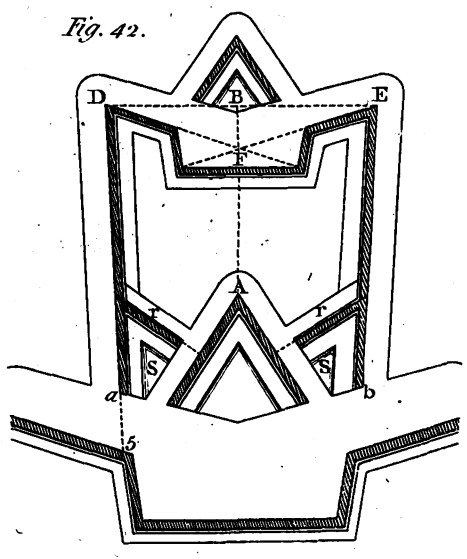
FORTIFICATION *Tab. VIII.*

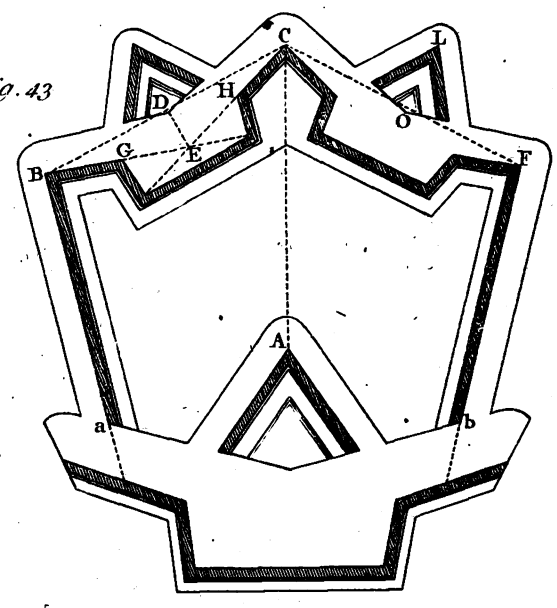
HORN - work

Fig. 42.



Double HORN- work or CROWN-work.

Fig. 43



L I N E

Fig. 44.

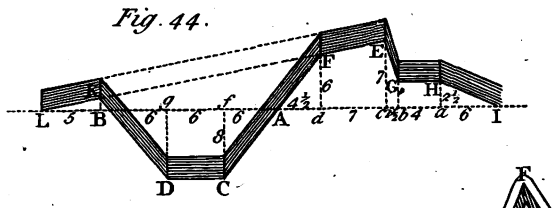


Fig. 45.

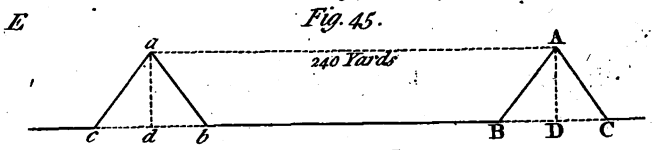
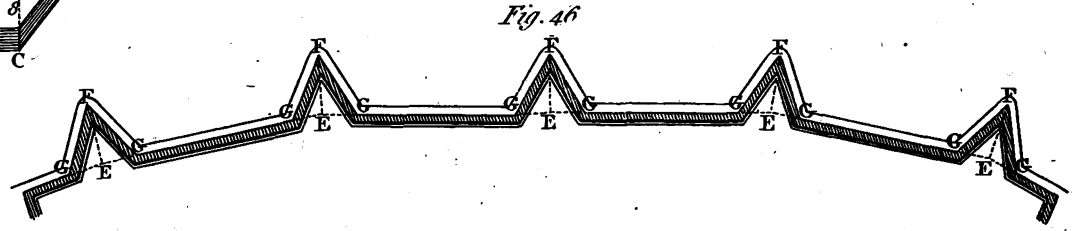
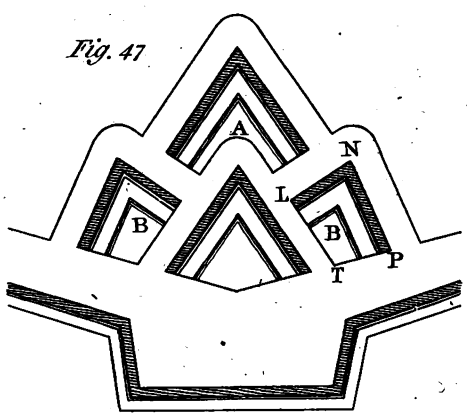


Fig. 46



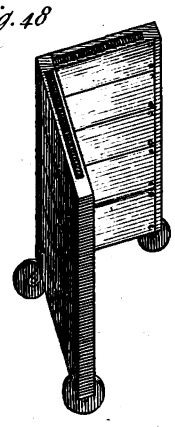
LUNETTE

Fig. 47



MANTELET

Fig. 48



M I N E

Fig. 49

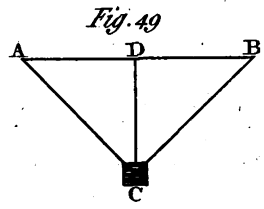


Fig. 50

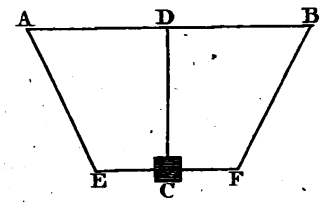


Fig. 51

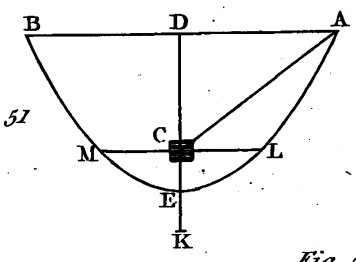


Fig. 52

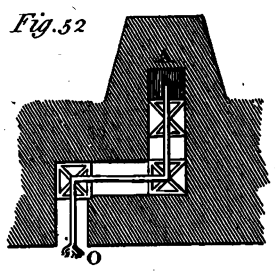


Fig. 53

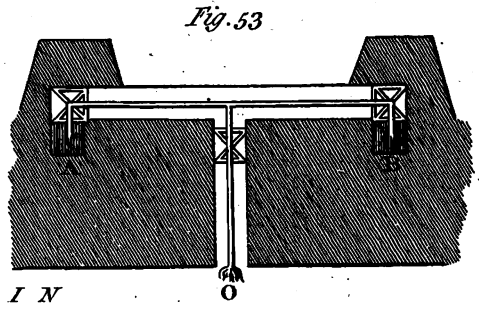
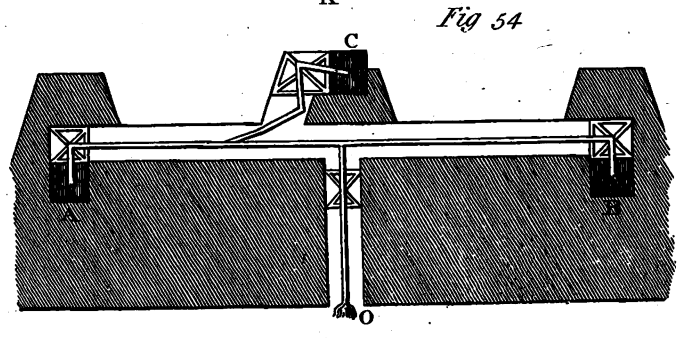


Fig 54



RAVELIN

TENAILLE

Fig. 55

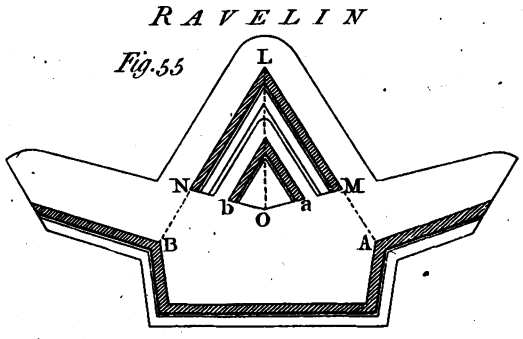


Fig. 57

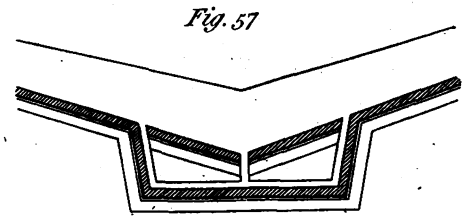
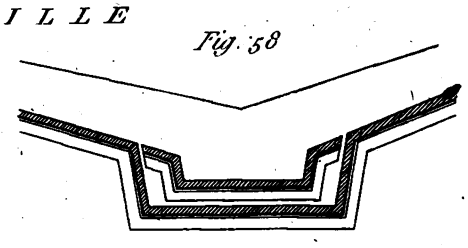


Fig. 58



TENAILLON

REDOUBT *Fig. 56*

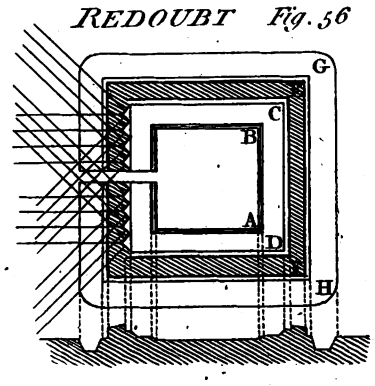


Fig. 59

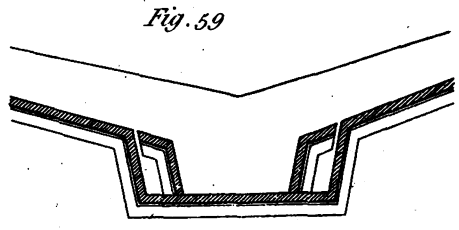
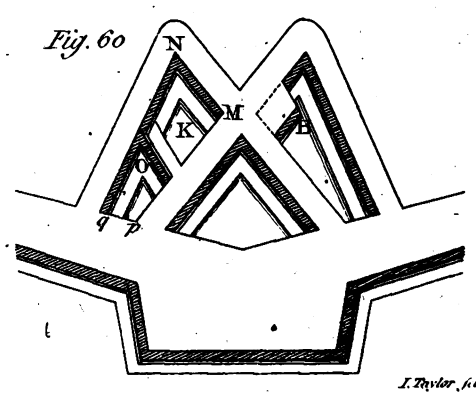


Fig. 60



I. Taylor, sculp.

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dicular to the curtin, makes the flank the ſubduple of the face, and ſubtriple of the curtin; and the angle of the baſtion equal either to two thirds of the angle of the polygon; or to half thereof, with the addition of fifteen or twenty degrees, to make it equal to a right angle.

Freitach determines the quantity of the flank in a ſquare to be ſix; in a pentagon, ſeven; in a hexagon, eight; in a heptagon, nine; in an enneagon, ten; in a decagon, eleven; and in all other figures, twelve Rhinland perches; conſequently, the face twenty-four, and the curtin thirty-ſix perches.

To draw the profile of a *fortification* after the Dutch manner: divide the ſide of the inner polygon, GH, (*Tab. Fortification, fig.* 1.) into five equal parts; the demigorge AH is to contain one of them; and the capital HC, two. Then divide the curtin EA into four parts; and make the flank AB one.

This is Freitach's method. Marolois's method of fortifying a hexagon is repreſented in *fig.* 12. Draw an indefinite right line AB; at the point A make the angle BAO equal to ſixty degrees; and as the flanked angle of the hexagon, according to Marolois, is 80°, the half flanked angle will be 40°; and let the diminiſhed angle BAD be 20°. In AD take AE=48 toiſes; and from E let fall on AB the perpendicular EN; and for the fauſſe-bray lay down 64 toiſes from N to I, and 72 for the length of the curtin. Take IB=AN, and at I erect a perpendicular IL=NE; and drawing the line LB, this will be the face of the demi-baſtion oppoſite to AE. Draw OB, which makes an angle ABO of 60°, with AB. At the point E, and with NE produced, make the angle BEF=55°; the line EF, forming this angle, will cut OA in a point F, from which draw FM parallel to AB. Produce the perpendiculars NE, IL, to the line FM, and you will have EG and LH for the flanks of the demi-baſtions, and GH will be the curtin. If a circle be deſcribed on the center O, with the radius OA, or AB, and a hexagon inſcribed in it, and each ſide of the hexagon be fortified in the ſame manner, the work will be finiſhed; and all the meaſures may be preſerved on the front AB. We may obſerve, that Marolois makes the flanked angle of his ſquare 60°, of the pentagon 72°, of the hexagon 80°, of the heptagon 85°, and of the octagon and other polygons 90°.

FORTIFICATION, *according to De Ville's*, or the *French method.* In this method the flanked angle is always right, and the flank is equal to the demi-gorge, and perpendicular to the curtin, and the lines of defence are *fichantes.* Let AB (*fig.* 13.) be the ſide of a hexagon, and divided into ſix equal parts: take AC and BD equal reſpectively to one of theſe parts for the demi-gorges of the baſtions of the front AB; at the points C and D erect the perpendiculars CL and DH, each equal to AC or BD; theſe will be the flanks of the demi-baſtions of the front AB. Draw the radii OA and OB, and produce them indefinitely beyond A and B; on OA produced, let fall a perpendicular LQ from the point L; make QM=QL, and draw ML, which will be the face of the demi-baſtion MLC. In the ſame manner the face HN of the other demi-baſtion may be determined; and if the ſame operations are performed with regard to the other ſides of the polygon, the *fortification* will be finiſhed. In order to cover the flank HD with an orillon, it is divided into three equal parts; GD is taken equal to one of theſe parts, and through the line GM is drawn to M, in which GK is taken equal to GD. Then the face NH is produced to meet the line MG in the point R; and on this point, as a center, with the radius RK, an arc is deſcribed, which will interſect the face NH produced, in I. Draw the line KI, and upon this let the orillon be conſtructed, by erecting an indefinite perpendicular on IN, at the point I, within the baſtion, and another on the middle of IK towards the baſtion, which perpendiculars will interſect, and the point of their interſection will give the center of the orillon; and if the compaſs be opened to I or K, the arc of the orillon may be deſcribed. For a ſecond flank, KG is produced from G to F, and FE is drawn parallel to GD.

FORTIFICATION, *according to De Sardi*, or the *Italian method.* This author allows 800 geometric Rhinland feet, or about 136 toiſes, to the ſide of his hexagon; which he divides into ſixteen equal parts, three of which parts he aſſumes for the demi-gorge; he makes the flank perpendicular to the curtin, and equal to the demi-gorge. He divides the curtin into eight equal parts, one of which is the ſecond flank; and through the extremity of this part, and that of the flank, he draws the face of the baſtion indefinitely; and he purſues the ſame operation with regard to the other ſides of the polygon; and the interſection of the faces gives the flanked angle of the baſtion; and he covers his flank with an orillon or epaulement.

FORTIFICATION, *according to the Spaniſh method.* The Spaniſh method is the ſame with that of De Ville, only omitting the ſecond flanks, and making the flanked angle obtuſe. In fortifying a regular polygon, they divide the ſide into ſix equal parts; they make the demi-gorges equal to one of theſe parts, the flanks perpendicular to the curtin, and equal to the demi-gorges, and the faces are drawn from the angle of the flank, and the extremity of the flanks, and their concurrence gives the flanked angle of the baſtions.

FORTIFICATION, *according to the reinforced order.* This method is aſcribed to different Italian authors, and particularly to De Marchi; and is explained in a book of *fortification* of Bourdin the Jeſuit, printed in 1655. Let any regular polygon, e. g. a hexagon, be inſcribed in a circle (*fig.* 14.) Let each of its ſides, AB, AC, be 160 toiſes; divide AB into eight equal parts, and let the demi-gorges of the baſtions, laid on from A and B, be equal to one of theſe parts. At the points D and E, which terminate the demi-gorges, erect the indefinite perpendiculars DK, EL, for the flanks of the demi-baſtions at A and B. Take DF and GE, each equal to a fourth part of AB, and at the points F and G erect the perpendiculars FH, GI, equal to the eighth part of AB, and draw the curtin HI; through the points I and F draw the line IM, terminated in M, which line will cut the perpendicular DK in K, and DK will be the flank of the demi-baſtion A, KM the face, and HF the double flank of the front AB. In the ſame manner the other demi-baſtion may be conſtructed in B, and by ſimilar operations on the other ſide of the polygon, the work may be completed. This method derives its name from the diſpoſition of the flanks belonging to each front.

FORTIFICATION, *according to M. Vauban's firſt method.* This method is divided into little, mean, and great; the little is chiefly uſed in the conſtruction of citadels, and is commonly formed of pentagons; the mean in that of all ſorts of towns, from an hexagon upwards to any number of ſides; and the great only in particular caſes, chiefly of irregular *fortification.* The conſtruction of the mean, which is the moſt uſeful, is as follows: deſcribe a circle with any radius AO (*fig.* 15. N° 2.) and in this circle inſcribe a polygon of as many ſides as the *fortification* is deſigned to have fronts; e. g. a hexagon. Biſect AB, one of the ſides, which M. Vauban always ſuppoſes to be 180 toiſes, in C, and at the point C erect a perpendicular, CD, towards the center of the polygon; when the polygon is a ſquare, CD muſt be one eighth of the ſide AB; when it is a pentagon, one ſeventh; but when it is a hexagon, or any other polygon of a greater number of ſides, CD will be one ſixth of the ſide. In this caſe, then, make CD=30 toiſes; and through D draw the indefinite lines ADG, BDF, in which take AE and BH, each equal to $\frac{2}{7}$ths of AB, or 50 toiſes, neglecting the fractions. On E, as a center, deſcribe an arc through the point H, meeting AD in G; and on H, as a center, deſcribe an arc through the point E, meeting BD in F; or, make each of the lines EG, HF, equal to the diſtance EH: then the lines joining the points A, E, F, G, H, B, will be the principal or outline of the front. And if the ſame conſtruction be performed on the other ſides of the polygon, we ſhall have the outline of the whole *fortification.* If with a radius of 20 toiſes, there be deſcribed circular arcs, from the angular points B, A, M, T, and lines be drawn from the oppoſite angles E, H, &c. ſo as to touch theſe arcs, their parts *ab*, *bc*, &c. together with theſe arcs, will repreſent the outline of the ditch. In this figure, the part FEALN is called the BASTION, AE and AL are the FACES of the baſtion, EF and LN are the FLANKS, FG the CURTIN, FN the GORGE of the baſtion, AG and BF the *lines of* DEFENCE, AB the exterior ſide of the polygon, CD the *perpendicular*; any line which divides a work into two equal parts is called the CAPITAL of that work, *a b c* the COUNTERSCARP of the ditch, A and M the *flanked* ANGLES, H, E, L, the angles of the *ſhoulder* or SHOULDER, G, F, and N, the angles of the flank; any angle whoſe point turns from the place is called a SALIANT angle, ſuch as A, M, and any angle whoſe point turns towards the place, *re-entering* ANGLE, ſuch as *b*, F, and N. If two lines be drawn parallel to the principal or outline, the one at the diſtance of three toiſes, and the other at the diſtance of eight toiſes from it, the ſpace *y x* included between the principal one, and that fartheſt diſtant, is called the RAMPART; and the ſpace *x x* contained between the principal line, and that next to it, and which is generally ſtained black, is called the PARAPET; within four feet of the parapet there is drawn a fine line, which expreſſes a ſtep, called BANQUETTE. All works have a parapet of three toiſes thick, and a rampart of eight to ten, beſides their ſlopes. The rampart is elevated more or leſs above the level of the place,

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from ten to twenty feet, according to the nature of the ground, and the particular conſtruction of the engineer. The parapet is a part of the rampart, elevated from ſix to ſeven feet and a half above the reſt, in order to cover the troops that are drawn up there from the fire of the enemy in a ſiege; and the banquette is two or three feet higher than the rampart, or about four feet lower than the parapet; ſo that when the troops ſtand upon it, they may juſt be able to fire over the parapet. The body of the place is that which is contained within the firſt rampart; and all the works which are conſtructed beyond the ditch, before the body of the place, are called OUTWORKS.

The following table exhibits the proportional dimenſions of the ſeveral parts in the little, mean, and great *fortification* of M. Vauban. In the firſt horizontal column are the numbers expreſſing the lengths of the exterior ſides from 80 to 260; in the ſecond, the perpendiculars anſwering to theſe ſides; in the third, the lengths of the faces of the baſtions; and in the fourth, the lengths of the capitals of the ravelins.

TABLE.

	Forts.						Little Fortif.				Mean.		Great.	
Side of polyg.	80	90	100	110	120	130	140	150	160	170	180	190	200	260
Perpendicular	10	11	12½	14	15	16	20	21	23	25	30	31	25	22
Faces of baſtions	22	25	28	30	33	35	40	42	45	47	50	53	55	60
Capital of ravelins	25	28	30	35	38	40	45	50	50	52	55	55	60	50

The principal works that are now uſed in the conſtruction of fortified places, beſide thoſe that have been already mentioned, are ARROWS, COVERT-WAYS, COUNTERGUARDS, CROWN-WORKS, DITCHES, *retired* FLANKS, GLACIS, HALF-MOONS, HORN-WORKS, LUNETTES, ORILLONS, RAVELINS, *detached* REDOUBTS, TENAILLES, and TENAILLONS.

FORTIFICATION, *according to M. Vauban's ſecond method, with tower-baſtions*, called the *ſyſtem of Landau*, becauſe the city of Landau is fortified after this manner. Let AB (*fig.* 16.) be the interior ſide of a hexagon, equal to 120 toiſes; draw AC, BD, from the center, through the extremities of the ſide; ſet off 6 toiſes from A to *b*, and from B to *c*; through the points *b* and *c*, draw lines at right angles to AB; from *b* ſet off ſix toiſes to *f* outwards, and four from *b* to *d* inwards; and from the points *f* and *d*, draw perpendiculars *f r*, *d n*, to the capital AC; then if *r* E is made equal to *r f*, the point E will be the ſaliant angle of the tower-baſtion, and E *f d n* half the tower. If in the capitals, there be taken, from the ſaliant angles of the tower-baſtions, the diſtances EC, FD, each of forty toiſes, the points C and D will be the ſaliant angles of the counterguards before the towers. From the points C and D draw the lines of defence C *c*, D *b*, to the points where the flanks of the towers cut the curtin; on which ſet off fifty-ſix toiſes for the faces of the counterguards; the flanks are found as in the firſt method, and likewiſe the tenailles. The ditch before the ſaliant angles of the towers is ſix toiſes, and its counterſcarp drawn to the extremities of the flanks of the counterguards; the right line which joins the ends of theſe flanks will determine the inſide of the tenailles. The ditch before the counterguards is twelve toiſes at the ſaliant angles, and the counterſcarp is drawn to the oppoſite ſhoulders in the ſame manner as in the firſt method. The capital of the ravelin is forty-five toiſes, its faces, when produced, terminate on thoſe of the counterguards, within ten toiſes of the ſhoulders; ten toiſes are cut off from the faces by the flanks, which are parallel to the capital as uſual. The ditch before the ravelin is ten toiſes; the covert-way five, the ſemi-gorges of the places of arms twelve the faces ſeventeen, and the glacis twenty. See *fig.* 17.

FORTIFICATION, *according to M. Vauban's third method*, or *that of New-Briſach*. This method is applied to an octagon, whoſe exterior ſide AB (*Tab.* II. *fig.* 18) is 180 toiſes, the perpendicular CD, 30; the faces AK, BL, of the counterguards, 60; the flanks LN, KM, are found by ſetting off 22 toiſes, as chords to the arcs deſcribed from the oppoſite ſhoulders as centers. From the extremities of the flanks a line is drawn, which will be parallel to the exterior ſide AB, meeting the capitals AE, BF of the counterguards at G and H, which line will terminate the inſide of the tenaille, and alſo the ſaliant angles, G, H, of the tower-baſtions. If EF be drawn parallel to G H, and at nine toiſes diſtant from it, the interſections E, F, with the capitals of the counterguards, will be the centers of the towers; from which ſet off ſeven toiſes from E to *a*, and F to *l*, for the ſemi-gorges, and draw the flanks *b c*, *k m*, through the extremities of theſe ſemi-gorges, perpendicular to the line EF; theſe flanks are four toiſes inwards from *a* to *c*, and *l* to *m*, and five outwards from *a* to *b*, and *l* to *k*; the faces *b* G, *k* H, are drawn from the points *b* and *k* to G and H, and the lines joining the inſide of the flanks, at the end of four toiſes, will complete the towers. The ditch is ſix toiſes before the ſaliant angle of the towers, and its counterſcarp meets the line GH, within ten toiſes of the extremities M, N, of the flanks of the counterguards. If from the point *n*, when the line EF interſects the perpendicular CD produced, five toiſes be ſet off to the point *r*, and the lines of defence are drawn from the extremities of the ſemi-gorges *a* and *l* of the towers through this point *r*; then the flanks of the counterguards produced will determine the little flanks *p*, *q*, and *s*, *t*, of the inſide rampart, and the extremities of theſe little flanks being joined, will give the curtin between them. The great ditch before the counterguards is fifteen toiſes, and its counterſcarp parallel to the faces; the capital of the ravelin is fifty-five toiſes, and that of the redoubt within it twenty-three; the faces of the ravelin are drawn to the faces of the counterguards within fifteen toiſes from the ſhoulders, and thoſe of the redoubt parallel to theſe; twelve toiſes are cut off from the faces of the ravelin, and ſix from thoſe of the redoubt, by the flanks which are parallel to the capital; the ditch before the ravelin is twelve toiſes, and that before the redoubt ſix; the covert-way and glacis are the ſame as in the ſecond method. The parapets of the counterguards, on both ſides of the ſaliant angles, are raiſed four feet higher for the ſpace of twenty feet above the reſt, in order to prevent the enfilades of the ricochet batteries. See *fig.* 19.

Mr. Muller has made ſeveral remarks on the three methods of M. Vauban above recited. With regard to the firſt he obſerves, that it is ſimple, eaſily conſtructed, and takes up but little ground, about once and a half more ground than the buildings. It is guarded from ſurprize by its ſtone revetements, requires only few men to defend it, and with the addition of ſome outworks, as counterguards before the baſtions, and lunettes or tenaillons to cover the ravelins, furniſhes a good defence. However, his flanks are too ſmall; his retired flanks on circular arcs of 60° are needleſs, ſince the flanks made upon their chords will contain as many guns, and reſiſt better than the curved flank; his capital ditch is too wide; the faces of the ravelins, inſtead of terminating on the ſhoulders of the baſtions, ſhould terminate three or four toiſes beyond them; the ſemi-gorges of the bonnet, inſtead of being fifteen toiſes, ſhould, in Mr. Muller's opinion, be but eight or ten at moſt; one of the faces of the lunettes ſhould be perpendicular to the face of the ravelin, and the other to that of the baſtion, in order to be defended in a direct manner; inſtead of the counterguards before the ravelin, which are ſeldom made, he recommends a redoubt within it, as leſs expenſive, and anſwering the ſame purpoſe. All tenaillons and counterguards ſhould have retrenchments.

The ſecond method, he obſerves, is deſigned for fortifying an old town already incloſed by a rampart; on which account M. Vauban begins within, and fortifies outwards, contrary to his other methods; the tower baſtions are joined to the old wall, and have underneath a magazine in the form of a croſs, round which are caſemates, or cellars, to hold both men and guns; thoſe in the flanks have each an embraſure, which opens into the ditch, and thoſe in the faces have embraſures, ſo as to fire out of one into the other, when taken by the enemy, and above there is a parapet twelve feet thick, with embraſures. Theſe towers are expenſive, and afford little reſiſtance; and ſmall baſtions, without caſemates, might be ſubſtituted in their room with advantage. The flanks of the counterguards are too ſmall, and are eaſily deſtroyed from the oppoſite covert-way; and, therefore, they ſhould either be enlarged or increaſed in number.

The third method differs only from the former, in having two ſmall flanks in each curtin, of about four toiſes, which can hardly hold two guns each, and, therefore, add no great ſtrength.

FORTIFICATION, *according to count Pagan's method*. This author eſtabliſhes three ſorts of *fortification*; viz. the great, mean, and little, whoſe chief dimenſions are contained in the following table.

	Great Fortif.		Mean		Little	
	Square	In all the other polyg.	Square	In all the other polyg.	Square	In all the other polyg.
Exter. ſides	200	200	180	180	160	160
Perpendic.	27	30	24	30	21	30
Faces	60	60	55	55	45	50

For conſtructing the mean *fortification*, let AB (*fig.* 20.) be the ſide of a regular polygon, e. g. of a hexagon, and equal to a hundred and eighty toiſes. Biſect it in D, and erect a perpendicular equal to thirty toiſes; from the points

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points A and B, draw through C the indefinite lines of defence AN and BM; let the faces AE and BF be each equal to fifty-five toiſes; draw the flanks FN and EM perpendicular to the lines of defence, and MN will be the curtin. Count Pagan, in order to increaſe the fire of his flank, made three flanks, raiſed one above another, and a ſecond baſtion within the firſt. To conſtruct theſe caſemates, as they are commonly called, biſect the flank FN in G; through the points A and G draw the line AG, and produce it indefinitely within the baſtion; produce alſo the line of defence AN; take GH = 5 toiſes, and through H draw the line HI parallel to FN or GN; draw LK parallel to HI, and at the diſtance of ſeven toiſes from it, and equal to fourteen toiſes from K to L; at the diſtance of ſeven toiſes from KL draw the parallel OP, making it equal to fourteen toiſes three feet from O to P; then draw through the point P the line PQ parallel to FB; this line will be the face of the interior baſtion, having *o* P for its flank, and let a parapet three toiſes thick be conſtructed, to the three flanks HI, LK, and OP. The great ditch is ſixteen toiſes, and its counterſcarp parallel to the faces of the baſtions; the capital of the ravelin fifty, and its faces are drawn to the ſhoulders; the ſemi-gorges of the redoubt within the ravelin fifteen, and the faces parallel to thoſe of the ravelin; the ditch of the ravelin twelve, and that of the redoubt ſix; the ſaliant angle of the counterguard is forty toiſes diſtant from that of the baſtion, and nine or ten broad at the extremities; the ditch before the counterguard is twelve, the covert-way four, and the faces of the place of arms eight, and parallel to the oppoſite counterſcarp. See *fig.* 21. N° 1.

This method, though at firſt received with great applauſe, has its defects; its triple flanks are too near each other; the ditch before the redoubt is but ill defended, which ſhould never be made without making tenailles likewiſe; the covert-way is too narrow, and the places of arms too inconſiderable for defending the glacis; and the want of traverſes in the covert-way is a defect, eſpecially ſince the modern diſcovery of ricochet batteries.

FORTIFICATION, *according to M. Blondel's method*, has a great affinity with that of the count de Pagan; only that the quantity of the lines and angles is differently determined. See *fig.* 22. and *fig.* 23. N° 1.

Mr. Blondel makes two ſorts of *fortification*, viz. the great, whoſe exterior ſide he makes two hundred toiſes; and the little, in which it is one hundred and ſeventy toiſes. In order to find the angles made by the exterior ſides, and the lines of defence, he directs to ſubtract 90° from the angle of the polygon, and to add 15° to the third part of the remainder, which will give the angle ſought. E. g. the angle of an hexagon is 120°, from which take 90°, and the third part of the remainder 30 is 10, which added to 15, gives the angle required. The lines of defence are equal to $\frac{7}{10}$ of the exterior ſide, i. e. 119 or 120 in the little, and 140 in the great. The conſtruction is as follows: let AB *(fig.* 23.) the exterior ſide of an hexagon, be one hundred and ſeventy toiſes; the angles ABC, BAD, twenty-five degrees each; the lines of defence, AD, BC, one hundred and twenty toiſes; let O be the point of interſection of theſe lines; biſect AO, BO, in E and H; then will AE, BH, be the faces; EC, HD the flanks; and CD the ſtrait part of the curtin. The orillons EI, LH, are ten toiſes each; the flanks are retired five toiſes behind the lines EC, HD: in all polygons above an heptagon, M. Blondel makes the retired flanks from ten to twelve toiſes diſtant from theſe lines, in order to lengthen the curtins. Each flank exceeds the flank before it nine feet in height, and they are eight toiſes diſtant from outline to outline. The counterſcarp of the ditch is drawn from the extremities I, L, of the orillons, parallel to the faces of the baſtions; the counterguards are but four toiſes broad, ten or twelve feet of which are taken for the parapet; the ditch before them is ten toiſes. If from the ſhoulder E, as a center, an arc be deſcribed through H, and another from H through E, the interſection of theſe arcs will be in the ſaliant angle of the ravelin, the faces of which are directed to a point in the faces of the baſtions within ſix toiſes of the ſhoulders; the gorge of the ravelin is determined by producing the faces of the counterguards; the ditch of the ravelin is twelve toiſes. The ſemi-gorges of the lunettes V are twenty toiſes; their faces parallel to the counterſcarps of the ditches, before the ravelin and counterguard, and the ditch before them, is eight toiſes; the covert-way ſix, and the faces of the places of arms, which are likewiſe parallel to the counterſcarps, are as much. The retired batteries, *x*, in the baſtions and ravelins, are ſeven toiſes from the faces; and their lenghts are determined by the faces and counterſcarps of the ravelin and counterguards produced. This method is very expenſive, and requires a numerous artillery for defence. His three flanks are too near each other, and too open, and, therefore, liable to be deſtroyed from the covert-way, for the counterguards are not broad enough to ſcreen thoſe flanks; the low batteries *x*, &c. are too narrow and confined; and his places of arms are too ſmall; his great ditch is too wide; and the omiſſion of traverſes in the covert-way is important, ſince the uſe of ricochet batteries.

FORTIFICATION, *according to the firſt method of baron de Coehorn.* This firſt method is applied to an hexagon, and it is ſuppoſed that the ſurface of the water is but four feet lower than the level ground. Let AB *(Tab.* III. *fig.* 24.) the interior ſide of an hexagon, be one hundred and fifty toiſes; take AC, BD, each equal to 30, and the capitals AE, BF, each 80, and AG, BH, 40; from E and F draw the lines of defence to D and C, and through G, H, lines parallel to ED, FC, in which take GI, HK, each equal to forty toiſes, for the higher faces of the baſtions. For the lower faces EM, FN, draw IO *(fig.* 25. N° 2.) perpendicular to IG, and equal to four toiſes; O*r* parallel to IG, and = 4 toiſes; then will *r* M, perpendicular to EM, determine the lower face EM. In order to determine the tower 3, in *r*M take *r*S = 5 toiſes; draw S*m* parallel to EM, and = 14 toiſes; in O*r* produced, take *r n* = 4 toiſes, and in EM take MV = 8 toiſes; then if the points *n* and *m* are joined by a right line, and *m*, V, by an arc of 60°, we ſhall have the outline of the tower. From the points C and D *(fig.* 24.) ſet off on the lines of defence fourteen toiſes to Y and W, and on the baſes YI and WK deſcribe equilateral triangles, and the angles oppoſite to theſe baſes will be the centers of the higher flanks YI and WK; and R being the interſection of the two lines of defence, biſect RM in S, and RC in Q, and, drawing SQ, *v*SQR will be half the tenaille; and drawing from C a line parallel to IY, ſo as to meet the tower, on this the mean flank may be deſcribed in the ſame manner as the former. The parapets of the three flanks, and thoſe of the parts *m*V, VM *(fig.* 25. N° 2.) of the towers, are twenty-four feet thick; the other parts M*r*, *r n m*, ſixteen, and all the other parapets, in general, are twenty feet. Behind the lower parapet there is a banquette of three feet, and a rampart of five; and under this rampart a ſtone gallery running from one end to the other, and divided into ſeveral apartments, which are ſhut from without; and alſo another, going from the ſaliant angle of the lower faces to that of the higher, with loop-holes facing the dry ditch X, *(fig.* 24.) which lies between the higher and lower faces of the baſtions; and likewiſe a row of paliſades parallel to the higher faces, and four toiſes diſtant from them. Before the mean flank there is a wet ditch ſix toiſes broad, and another *z (fig.* 25.) behind the towers of the ſame breadth, over which there are two draw-bridges, parallel to the higher faces. The ditch *z* is flanked by three embraſures in O*r*, and the dry ditch by two in IO. The great ditch is twenty-four toiſes broad, and its counterſcarp parallel to the lower faces of the baſtions; the ſemi-gorges OL of the ravelin *(fig.* 24.) are twenty-nine toiſes, and the faces LP, forty-five; the dry ditch Y is ſixteen toiſes, the rampart twenty-eight feet, and the lower faces aT are parallel to the higher ones, the parapet of which is twenty, and the banquette three. In the gorge of the ravelin there is a ſmall redoubt *a*, about five feet high, and underneath a lodgment of ſtones, the walls being eighteen inches thick at the ſides; the roof is made of planks, covered with three feet of earth. There is a dry ditch going from the extremities of the faces to the redoubt, and round its angle, having a row of paliſades before it, to ſecure the retreat from the ravelin into this redoubt; there is likewiſe another row going from the extremities of the faces, in a round form, turning towards the gorge of the ravelin.

In the dry ditch of the ravelin, within ſix toiſes from the great ditch, is a coffer, and a ditch *p* of ſix toiſes before it: this coffer has a wall on both ſides, and the roof is planked and covered with a foot and half of earth; above this is a ſtone parapet of five feet high, with a banquette behind it. There runs a covered gallery under the rampart of the lower faces, and another joining the two ſaliant angles, together with a row of paliſades, in the ſame manner as in the dry ditch before the baſtions. The wet ditch before the ravelin is eighteen toiſes; the counterguards *x*, which the author calls *cover-faces*, are twenty-five feet broad, and the ditch before them is fourteen toiſes; the covert-way is twelve toiſes broad, and the glacis twenty; the ſemi-gorges *f g*, *g h*, of the places of arms, are twenty-two toiſes, and are taken from the point *g*, where the branches of the covert-way meet, and the faces *f k*, *h k*, are twenty-eight; within theſe places of arms are traverſes of twenty feet thick and eighteen toiſes long, within ten or twelve feet from, and parallel to the faces. The ſtone lodgments *b*, within the places

of

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of arms, are found by ſetting off twelve toiſes from the point *g*, for the ſemi-gorges, and the faces are drawn parallel to thoſe of the places of arms. At ſix toiſes from the places of arms, are coffers *q* of eight feet broad, made with planks at the ſides, and above with a foot of earth over and before them. There are two banquettes all round the covert-way, and before the traverſes, as alſo two rows of palliſades before the traverſes, one of which joins them, and the other goes round the covert-way. Laſtly, the re-entering angles of the counterſcarp next to the covert-way are made a little round, as likewiſe that in the ravelin; but the contrary way, that is, they are made hollow.

FORTIFICATION, *according to Coehorn's ſecond method.* In this method, the level of the ground is ſuppoſed to be three feet above the ſurface of the water, and A B, *fig.* 26. is the interior ſide of an heptagon of a hundred and twenty-ſix toiſes; take in the capitals, A C, B D, each of ſeventy-two toiſes; at the extremities C, D, make the angles A C E, B D F, each of forty degrees; and ſet off ſixty-ſix toiſes for the faces C E, D F, of the baſtions; on the interior ſide, take A G, B H, each of thirty toiſes, and from the point D as center, deſcribe an arc through the point G, on which ſet off a chord of thirty; and on this chord deſcribe the mean flank G I, which is an arc of ſixty degrees.

Draw a line from the ſaliant angle D through the extremity I of this flank, on which take I a of ten toiſes; join a E, on which deſcribe the orillon as uſual.

The outline of the higher flank is twelve toiſes diſtant from that of the outline of the mean; this flank is an arc deſcribed from the ſame center as that of the former, the chord of which is forty toiſes.

From the points G, H, draw the broken parts of the curtain perpendicular to the capital of the baſtion, and make it nine toiſes long: the extremity of the higher flank is terminated, by the inſide line of the parapet of the curtin produced.

The tenaille is found by producing the faces of the baſtions ten toiſes; through the extremity of which, an arc is deſcribed from the oppoſite ſaliant angle of the baſtion, as center; on this arc is ſet off a chord of twenty toiſes; and this chord ſerves to deſcribe the flank upon, which is an arc of ſixty degrees; the curtin is a right line.

There is a wet ditch before the tenailles of ten toiſes broad, with two bridges at each end, near the orillons; the one directly over it, and the other along the faces of the baſtion.

The dry ditch round the body of the place is twenty toiſes broad, before the faces of the baſtion to which it is parallel, and the lower rampart K L twenty-nine feet; the ſemi-gorges M L are fifteen toiſes, and the flanks L N, eighteen, and are deſcribed from the ſaliant angles K of the lower faces as centers.

The ſaliant angle of the ravelin is a hundred and twenty-five toiſes diſtant from the curtin of the body of the place, and is ſeventy degrees; the faces are fifty toiſes long; the faces of the redoubt *x*, are ſixteen toiſes diſtant from thoſe of the ravelin, and fourteen long.

The wet ditch round the lower faces of the ravelin is twenty-four toiſes broad: the work beyond this ditch, which the author calls the ſecond counterſcarp, is twenty, parallel to the ditch.

To find the broken part of this work, join the two re-entering angles m, r; on which take m r, of thirty toiſes, and draw r t, r v, parallel to the outline of the counterſcarp, each equal to twelve: ſet off twenty-two from t to s, and from v to q; and upon theſe lines as chords deſcribe the round flanks, which are arcs of ſixty degrees.

The traverſes in this counterſcarp are drawn at ten toiſes from the flanks perpendicular to the parapet.

The redouts z in the re-entering angles, are found by ſetting off ſixteen toiſes from the points m, to n for their capitals, and the faces are parallel to the broken curtin before them: thoſe marked y which are in the ſaliant angles are found by producing the counterſcarps of the great ditch, and ſetting off twelve toiſes from the points of their interſections for their faces; and the flanks are drawn parallel to their capitals.

The ditch before this work is fourteen toiſes; as to the covert-way and glacis, they are the ſame as in the author's firſt method.

FORTIFICATION, *according to Coehorn's third method.* Here the level of the ground is five feet above the ſurface of the water; and the author ſuppoſes an octagon, whoſe interior ſide A B, *fig.* 27. is a hundred and ten toiſes; the ſemi-gorges A n, B m, twenty-one; the capitals A C, B D, of the baſtions ſixty-four; and the ſaliant angles eighty-five degrees; the faces C E, D F, of the baſtions fifty-four toiſes; the parts Q s, Q r, of the tenaille thirty-two; the lower flanks, that is, thoſe of the tenaille, are found by deſcribing arcs through the points s, r; from the oppoſite ſaliant angles D C, on which are twenty toiſes ſet off as chords; and theſe chords ſerve to deſcribe arcs of ſixty degrees upon, for the required flanks.

From the extremities v, t, of theſe flanks, lines are drawn to the oppoſite angles D, C, and ſix toiſes ſet off from v to q; and upon q E the orillon is deſcribed as uſual.

The higher flanks are deſcribed from the ſame centers, as the lower through the extremities n, m, of the curtin; and their chord is thirty toiſes.

The wet ditch before the body of the place is twenty toiſes, and its counterſcarp parallel to the faces of the baſtions.

The capital V W of the detached baſtion is a hundred toiſes; the faces are directed to the ſaliant angles of the inner baſtions; the dry ditch behind the lower faces in the detached baſtions is twenty toiſes; and the higher faces are parallel to the lower, and thirty-one toiſes long: the towers x, and the ditch before them, are made in the ſame manner as in the firſt method. To find the flanks, make the ſemi-gorges V a, V b, each thirty-eight toiſes, and draw the chords off theſe flanks parallel to the capital V W; and from the extremities of the higher faces draw alſo lines to the former, upon which the flanks are deſcribed as uſual.

The counterſcarp of the ditch before the redoubt z, is drawn from the extremities of the flanks parallel to the faces; and at ſix toiſes from this, the faces of the redoubt are drawn; four toiſes of which are cut off for the flanks.

The ditch before the detached baſtion is twenty-four toiſes; the ravelins, counter-guards, covert-way, and glacis, are the ſame here as in the firſt method.

There are little pits or ponds l, l, dug between the higher and lower curtins, to hold water, in order to prevent the paſſing from the tenailles to the flanks.

Mr. Muller has urged a number of objections againſt Coehorn's firſt method, for which we muſt refer to his Elements of *Fortification*, p. 91, &c. and as to the ſecond and third, they are abſolutely impracticable. However, Coehorn's works were publiſhed before he had acquired that experience which afterwards rendered him one of the greateſt engineers; and Bergen-op-zoom, which he fortified, is one of the beſt contrived *fortifications* in all Europe.

FORTIFICATION, *according to the method of Scheiter.* This method is divided into the great, mean, and little: the exterior ſide of the polygon for the great ſort is two hundred toiſes, for the mean ſort one hundred and eighty, and the ſmall one hundred and ſixty. The line of defence in the firſt is one hundred and forty toiſes, in the ſecond one hundred and thirty, and in the third one hundred and twenty. This line is always raſant. All the other lines are fixed at the ſame length for all polygons, whoſe ſtructure chiefly depends upon the knowledge of the exterior ſide, of the capital, and of the flanked angle: for which conſult the following

TABLE *of Capitals and flanked Angles.*

Polygons	IV	V	VI	VII	VIII	IX	X	XI	XII
The flanked angles in the three ſorts of *fortification*	deg. 64	76	84	90	95	97	99	101	103
Capital for the great ſort	toiſes 46	49	51	52	53	54½	56½	58	59
Ca. for the mean ſort	42	44½	46½	48½	50	51	52½	54	54
Ca. for the ſmall ſort	39	41½	42½	45	46	47½	48½	50	50½

Scheiter detaches the baſtions from the curtin, and forms a kind of receſs behind the curtin: ſuppoſe an octagon to be fortified with his greater *fortification*; let A B, (*Tab.* IV. *fig.* 28.) be its exterior ſide, and equal to two hundred toiſes; A C, B D, parts of the radii, equal to forty-ſix toiſes, be the capitals, and draw the interior ſide C D: in the compaſs take a hundred and forty toiſes for the line of defence, and putting one leg in the flanked angle A, deſcribe with the other an arc to cut the interior ſide in E; make C F = E D, and draw through F and B the ſecond line of defence F B; at E and F, on the lines of defence A E and F B, erect the perpendiculars E L and F I, which, meeting the lines of defence alternately, determine the faces of the counter-guards or detached baſtions of Scheiter. Produce the lines of defence towards the capitals, and take the parts E H and F P, each of ſixteen toiſes, and, biſecting theſe lines, draw the higher flanks parallel to the lower, and make the ſame conſtruction on the other ſides; take the diſtance P Q, and with one leg of the compaſs in P, deſcribe an arc to interſect the capital in the point N; draw N Q and N P, and the counterguard will be finiſhed. About the counterguard make a large ditch of eighteen toiſes, which will give the redan R S T, and as the ſcarp of this ditch forms a

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ſaliant angle towards the middle of the curtin, Scheiter, in order to remedy this inconvenience, conſtructed there a ſmall baſtion in the following manner: from the point 3, where the lines of defence interſect one another, he let fall a perpendicular 34 on the interior ſide; and from the point 4 on each ſide, he took the diſtances 45 and 46, each equal to 43; and then drew the faces 53 and 36 of this baſtion. The flanks are drawn parallel to the perpendicular 43, and produced till they meet a parallel to P F and E H. The ditch of the counterguards is formed by producing the faces of twenty toiſes, as Z A to X, and drawing a line from X to the angle of the ſhoulder L, &c.

On the re-entering angle of the ditch, Scheiter deſcribes a kind of redoubt K, the capital of which is ſixteen toiſes; the counterguards are encompaſſed with *fauſſe-braies*, as well as the whole interior incloſure, except the faces of the ſmall baſtion in the middle of the curtins: he alſo adds a covert-way to that of the place, at the foot of the glacis of the firſt. This ſyſtem of Scheiter differs eſſentially from that which M. Vauban executed in the *fortification* of New Briſach; and yet ſome have groundleſsly charged Vauban with having borrowed his from this of Scheiter.

FORTIFICATION, *according to M. Belidor's firſt method.* Let A B, *fig.* 29. be the exterior ſide of an octagon, and equal to two hundred toiſes; the perpendicular C D, fifty; the faces A E, B F, ſeventy; and the flanks are found according to M. Vauban's method.

The line joining the extremities *a* and *b* of the flanks of the ſame baſtion, ſerves as an exterior ſide for tracing the front of a polygon, whoſe perpendicular *c d* is thirteen toiſes, the faces twenty-two; the parts *d f* of the lines of defence, which terminate the flanks, are fourteen; the dry ditch before this front is ten toiſes at the points *a*, *b*, and the counterſcarp terminates at the oppoſite ſhoulders.

The rams-horns *g*, are deſcribed from a point, in the middle of the faces of the interior front as centers, with a radius of twenty-five toiſes.

The retrenchments H, are drawn from a point h in the face at fifteen toiſes from the ſhoulder to the points *b*, *a*, and are twenty-five toiſes long; the orillons k l, eight, and the flanks n m are eight toiſes retired near the orillon; which are the chords of an arc from the oppoſite ſhoulders; the ditch before theſe retrenchments is eight toiſes near the parapet of the baſtions, and its counterſcarp directed to the ſhoulders.

The ſaliant angle of the redoubt B touches the interſections of the curtins produced, and the faces terminate on the faces of the inner front within three toiſes of the ſhoulders; its ditch is three toiſes: theſe redoubts are a ſtone wall of three or four feet thick, with loop-holes in the faces.

M. Belidor has made no outworks to this ſyſtem, but Mr. Muller has added ravelins and a covert-way, made in the uſual manner; the great ditch is twenty toiſes before the ſaliant angles of the baſtion, and its counterſcarp is directed to the ſhoulders; and the faces of the ravelins to the outline of the retrenchments H.

FORTIFICATION, *according to M. Belidor's ſecond method.* A B, *fig.* 30. is the exterior ſide of an octagon of two hundred toiſes; the perpendicular C D, fifty-five, and the faces A E, B F, ſeventy, as in the former; and the flanks are likewiſe found according to M. Vauban's method.

The line *a b*, which paſſes through the extremities of the flanks, ſerves as an exterior ſide to the inward polygon, whoſe perpendicular c d is five toiſes, the faces twenty-four, and the flanks are chords of arcs deſcribed from the oppoſite ſhoulders of the detached baſtions as centers.

This inward polygon is nothing elſe but a ſtrong wall, behind the curtin of which, and about eighteen feet diſtance from it, is a parapet or epaulement of earth three toiſes thick; and within the baſtions are cavaliers, whoſe fronts are circular arcs deſcribed with a radius of about twenty-three or twenty-four toiſes; the flanks are ſeven toiſes long, and gorges thirty-two.

The counterſcarp of the ditch before this polygon is ſeven toiſes at the ſaliant angles *a*, *b*, and parallel to the curtin.

The rams-horns or tenailles touch the lines of defence within three toiſes of the ſhoulders, and are deſcribed ſo as to meet the other lines of defence in the ſame point as the counterſcarp of the inner ditch.

The outline of the curtin between the rams-horns is nine toiſes from the ditch.

The exterior ſide h k of the retrenchments within the detached baſtions, meets the faces within twenty toiſes from the ſhoulders; the perpendicular m n, is ſeventeen, the faces h l, twenty; the chord on which the orillon is deſcribed is five toiſes, as likewiſe the retired part of the flank; the flanks and orillons are made according to M. Vauban's method.

The circular curtin and the round part of the ditch behind it, are deſcribed with a center, twenty-five toiſes diſtant from the points *a*, *b*.

The great ditch is twenty toiſes before the ſaliant angles of the detached baſtions, and is ſuppoſed to be dry; for which reaſon M. Belidor made a caponiere to go from the curtin to the ravelin, eighteen or twenty feet wide, whoſe parapets terminate on both ſides in a ſlope or glacis.

The capital of the ravelin Q is ſixty-ſix toiſes, that of the redoubt P, thirty; the faces of the ravelin are directed to thoſe of the retrenchments within the baſtions, and thoſe of the redoubt to the ſhoulders; the batteries in the ravelin are retired eight toiſes behind the faces; the ditch of the ravelin is twelve toiſes, and that of the redoubt ſeven.

The ſemi-gorges of the lunettes R, are twenty-five toiſes, and the faces perpendicular to thoſe of the ravelin and the baſtion; the ditch before them is eight toiſes, and the batteries S, are retired as much, and are fifteen toiſes long: laſtly, the covert-way is ſix toiſes.

FORTIFICATION, *according to M. Belidor's third method.* The figure in this conſtruction, is part of an octagon, whoſe ſide A B, *fig.* 31. is two hundred toiſes, the perpendicular C D, forty; the faces A E, B F, fifty-five; the parts D r of the lines of defence, between the perpendicular and the broken part of the curtin, thirty; and the length of the broken parts r n, twenty-five; the orillon is nine, and is a part of a flank found according to M. Vauban's method; the flanks are eight toiſes retired, and are arcs of ſixty degrees; the outlines of the rams-horns are thirteen toiſes diſtant from each other; the paſſages at their extremities are three, the outmoſt or loweſt is deſcribed with a radius of thirty toiſes, and the other is deſcribed from the ſame center.

Mr. Muller has omitted the cavaliers placed in the gorges of the baſtions, as being according to his notion ſuperfluous.

The center R of the arc K L, is eighteen toiſes diſtant from the re-entering angle of the counterſcarp; the chord K L is forty-four toiſes, as well as the other face of the lunette; and the radius R K, eighty-eight; the battery H is ten toiſes retired.

The figure m is a redoubt made of a ſtone wall full of loop-holes, with a ditch of two toiſes before it.

The ditch before the lunettes is twelve toiſes at the ſaliant angles, and its counterſcarp directed to the extremities of the oppoſite faces.

The capital of the ravelin W is forty-four toiſes, the ſemi-gorges, thirty-one; the flanks are nine toiſes, and directed to the ſhoulders of the baſtions.

The ditch before the ravelin is ten toiſes, and the covert-way ſix.

The glacis T, before the ſaliant angles of the baſtions, is fifteen toiſes broad; the ſemi-gorges of the places of arms X are twenty-ſix toiſes; and thoſe of the redoubts or ſtone wall within them, twenty, reckoning from the edge of the glacis T; and the faces are drawn parallel to the oppoſite ſemi-gorges.

The redoubts S within the lunettes, are alſo made of a wall three or four feet thick full of loop-holes, with a ditch of three toiſes before them.

The dimenſions of the arrows and detached redoubts, are the ſame as thoſe in M. Vauban's method, only the arrows have flanks parallel to the paſſage of ten toiſes.

The ſeveral ſyſtems of Pagan, Vauban, Coehorn, Blondel, and Belidor, may be ſeen at one view in *Tab.* V. *fig.* 32.

FORTIFICATION, *according to Mr. Muller's firſt method.* Let AB, *Tab.* VI. *fig.* 33. be the exterior ſide of a polygon of any length, e. gr. a hundred and eighty toiſes; make the perpendicular C D of any length, as the ſixth, fifth, or fourth part of the exterior ſide, according to the expence or importance of the place: here it is the ſixth part or thirty toiſes; ſet off fifty toiſes or more for the faces B H, A E, or rather $\frac{2}{7}$ of the exterior ſide; from the ſaliant angle A deſcribe an arc with the radius A I of twenty toiſes, that is two or three toiſes more than the breadth of the ditch; draw from the oppoſite ſhoulder H a tangent H I to that arc, and from the angle A the indefinite line A b parallel to that tangent; then, if from the angle A as center an arc a b be deſcribed with any radius, the flank G H is drawn parallel to the chord a b: one of the flanks being thus found, the others will be found by taking the diſtance D G, between the perpendicular and the angle of the flank, and carrying it from the extremities of all the perpendiculars on the lines of defence, as from D to F; this being done, the counterſcarp of the ditch is drawn parallel to the line H I or to A b; and having the point of re-entering angle O, its diſtance from the extremity of the perpendicular, being carried all round, will give the re-entering angles before the other fronts.

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The tenailles h k, which M. Belidor has invented, and called them rams-horns, are deſcribed, by ſetting off three toiſes from the ſhoulder Q of the baſtion to the point h, and drawing h f perpendicular to the line of defence; then its interſection f, with the other line of defence produced, will be the center of the arc h k.

In order to conſtruct the ravelin, ſet off twelve or fifteen toiſes from the ſhoulder E to the point r, in the face of the baſtion, and from the angle G of the flank as center, deſcribe an arc through the point r, meeting the perpendicular C D produced at L; from this point L draw the faces, ſo as when produced to fall on the faces of the baſtions within three toiſes of the ſhoulders; the ditch of the ravelin is twelve toiſes.

For the retired flanks, find the flank Q R as before, on which ſet off five or ſix toiſes for the ſhoulder or orillons; and from a point g in the oppoſite face of the baſtion at five toiſes from the ſaliant angle B, draw the broken part of the flank; then draw the retired flank parallel to the line Q R, at five toiſes diſtant from it: the orillon may be made round in the manner of M. Vauban's, if it be thought proper.

FORTIFICATION, *according to Mr. Muller's ſecond method, with detached baſtions.* Let the interior ſide A B, *fig.* 34. of an octagon be a hundred and thirty toiſes; take A b, B n, equal to twelve toiſes for the ſemi-gorges of the ſmall baſtions, and as much for their capitals A c, B r; from the points c, r, draw the lines c n, r b, to the extremity of the gorges, and make the flanks b d, n m, perpendicular to the lines of defence; the ditch is ſix toiſes at the ſaliant angles c, r, and its counterſcarp drawn to the extremities of the flanks of the detached baſtions.

The capitals c C, r D, of the detached baſtions are fifty-five toiſes, and the lines of defence are drawn to the extremeties b and n of the interior flanks; the faces are ſixty; the radius of the arc, which ſerves to determine the poſition of the flanks, eighteen; and the ditch ſixteen at the ſaliant angle.

The ravelin is conſtructed by deſcribing an arc from the extremity of the flank, as center, through a point in the oppoſite face of the baſtion, within twenty toiſes of the ſhoulder, which arc interſects the capital of the ravelin at the ſaliant angle; the faces terminate within five toiſes of the ſhoulders, the ſemi-gorge of the redoubt R is fifteen, its faces parallel to thoſe of the ravelin, and its parapet two toiſes; the ditch of the ravelin twelve, and that of the redoubt ſix.

The ſemi-gorges of the places of arms are twenty toiſes, thoſe of the ſtone redoubts p within them twelve; the faces of the places of arms are twenty-five; and thoſe of the redoubts parallel to them, with a dry ditch of three toiſes before them; the covert way is ſix, and the glacis twenty.

The faces of the tenailles are ſixteen toiſes, the paſſage between them and the flanks of the baſtions three; their flanks are parallel to the others, the curtin is drawn through the points where they meet the lines of defence, and the inſide of the tenailles is terminated by lines drawn through the extremities of the flanks of the detached baſtions.

FORTIFICATION, *according to Mr. Muller's third method, with detached orillon baſtions.* Let the exterior ſide A B, *fig.* 35. of an octagon be two hundred toiſes, the perpendicular C D forty, that is, a fifth part of the exterior ſide, the faces A E, B F, fifty-five; the radius of the arc which ſerves to determine the poſition of the flanks, twenty-two; the ditch ſixteen at the ſaliant angles; the orillon five; the flank is retired five toiſes; and the line k d, which terminates the flanks, is drawn from a point d, in the face at five toiſes from the ſaliant angle; the ſhoulders of the tenailles are twenty toiſes from thoſe of the baſtions; the flanks parallel to the others, and the curtin is drawn through the points of interſection of the flanks and lines of defence.

Take on the lines E l, F h, drawn from the extremities of the faces parallel to the flanks, and which terminate the inſide of the tenailles, the parts l n, h m, each of ſix toiſes, for the breadth of the ditch; and upon the exterior ſide r n, conſtruct a front of a polygon, by making the perpendicular twelve, and faces twenty toiſes.

The redoubts V are made of a wall three feet thick only with loop-holes; their ſaliant angle is determined by the counterſcarps of the inner ditch produced; and the faces terminate within three toiſes of the ſhoulders; the ditch about theſe redoubts is four toiſes.

The ravelins and covert-way are conſtructed in the ſame manner as thoſe in the former method.

Mr. Muller has made remarks on theſe ſeveral conſtructions, deſigned to ſhew in what reſpects they are ſuperior to thoſe of M. Vauban, already recited. See Muller's Elem. of *Fortification*, p. 100, 104, 108, &c.

FORTIFICATION, *profile of a*, is a repreſentation of a vertical ſection of a work, ſerving to ſhew thoſe dimenſions which cannot be repreſented in plans, and are neceſſary in the building of a *fortification*. This profile is conſtructed in the following manner: provide a ſcale of equal parts, adapted to the perpendicular height of the work, e. gr. let *a b*, *Tab.* VII. *fig.* 37. be a ſcale of twenty toiſes; and let A B, repreſent the level of the ground plane, ſo that thoſe parts of the *fortification* which are above the ſurface of the ground, or below it, may be above or below this line in the profile. From the point A, in the line A B, take A C = 4 toiſes three feet, for the interior talus or ſlope of the rampart; at C erect a perpendicular C D of three toiſes eighteen feet for the height of the rampart; through the point D draw an indefinite line D N parallel to A B, in which take D E = 5 toiſes for the breadth of the *terre-plein* of the rampart: at the point E erect the perpendicular E F = 2 feet for the height of the banquette, and draw F H parallel to D N, making F G and G H, each equal to three feet. Draw the line E G, which will repreſent the talus of the banquette, and G H will be the upper part of it: on the point H erect the perpendicular H I = 4½ feet for the height of the parapet above the banquette. From I draw the indefinite line I K parallel to D N, in which take I L = 1½ foot, and draw H L, which will be the interior ſide of the parapet: take L K = 3 toiſes for the thickneſs of the parapet, and from the point K let fall the indefinite line K P, perpendicular to the line A B, and produce it below A B: in this line take K M = 2½ feet, and draw the line L M for the upper part of the parapet, which is a talus, that the ſoldier on the banquette may be able to diſcover the covert-way and the glacis. On the point N, where D N interſects K P, as a center, with a radius of one foot, deſcribe a ſmall ſemi-circle, which repreſents the *cordon*; take N P = 6 toiſes, and from the point P draw an indefinite line P n parallel to A B, which will repreſent the bottom of the ditch, the depth of which is ſuppoſed to be equal to the height of the rampart. Take N O = 5 feet for the thickneſs of the *revetement* of the *cordon*, and from the point O draw the indefinite line O Q parallel to N P; this will be the interior ſide of the *revetement* of the point P, where the line P n meets the line N P; take P R = 7 feet, or about the fifth part of its height N P, for the talus of the *revetement*, and draw the line N R, which repreſents the ſcarp or exterior ſide of the *revetement*: take R S = 1 foot for the jutting of the foundation, and draw S T perpendicular to P n, making it equal to two or three toiſes for the depth of the foundation; draw T Q parallel to P n, and let it interſect O Q in Q; and let Y & be drawn parallel to N M, and at the diſtance of three feet, for the *revetement* of the parapet. In order to repreſent the profile of the counterfort or buttreſs, when there is any, take O V = 9 feet, and draw V X parallel to O Q; V X, Q O, will repreſent this profil, by means of which the *revetement* O R is ſtrengthened. That the *terre-plein* of the rampart may have a proper declivity, for carrying away the water which falls upon it, let D W be equal to 1½ foot, and draw W E, which will repreſent the upper part of the rampart, and the line A W repreſents the ſlope of its interior ſide. Suppoſe the breadth of the ditch to be twenty toiſes, and lay this down from P to n; and on the point n erect the perpendicular n m, terminated by the line A B at m, which will be the limit of the counterſcarp. At the diſtance of three feet from this line, and parallel to it, draw z y, which will give the thickneſs of the *revetement* of the counterſcarp; n u = 3 feet will be the talus of this *revetement*, and the line u m the exterior ſide of it. The foundation may be made to terminate at the diſtance of about ſix inches from the point u. Let m c = 5 toiſes be the breadth of the covert-way, and at the point c erect a perpendicular c d = 2 feet for the height of the banquette. Draw d f parallel to A B, and equal to one toiſe, in which take d e and e f, each equal to three feet.

Draw the line c e for the talus of the banquette, and e f will be the upper part of it: from the point f erect a perpendicular f l = 4½ feet, for the height of the parapet of the covert-way above the banquette. Produce f l till it cuts A B in r; take r g = 20 toiſes for the breadth of the glacis, and draw l g, which will repreſent the glacis, or the declivity of the rampart of the covert-way: in this line take l h = 1 foot, and draw h f, which will be the interior ſide of the parapet of the covert-way; after which let there be a paliſade conſtructed on the banquette, and the profile is finiſhed. Encyclopedie.

FORTIFIED *place*, a *fortreſs*, or *fortification*, i. e. a place well flanked, and ſheltered with works. See *Tab. Fortification*, *fig.* 21. with the explanation annexed to it, and *fig.* 38. which repreſents a *fortified* place beſieged.

Places fortified after the modern way, conſiſt chiefly of baſtions and curtins, and ſometimes of demi-baſtions, according

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cording to the ſituation of the ground; of cavaliers, ramparts, fauſſe-brayes, ditches, counterſcarps, covert-ways, half-moons, ravelins, horn-works, crown-works, out-works, eſplanades, redents, and tenailles. See each under its proper article, BASTION, &c.

There are other moveable and additional parts; as bermes, parapets, banquettes, embraſures, cordons, boyaux, moulinets, chevaux de friſe, chauſſetrapes, galleries, mantelets, batteries, ſaps, mines, blinds, gabions, and paliſades. See each in its place, BERME, PARAPET, &c.

Several of theſe works, again, conſiſt of diverſe parts, which have different denominations: thus, a baſtion conſiſts of faces, flanks, caſemates, orillons, gorge, &c. which ſee.

FORTIN, or FORTLET, a diminutive of the word *fort*, importing a little *fort*, or ſconce, called alſo *field* FORT.

Star FORTIN, is that whoſe ſides flank each other, &c. See *Star* FORT.

FORTIORI. *A multo* FORTIORI. See MULTO.

FORTIS *Aqua*. See AQUA *Fortis*.

FORTISSIMO, in the *Italian Muſic*, is uſed to ſignify *very ſtrong*. It is ſometimes denoted by FFF, or *fff*, and intimates that the performers are to play or ſing very loud or ſtrong, to expreſs ſome paſſion, &c. See FORTE.

FORTRESS. See FORT and FORTIFICATION.

FORTUNA *equeſtris*. See EQUESTRIS.

FORTUNA, in our ancient *Law-Books*, is the ſame with what we call TREASURE-*trove*.

Theſaurum ducente fortuna *invenire inquirendum eſt per* 12 *juratores pro rege, &c. quod fideliter præſentabunt, &c. omnes* fortunas, *abjurationes, appella*, &c.

Some pretend it alſo ſignifies *fortuito occiſos*; but this ſeems to be very fanciful.

FORTUNATE *iſlands*, in the *Ancient Geography*, an appellation which has given the critics and antiquaries great perplexity; being the name of a place famous for golden apples which grew there; or, as Varro ſays, for ſheep with golden fleeces.

The ancients deſcribe them as ſituate without the ſtreights of Gibraltar, in the Atlantic ocean. The common opinion of the moderns takes them for the Canary iſlands; this is grounded principally on the ſituation and temperature of thoſe iſlands, which renders the uſe of cloaths there unneceſſary; and from the abundance of oranges, lemons, grapes, and other delicious fruits growing there.

Ol. Rudbeoks has found a very different place for them. That learned author, who makes his native country, Sweden, the ſcene of all that is great and extraordinary in ancient tradition and fable, will have the *Fortunate Iſlands* to be Sweden; and the delicious fruits, talked of by the ancients, his imagination ſuggeſts, were nothing but the virtue and good manners, which anciently flouriſhed in that cold hyperborean nation.

FORTUNE. See PROVIDENCE, FATE, &c.

FORTUNE, Τυχη, is a name unknown in the earlier ages; and does not occur either in Homer or Heſiod; as not being invented in their time.

In after-days it was introduced as a machine; and made to ſerve divers purpoſes in natural philoſophy and theology.

Plutarch, in an expreſs treatiſe of the *Fortune* of the Romans, accounts for the practice of the ancient poets, who ſeem to make Jupiter the author of all the evils of life. Mankind, he obſerves, before the name of *Fortune* had got into the world, perceiving a certain arbitrary cauſe, diſpoſing of things in an irreſiſtible manner, called it *God*; but the ſame cauſe being often obſerved to act at random, and without any rule or order at all, the ſupreme Being came to be diveſted of the attribute; and *Fortune*, or Deſtiny, acknowleged in his ſtead.

It is not eaſy to unravel what the ancients meant by the name *Fortune*. The Romans underſtood by it a principle of fortuity, whereby things came to paſs, without being neceſſitated thereto; but what and whence that principle is, they do not ſeem to have ever preciſely thought; whence their philoſophers are often intimating, that men only framed the phantom *Fortune*, to hide their ignorance; and that they call *Fortune* whatever befals a man without his knowing for what purpoſe. Hence Juvenal, ſat. x. ver. 366, affirms, they were men who made a deity of *Fortune*.

Nullum numen abeſt, ſi ſit prudentia; ſed te
Nos facimus, Fortuna, *deam, cœloque locamus.*

The ingenious Mr. Spence gives another reading of this paſſage:

Nullum numen habes, ſi ſit prudentia; ſed te
Nos facimus, Fortuna, *deam cœloque locamus.*

This reading, he thinks, agrees beſt with the context: Juvenal ſays, ver. 356. that the two things we ſhould pray for are good health and good ſenſe; that we might be the authors of our own happineſs if we pleaſed, ver. 363. that virtue is the only way to true happineſs, ver. 364. that if we ourſelves are prudent, *Fortune* has no power over us; and that, in truth, ſhe is no goddeſs at all, and has only uſurped a ſeat in heaven from the folly of mankind, ver. 366. *Fortune* was not conſidered as a deity by the old Romans, but was made ſo by the devotion and folly of the vulgar; and Mr. Spence ſays, that he has ſeen an ancient gem, in which Cybele, the mother of the gods, is repreſented as turning away her head from *Fortune*, in an attitude of diſowning and rejecting her. Polymetis, p. 150, 154, &c.

According to the opinion of the heathens, therefore, *fortune*, in reality, was only the arrival of things in a ſudden and unexpected manner, without any apparent cauſe, or reaſon; ſo that the philoſophical ſenſe of the word coincides with what is vulgarly called *chance*.

But in religion it had a farther force; altars and temples in great numbers were conſecrated to this *Fortune*, as a deity. This intimates that the heathens had perſonified, and even deified, their chance; and conceived her as a ſort of goddeſs, who diſpoſed of the fate of men at her pleaſure. Hence that invocation of Horace, *O diva, gratum quæ regis Antium*; in the thirty-fifth ode of the firſt book, where he recommends Auguſtus, then preparing for a viſit to Britain, to her protection. From theſe different ſentiments it may be inferred, that the ancients at one time took *Fortune* for a peremptory cauſe, bent upon doing good to ſome, and perſecuting others; and ſometimes for a blind, inconſtant cauſe, without any view or determination at all.

If then the word *Fortune* had no certain idea in the mouth of thoſe who erected altars to her; much leſs can it be aſcertained what it denotes in the mind of thoſe who now uſe the word in their writings.

They who would ſubſtitute the name *Providence* in lieu of that of *Fortune*, cannot give any tolerable ſenſe to half the phraſes wherein the word occurs.

Horace paints the goddeſs, preceded by Neceſſity, holding nails and wedges in her hands, with a cramp-iron, and melted lead to faſten it; rarely accompanied with Fidelity, unleſs when ſhe abandons a family; for in that caſe Fidelity never fails to depart with her, as well as friends.

She is diſreſpectfully ſpoken of by moſt of the Roman writers, and repreſented as blind, inconſtant, unjuſt, and delighting in miſchief. Ovid. ad Liv. ver. 52. ver. 374. Hor. lib. i. od. 34. ver. 26. lib. iii. od. 29. ver. 51. Statius, Theb. xii. ver. 505. However, they had a good as well as a bad *Fortune*, a conſtant and inconſtant *Fortune*, the latter of which was repreſented with wings, and a wheel by her. Hor. lib. iii. od. 29. ver. 56.

Juvenal alludes to a ſtatue of *Fortune*, which exhibited her under a very good character, as the patroneſs of the poor infants that were expoſed by their parents in the ſtreets. Sat. vi. ver. 605.

The painters repreſent her in a woman's habit, with a bandage before her eyes, to ſhew that ſhe acts without diſcernment; and ſtanding on a wheel, to expreſs her inſtability. The Romans, ſays Lactantius, repreſented her with a cornucopiæ, and the helm of a ſhip, to ſhew that ſhe diſtributes riches, and directs the affairs of the world. In effect, it is with ſuch characters, that we ſee her repreſented on ſo many medals, with the inſcriptions, FORTVNA AVG. FORTVNA REDVX. FORTVNAE AVG. or REDVCIS, &c. Sometimes ſhe is ſeen pointing at a globe before her feet, with a ſceptre in one hand, and holding the cornucopiæ in the other.

The Romans had a virile, as well as a muliebrian *Fortune*, for the objects of their adoration: the *Fortuna virilis* was honoured by the men, and the *fortuna muliebris* by the women.

They honoured *Fortune* alſo under a variety of other appellations. The Romans derived the worſhip of *Fortune* from the Greeks, under the reign of Servius Tullius, who dedicated the firſt temple to her in the public market. Nero alſo built a temple to *Fortune*. The *Fortune* worſhipped at Antium was probably of the moſt exalted character of any among the Romans; if we may judge by the account which Horace gives us of the great ſolemn proceſſions that were made to her. Hor. lib. i. od. xxxv. ver. 22. But the moſt celebrated temple of *Fortune* was at Præneſte. Statius ſpeaks of ſeveral *Fortunes* there, and calls them the *Præneſtinæ ſorores*. Lib. i. Sylv. iii. ver. 80.

On the reverſe of a medal of Commodus, we have a repreſentation of *Fortune*, under the quality, or ſurname of *Manens*, i. e. *ſtable, permanent*; holding a horſe by the reins. On the Greek medals we meet with ΑΓΑΘΗ or ΚΑΛΗΤΥΧΗ, *Good Fortune*. Conſtantine gave the epithet *anthouſia*, i. e. *flouriſhing*, to the *Fortune* of his new city Conſtantinople.

FORTUNE, *part of*. See PART.

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FORTUNE-*tellers*. Pretenders to tell *fortunes*, and to any crafty ſcience for the diſcovery of ſtolen goods, are puniſhable by impriſonment, pillory, and binding to the good behaviour, and ſhall be deemed vagabonds. Stat. 9 Geo. II. cap. 5. ſect. 4. Stat. 17 Geo. II. cap. 5. ſect. 2. See CONJURATION.

FORTY *days*. See QUADRAGESIMA, and LENT.

FORTY *days court*. See ATTACHMENT *of the foreſt*.

FORTY *hours, prayers of*. See HOURS.

FORTY *ſhilling-land* is uſed in Scotland for a certain portion of arable land. The *forty-ſhilling land* of old extent contains eight OXGANG, or 104 acres.

FORUM, in *Antiquity*, is uſed in divers acceptations: ſometimes for a place of traffic, anſwering to our market-place; in which ſenſe it has uſually ſome adjective added to it, as *forum boarium*, the *beaſt-market*; *forum piſcarium*, the *fiſh-market*; *olitorium forum*, the *herb-market*.

FORUM, again, is uſed for any place, where the governor of a province convenes his people, to give judgment, according to courſe of law.

Whence a man is ſaid *forum agere*, when he keeps the aſſizes; *forum indicere*, when he appoints the place where they are to be kept, &c.

FORUM was alſo a public ſtanding place in the city of Rome, where cauſes were judicially tried, and orations delivered to the people.

Of theſe *forums* there were ſeveral; at firſt only three, viz. *Romanum*, *Julianum*, and *Auguſtum*; but that number was afterwards increaſed to ſix, by the addition of the *Tranſitorium*, called alſo *Palladium*; the *Trojanum*, and *Saluſtii forum*.

The firſt, and moſt eminent of theſe, was the *forum Romanum*, called alſo *forum vetus*; and abſolutely, *forum*, or *the forum*.

In this was an apartment, called the ROSTRA, where the lawyers pleaded; the officers harangued; funeral orations were delivered, &c.

In the ſame *forum* was the *comitium*, or hall of juſtice, with the ſanctuary of Saturn, the temple of Caſtor, &c.

FORUM is alſo uſed among caſuiſts, &c. for *juriſdiction*.

Thus they ſay *in foro legis*, or the *outer forum*, i. e. in the eye of the laws, or the common courſe of juſtice: *in foro conſcientiæ*, or the *inner forum*, i. e. in the eye of God, or a man's own conſcience.

There are a great many things not condemned *in foro legis*, which yet are criminal *in foro conſcientiæ*.

FOSS, or FOSSE, in *Fortification*, &c. a DITCH, or MOAT.

The word is French, formed of the Latin participle *foſſum*, of the verb *fodio*, *I dig*.

FOSSE, *advance*. See ADVANCE.

FOSSE, *van*. See VAN.

FOSS, FOSSA, in *Anatomy*, a kind of cavity in a bone, with a large aperture, but no exit, or perforation.

When the aperture is very narrow, it is called a *ſinus*.

In the cranium there are ſix internal, and fourteen external *foſſes*. The cavity of the orbit, which contains the eye, is a *foſs*.

Foss is particularly uſed for the cavity, or denture in the back part of the neck.

FOSSA *magna*, or *navicularis*, is an oblong cavity, forming the inſide of the *pudendum muliebre*, and which preſents itſelf upon opening the labia; and in the middle whereof are the *carunculæ myrtiformes*. See *Tab. Anat. (Splanch.) fig.* 9. *lit. t*.

FOSSA, in our *Ancient Cuſtoms*, was a ditch full of water, where women committing felony were drowned; as men were hanged. *Nam & ipſi in omnibus tenementis ſuis omnem ab antiquo legalem habuere juſtitiam, videlicet ferrum*, foſſam, *furcas*, & *ſimilia*. In another ſenſe it is taken for a grave, as appears by theſe old verſes:

Hic jacent in foſſa *Bedæ venerabilis oſſa*:
Hic eſt foſſatus, *qui bis erat hic cathedratus*.

Foss-*way* was anciently one of the four great Roman highways of England: ſo called, according to Camden, becauſe it was ditched on both ſides, which was the Roman method of making highways.

FOSSARII, in *Antiquity*, a kind of officers in the Eaſtern church, whoſe buſineſs was to inter the dead.

Ciaconius relates, that Conſtantine created nine hundred and fifty *foſſaries*, whom he took out of the divers colleges or companies of tradeſmen: he adds, that they were exempted from taxes, ſervices, burdenſome offices, &c.

F. Goar, in his notes on the Greek Euchologion, inſinuates, that the *foſſarii* were eſtabliſhed in the times of the apoſtles; and that the young men, who carried off the body of Ananias, and thoſe perſons full of the fear of God, who interred St. Stephen, were of the number.

St. Jerom aſſures us, that the rank of *foſſarii* held the firſt place among the clerks; but he is to be underſtood of thoſe clerks only, who had the direction and intendance of the interment of the devout.

FOSSIL, in *Natural Hiſtory*, is uſed, in a general ſenſe, for any thing dug up, or found under ground. Such are all minerals, metals, rock ſalts, &c.

Foſſils is uſed in a more confined ſenſe by Linnæus, to denote the third claſs of ſtones; and includes petrified, concrete, and terrene ſubſtances.

The chemiſts divide all bodies into three claſſes, or kingdoms; viz. *foſſil* or *mineral*, *vegetable*, and *animal*.

Foſſils may be diſtinguiſhed into, 1. Such as are *natives* of the earth; and, 2. Such as are *adventitious*, and repoſited therein by any extraordinary means; as earthquakes, deluges, &c.

FOSSILS, *native*, or FOSSILS *properly ſo called*, are ſenſible bodies, generated and growing in the earth, and found either buried in it, or lying on its ſurface; whoſe conſtituent parts are ſo ſimple and homogeneous, that there is no apparent diſtinction of veſſels and juices; nor any difference between the part, and the whole.

The firſt perſon who attempted to reduce the ſubject of *foſſils* into a regular ſcience, was Dr. Woodward, who publiſhed a method of arrangement, founded on the growth, ſtructure, and texture of *foſſils*. But this ſyſtem being found inſufficient for diſtinguiſhing the bodies of the *foſſil* kingdom with accuracy, was ſucceeded by the method of dividing theſe bodies, according to the various changes produced on them by fire, into *calcarii*, *apyri*, *vitreſcentes*, &c. eſtabliſhed by the Swediſh and German authors; and this method now univerſally prevails. The mineralogy of Wallerius is on this plan; however, other writers, as Dr. Hill, Mendes da Coſta, &c. have endeavoured to form a new ſyſtem from the combined principles of Woodward and Wallerius; and arranged *foſſils*, not only according to their growth, texture, and ſtructure, but alſo their principles and qualities, as diſcovered by the aid of fire and acid menſtrua.

Native *foſſils* are either *ſimple*, or *compound*.

FOSSILS, *ſimple*, are thoſe, whoſe parts, however divided, are all of the ſame nature, i. e. of the ſame gravity, magnitude, figure, hardneſs, and mobility.

Such is quickſilver, which, however divided, is always found the ſame.

Of *foſſils* naturally and eſſentially ſimple, ſome, according to Dr. Hill, in his Hiſtory of *Foſſils*, are neither inflammable nor ſoluble in water, of which he reckons three ſeries; as thoſe of no regular ſtructure or determinate figure, comprehending the ſimple EARTHS, of which there are ſeveral orders and genera; thoſe of a regular ſtructure, and no determinate figure, of which ſeries there are three claſſes, viz. the TALCS, the FIBRARIÆ, and the GYPSUMS, each of which is again ſubdivided into orders and genera; and thoſe of a regular ſtructure and a determinate figure, comprehending three claſſes, viz. the SELENITÆ, CRYSTALS, and SPARS, which include various orders and genera. Other ſimple foſſils, though uninflammable, are ſoluble in water; ſuch are the ſimple SALTS: and others, on the contrary, are inflammable, but not ſoluble in water; of which there are two ſeries, viz. thoſe of a ſolid form, comprehending the PHLOGIDIAUGIA and the PHLOGISCIERIA.

FOSSILS, *compound*, are thoſe which may be divided into different, or diſſimilar parts.

As antimony, which may be reſolved by fire into ſulphur, and a metalline part.

Of theſe compound *foſſils*, in the diſtribution of Dr. Hill, ſome are neither inflammable, nor ſoluble in water, of which there are four ſeries; as thoſe that are found in continued ſtrata, comprehending the two claſſes of *compound* EARTHS, ſubdivided into LOAMS and MOULDS, and their ſubordinate genera; and STONES, including three orders, and under thoſe eight genera; thoſe again, that are formed in detached maſſes, of a regular ſtructure and determinate figure, comprehending the two claſſes of SEPTARIÆ and SIDEROCHITA; thoſe formed in detached maſſes, of no determinate figure or regular ſtructure, and compoſed of a cryſtalline or ſparry matter, debaſed by an admixture of earth in various proportions, comprehending four claſſes, viz. the SCRUPI, the *ſemipellucid* GEMS, the PEBBLES, and SANDS; and thoſe that are formed of a fine pellucid ſubſtance, of great hardneſs, and never fouled by an admixture of earthy, or any other coarſe matter, but ſuſceptible of elegant tinges from metalline particles, of which ſeries there is only one claſs, including the pellucid GEMS, of which there are two genera, viz. ſuch as retain one ſimple and permanent appearance in all lights, as the diamond, the carbuncle, the ruby, the garnet, the hyacinth, the amethyſt, the ſapphire, the beryll, the emerald, the praſius, the chryſolite, and the topaz; and ſuch as exhibit variable colours, when viewed in different lights, as the opal and aſteria. Other compound *foſſils* are ſoluble in water, but not inflammable, as all the *metallic* SALTS, ſome of which are found naturally in a ſolid form, as VITRIOL and CHALCANTHUM; and others in a liquid

ſtate,

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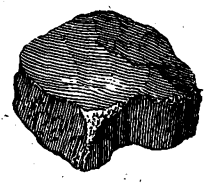
FOSSILS.

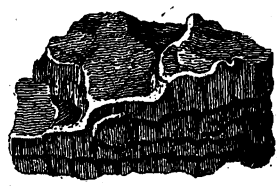
Class I. Native Fossils.

Talcs
SPECULARIS. HYALINA. BRACTEARIUM. ELASMIS.

TRICHERIA



LACHNIS



Fibrariæ.
ASBESTOS

AMIANTHUS

Class II. Selenitæ.

LEPTODE-CARHOMBIS

PACHODE-CARHOMBIS

TETRADE-CARHOMBIS

ISCHNAMBLUCIS

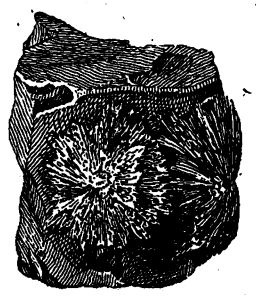
ISAMBLUCIS

Class III. Cryſtals.

OXUCIA

INOXUCIA

LEPASTRUM



SANIDIUM

CATHETOLIPES

TRICHESTRUM

SYMPLEXIUM

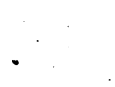
MACROTELOSTYLUM

BRACHYTELOSTYLUM

PAURAEDRASTYLUM

POLYAE-DRASTYLUM

ELIPOPA-CHYSTYLUM



ELIPOMACROS-TYLUM

OLIGAEDRUM

PANGONIUM

ARTHRODIA

CASSITERION

SIDERION

MOLYBDION

Class IV. Siderochitæ.

EMPHEREPYRA

HETEROPYRA

GÈODES

ENHYDRUS

Class V. Pyritæ.

PYRIPLACIS

GYMNOPYRIS

PYRITRICHUM

PYRITRICHIPHYLLUM

PYRICUBIUM

PYROCTOGONIA

PYRIPOLY-GONIUM

ÆTITES

Crofs Stones

BASALTES

DENDRITIS

PISOLITHOS

LEPIDOTES

OCULATUS Lapis

OCULUS Beli

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FOSSILS *Tab.II.*

Claſs VI. Extraneous Foſsils.

Plants in Stone.

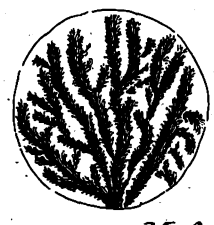
American Fern

Horsetail

Stellate Plants

Ear of Corn

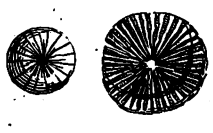
Leaves of Trees



Moſses

Claſs VII. Corals.

PORPITES



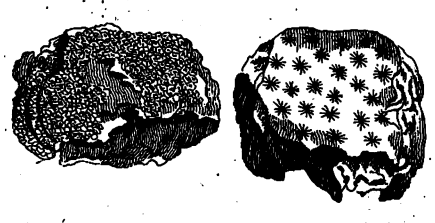
PORUS

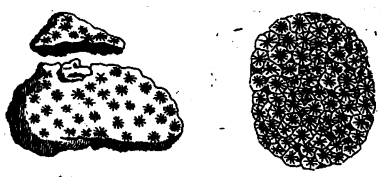
TUBULARIA

JUNCI Lapidei

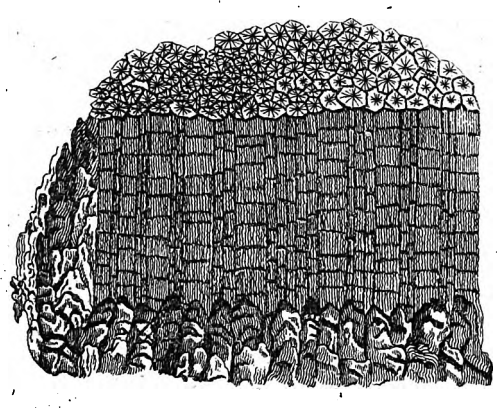
CALAMUS Indicus

Astroites or STAR Stone



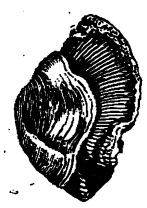


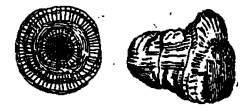
LITHOSTROTION



CORAL

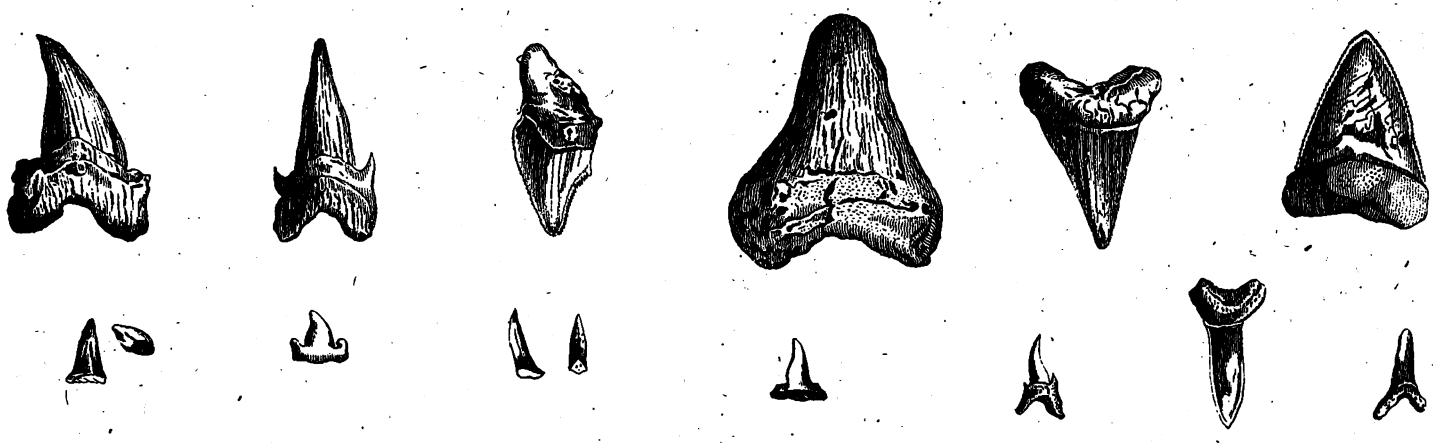
MYCETITES





Claſs VIII. Fiſhes Teeth.

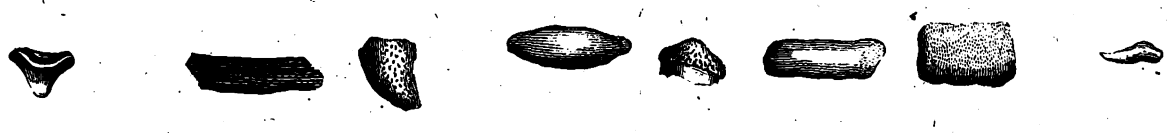
GLOSSOPETRÆ or Lamiodontes



CONICHTHYODONTES or Plectronitæ

BUFONITÆ or Lycodontes

ICHTHYPERIA or Siliquastra



I.Taylor ſculp.

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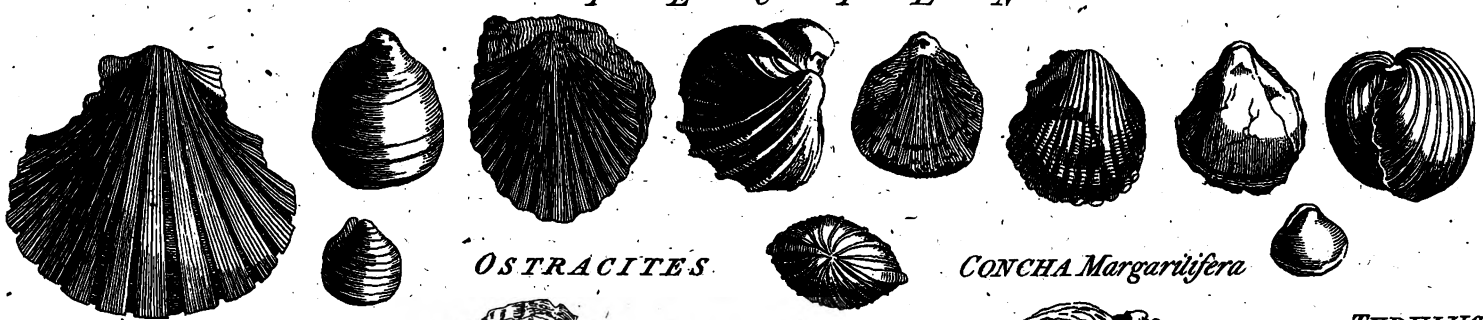
FOSSILS *Tab. III.*

Class IX. Fosil Shells.

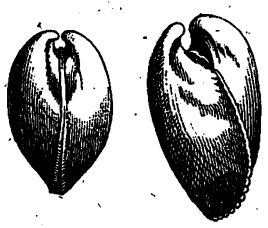
PECTEN



OSTRACITES

CONCHA Margaritifera

BUCARDITÆ



TUBULUS Marinus

DENTALIA

SYRINGOIDES Lapis

CYLINDRI

TROCHI

COCHLEÆ

BUCCINA

NAUTILI

NERITÆ

CONCHÆ Anomiæ.

Ammonitæ or SNAKE Stones

ORTHOCERATITES

GRYPHITES

ECHINITÆ

Class X. Fosil Bodies once parts of Animals.

BELEMNITÆ

JUDAICUS Lapis

ACULEI – Echinorum

ENTROCHUS

APPENDICULÆ Asteriarum

TROCHITÆ

ASTEROPODIUM cum Asteria

Asteriæ or STAR Stones

ASTEROPODIUM

I. Taylor sculp.

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ſtate, ſuch as the water from which the blue Cyprian vitriol is procured; and others are inflammable but not ſoluble in water, of which there are three claſſes, viz. the MARCASITES, the PYRITÆ, and PHLOGONIÆ.

Dr. Hill adds a third general diviſion of *foſſils*, including the metallic *foſſils*, ſome of which are fuſible by fire, and not malleable in their pureſt ſtate; ſuch are antimony, biſmuth, cobalt, zinc, and quickſilver; and others are fuſible by fire, but concrete again in the cold, and become malleable, or diſtenſible, and ductile under the hammer: ſuch are tin, iron, copper, ſilver, lead, and gold.

FOSSILS, *adventitious*, or *foreign*, include the ſubterraneous exuviæ of ſea and land animals, and even vegetables; as ſhells, bones, teeth, leaves, ſtalks, &c. which are found buried in great abundance, in divers parts of the earth. See *Foſſile* PLANTS, SHELLS, WOOD, &c.

Theſe extraneous *foſſils* have employed the curioſity of ſeveral of our lateſt naturaliſts, who have each their ſeveral ſyſtem to account for the ſurpriſing appearances of petrified ſea-fiſhes, in places far remote from the ſea, and on the tops of mountains; ſhells in the middle of quarries of ſtone; and of elephants teeth, and bones of divers animals, peculiar to the ſouthern climates, and plants only growing in the Eaſt, found *foſſile* in our northern and weſtern parts.

Some will have theſe ſhells, &c. to be real ſtones, and ſtone plants, formed after the uſual manner of other figured ſtones; of which opinion is our learned Dr. Liſter.

That author, though he allows of petrified ſhells on the ſea-ſhores, will by no means agree, that there are any ſuch petrifactions in the midland countries. The ſhell-like ſtones, found in our quarries, he contends, are *lapides ſui generis*; and never were any part of an animal.

His reaſons are, that their matter and texture is perfectly the ſame with that of the rock, or quarry, where they are taken; as iron-ſtone ſhells are all iron-ſtone; ſpar, or cryſtalline, all ſpar, &c. Add, that the quarries of different ſtone yield different ſorts of theſe ſhells; and that there are no animals in nature, which yield any thing exactly like many of them.

But to this erroneous doctrine it is to be anſwered, 1. That theſe ſhells found under-ground, are often perfectly conformable to thoſe in the ſea in figure, ſubſtance, magnitude, &c. 2. The ſubſtance of theſe *foſſils* often alſo differs eſſentially from the common ſubſtance of ſtones. It is true, we frequently find them covered, or impregnated with a mineral, or ſtony matter, which has gradually inſinuated itſelf into the pores; but it is in many caſes eaſy to diſtinguiſh that matter from the ſubſtance of the ſhell.

Another opinion is, that theſe *foſſil* ſhells, with all other foreign bodies found within the earth, as bones, trees, plants, &c. were buried therein at the time of the univerſal DELUGE; and that having been penetrated either by the bituminous matter, abounding chiefly in watery places, or by the ſalts of the earth, they have been preſerved entire, and ſometimes petrified.

Others think, that thoſe ſhells, found at the tops of the higheſt mountains, could never have been carried thither by the waters, even of the deluge; inaſmuch as moſt of theſe aquatic animals, on account of the weight of their ſhells, always remain at the bottom of the water, and never move but cloſe along the ground.

They imagine, that a year's continuance of the waters of the deluge, intermixed with the ſalt waters of the ſea, upon the ſurface of the earth, might well give occaſion to the production of ſhells of diverſe kinds in different climates; and that the univerſal ſaltneſs of the water was the real cauſe of their reſemblance to the ſea-ſhells; as the lakes formed daily by the retention of rain, or ſpring-water, produce different kinds.

Others think, that the waters of the ſea, and the rivers, with thoſe which fell from heaven, turned the whole ſurface of the earth upſide down; after the ſame manner as the waters of the Loire, and other rivers, which roll in a ſandy bottom, overturn all their ſands, and even the earth itſelf, in their ſwellings and inundations; and that in this general ſubverſion, the ſhells came to be interred here, fiſhes there, trees there, &c. See Journ. des Sçavans, 1715. p. 19. and Mem. de Trev. 1713.

But nobody has ſet this ſyſtem in a better light than Dr. Woodward, in his Natural Hiſtory of the Earth. That author, purſuing and improving the hypotheſis of Dr. Burnet, maintains the whole maſs of earth, with every thing belonging thereto, to have been ſo broken and diſſolved, at the time of the deluge, that a new earth was then formed in the boſom of the water, conſiſting of different ſtrata, or beds of terreſtrial matter, ranged over each other uſually, according to the order of their ſpecific gravities. By this means, plants, animals, and eſpecially fiſhes, and ſhells, not yet diſſolved among the reſt, remained mixed and blended among the mineral and *foſſil* matters; which preſerved them, or at leaſt aſſumed and retained their figures and impreſſions, either indentedly, or in relievo.

Camerarius attacks this opinion of Dr. Woodward, and goes yet higher, and advances many new notions. He ſuppoſes, 1. That the greateſt part of the ſhells now dug from under-ground, had been placed there before the deluge, that is, at the time of the creation, when God ſeparated the earth from the waters. 2. That, without having recourſe to the diſſolution of the earth by the waters, one might ſuppoſe moſt of them to have ſlipped in at the chinks and crevices naturally happening after the waters were retired, and the earth ſufficiently drained. 3. That particular inundations might have ſwept moſt of theſe ſhells into the places where we now find them. 4. That the ſea may have wrought, or caſt up, moſt of theſe ſhells through ſubterraneous ſpiracles and canals. 5. That God has created divers ſtony and metalline bodies, perfectly like the vegetables and animals, which we ſee on earth, and in the ſea.

To all theſe ſuppoſitions, Dr. Woodward anſwers, 1. That it is no ways probable, God ſhould create ſuch a number of ſhell-fiſh of the ſame ſpecies at once; and that purely with a deſign to deſtroy them all again ſo ſoon after; that among the *foſſil* ſhells of the ſame ſpecies it is eaſy to diſtinguiſh thoſe of different ages; that ſome appear preciſely ſuch as we now find them in the ſpring, the ſeaſon when the deluge began; that it is not only ſhells we find under-ground, but alſo bones of quadrupeds, plants, and trees of extraordinary ſizes, and which are not of the number of aquatics; and laſtly, that the waters were ſeparated from the earth on the third day, and that none of theſe things were created, till afterwards. 2. That, on the ſecond ſuppoſition, theſe ſhells would be diſpoſed perpendicularly, and not horizontally, as they are always found; that we ſhould ſometimes find them in the clefts of the earth, where in fact there are none but what are broken. 3. That we have no acquaintance with any of theſe pretended inundations; that they could never have brought ſhells, ſtags horns, and elephants teeth, from America, and the Eaſt Indies, to England, and the other parts of Europe; nor the fruits, pines, and beeches, frequently found far greater than any of our growth. Add, that theſe particular inundations muſt have riſen to the tops of the higheſt mountains, and of conſequence they muſt have been general. 4. On the fourth ſuppoſition it muſt be held, that God did not only create all theſe ſeveral bodies in the entrails of the earth, but their ſeveral parts, and the ſeparate pieces and fragments of thoſe parts; a piece of ſhell, for inſtance; one ſide of a ſhell, which conſiſts of two; a ſhell void of the fiſh it ſhould contain; beards of corn, without the grain; pieces of cedar-bark, without the wood; pieces of bullocks hides without fleſh and bones; human ſkins without bodies; a bone without the reſt of the ſkeleton; a tooth without the jaw, &c. Add, that the *foſſil* ſhells have not only external, but eſſential reſemblances to ſea-ſhells; both, e. gr. yielding, by analyſis, a quantity of ſea-ſalt; that among the *foſſil* teeth of fiſhes, we meet with ſome apparently worn; and, laſtly, that the ſhell-fiſh, called *purple*, has a long ſharp tongue, by means whereof it pierces other ſhells, and picks the fiſh out of them; and that in digging under-ground we actually meet with divers of theſe ſhells thus pierced. Can ſuch minute thorough-paced reſemblances be the accidental effects of a *luſus naturæ?* See MARINE *remains*, PETRIFACTION, *Formed* STONES, SHELLS, &c.

FOSSIL-*plant*. See PLANT.

FOSSILS, *marine*. See MARINE.

FOSSIL-*ivory*. See IVORY.

FOSSIL-*ſalt*. See SALT.

FOSSIL-*wood*. See WOOD.

FOSSORES, in *Natural Hiſtory*, a name given to a ſpecies of ſmall worms hatched from the eggs of a fly, which feeds on the parenchymatous ſubſtance of the leaves of plants, burying themſelves between the two membranes. Theſe animals in general are called by Reamur, *aſcarides*; but as they greatly differ in their ſize, and in their manner of eating and deſtroying leaves, the ſmall ones which eat but ſlowly, and gnaw their way in crooked furrows, are called by him *foſſores parvi*; and on the contrary, thoſe which eat away all that lies before them, and are of a ſomewhat larger ſize, are called *foſſores magni*. See ASCARIDES.

FOSTER-*land*, in our *Old Writers*, is land given or allotted for the finding of food or victuals; as for monks in monaſteries, &c.

FOSTERLEAN, anciently ſignified nuptial gifts; much the ſame with what we now call JOINTURE.

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The word is originally Saxon, and ſignifies *ciborum exhibitio*, that is, a ſtipend which the wife has for her maintenance. *Poſtea ſciendum eſt cui* foſterlean *pertineat, vadiet hoc Brigdunia, & plegient amici ſui.*

FOTHER, or FODDER, is a weight of lead, containing eight pigs, and every pig one and twenty ſtone and a half; ſo that it is about a tun or common cart-load. Among the plumbers in London, it is nineteen hundred and a half; and at the mines it is two and twenty hundred and a half.

The word is of Teutonic origin, from *fuder*.

FOTHERING, in *Sea-Language*, is a peculiar method of endeavouring to ſtop a leak in the bottom of a ſhip while ſhe is afloat, either under ſail, or at anchor. It is uſually performed in the following manner: a baſket is filled with aſhes, cinders, and chopped rope-yarns, and looſely covered with a piece of canvas: to this is faſtened a long pole, by which it is plunged repeatedly in the water, as cloſe as poſſible to the place where the leak is conjectured to lie. The oakum, or chopped rope-yarns, being thus gradually ſhaken through the twigs, or over the top of the baſket, are frequently ſucked into the hole along with the water, ſo that the leak is choaked, and the entrance of the water prevented. Falconer's Mar. Dict.

FOTOQUE, in the *Japoneſe Theology*, the name of an order of deities; the other order being called CAMIS. From the latter they obtain the bleſſings of this life, and from the former thoſe which relate to a future life.

FOTUS, in *Medicine*, the ſame as FOMENTATION.

FOUCADE. See FOUGATE.

FOVEA *cordis*, the pit of the heart, or rather of the ſtomach, called alſo *ſcrobiculus cordis*.

FOUGATE, FOUGASSE, or FOUGADES, in the *Art of War*, a little mine, in manner of a well, ſeldom exceeding ten feet in width, and twelve in depth; dug under ſome work, or poſt, that is like to be loſt; and charged with barrels, or ſacks of gunpowder, covered with earth. It is frequently placed before the weakeſt parts of a fortification, as the ſaliant angles and faces, not defended by a croſs-fire, and is ſet on fire like other mines, with a ſauciſſe.

The word is French. M. Huet derives it from *focata*, or *focus, fire*.

FOUL, in the *Sea-Language*, is uſed when a ſhip has been long untrimmed, ſo that graſs, weeds, periwinkles, barnacles, or the like, ſtick or grow to her ſides under water. In this ſtate, ſhe is ſaid to be *foul*.

A ſhip is ſaid to make *foul water*, when, being under ſail, ſhe comes into ſuch ſhoal, or low water, that though her keel doth not touch the ground, yet ſhe comes ſo near it, that the motion of the water under her raiſes the mud from the bottom, and ſo *fouls* the water.

FOUL is alſo a ſea-term, importing the running of one ſhip againſt another. This happens ſometimes by the ungovernable violence of the wind, and ſometimes by the careleſſneſs of the people on board; and ſometimes happens to ſhips of the ſame convoy; ſometimes to ſuch as meet accidentally; and ſometimes to ſuch as are in port, by means of others coming in. The damages occaſioned by running *foul*, are of the nature of thoſe in which both parties muſt bear a part; they are uſually made half to fall upon the ſufferer, and half upon the veſſel which did the injury; but in caſes where it is evidently the fault of the maſter of the veſſel, he alone is to bear the damage.

FOUL *ground* of a road, bay, ſea-coaſt, or harbour, ſignifies that which is rocky, or abounding with ſhallows, or otherwiſe dangerous.

FOUL *hawſe* denotes that the cables are turned round each other, by the winding or turning about of a ſhip while ſhe rides at anchor.

FOUL *wind* expreſſes that which is unfavourable, or contrary to the courſe of the ſhip, in oppoſition to large or fair.

FOUL *feeding*, in the *Manege*, denotes a voracious appetite, to which ſome horſes are ſubject, which, though not properly a diſeaſe, is the cauſe of various maladies. It is commonly the effect of ſome latent diſtemper, and frequently occaſioned by worms irritating the inteſtines. *Foul* feeders will leave their hay to eat their litter, even when it is ſoaked with their dung and urine, and diſcover a vitiated as well as a voracious appetite. The beſt remedy in caſes of this kind is to begin with purging, and to diſſolve chalk in their water, and afterwards to give them good exerciſe. The following draught will alſo ſerve to blunt their appetites: take a large handful of the roots of marſhmallows; cummin ſeeds, and fenugreek ſeeds, of each an ounce; liquorice roots ſliced, half an ounce; boil them in three pints of water, till the roots are ſoft and ſlimy; then pour off the decoction, and diſſolve it in an ounce of gum arabic, and add four ounces of linſeed oil. Let the horſe have four handfuls of this mixture every morning faſting, till his appetite abates. Care ſhould alſo be taken to keep the ſtalls as clean as poſſible. Gibſon's Farriery.

FOULDAGE. See FALDAGE.

FOULNESS *of colours*, in *Painting*, is uſed in oppoſition to brightneſs, and denotes a defect of purity. It is ſometimes called *breaking* the colour.

FOULNESS *in wounds*. When what the ſurgeons call uncleanneſs or *foulneſs* is perceived in a wound, that is, when the fleſh in it looks fungous, black, putrid, or livid, it muſt be well cleanſed before any attempts are made to heal it. Different methods of effecting this have been in uſe at different times among the ſurgeons: the ancients uſed honey, but the moſt uſual practice now is, to apply a digeſtive ointment made of turpentine diſſolved in the yolk of an egg, and afterwards mixed with honey of roſes; but where this is not found ſtrong enough for the purpoſe, the Egyptian ointment is to be uſed, mixed either with ſpirit of wine, or with the common digeſtive. To theſe digeſtive ointments a ſmall quantity of aloes and myrrh may alſo very properly be added; and where more ſtrength is required in them, a ſmall quantity of red precipitate is to be added. The uſe of lime-water as a detergent is alſo very great, and yet more ſo, if there be added to every pint of it twenty or thirty grains of ſublimate; this makes what is called the PHAGEDÆNIC *water*. Applications of this kind are to be continued till the wound is entirely clean, and then it is to be healed with the common digeſtives, &c. Heiſter's Surgery, p. 42.

FOUMART, a name uſed in ſome parts of England for the WEASEL, called alſo, in ſome places, the *fitchet*. See POLE-*cat*.

FOUNDATION, that part of a building which is underground: or, that maſs of ſtone, &c. which ſupports a building; or upon which the walls of the ſuperſtructure are raiſed: or, it is the coffer, or bed, dug below the level of the ground, to raiſe a building upon.

The *foundation* either takes up the whole area and extent of the building, as when there are to be vaults, cellars, or the like; or it is drawn in cuts, or trenches, as when only walls are to be raiſed.

The *foundation* is properly ſo much of the maſonry, as reaches as high as the ſurface of the ground; and this is always to be proportioned to the load or weight of the building which it is to bear.

Sometimes it is maſſive, and continued under the whole building; as in the antique arches, and aqueducts, and ſome amphitheatres: more uſually it is only in ſpaces, or intervals; either to avoid expence, or becauſe the vacuities are at too great a diſtance; in which latter caſe they make uſe of inſulated pillars, bound together by arches.

That we may *found* our habitation firmly, ſays Sir H. Wotton, we muſt firſt examine the bed of earth, upon which we are to build; and then the under-ceilings, or ſubſtruction, as the ancients called it. For the former, we have the general precept in Vitruvius: *Subſtructiones* fundationes *fodiantus, ſi queant inveniri ad ſolidum, & in ſolido:* by which he recommends not only a diligent, but even jealous examination of what the ſoil will bear; adviſing us not to reſt upon any appearing ſolidity, unleſs the whole mould, through which we cut, have likewiſe been ſolid.

But how deep we ſhould go in this ſearch, he has nowhere determined, as perhaps depending more on diſcretion than regularity, according to the weight of the work: yet Palladio has ventured to reduce it to a rule; allowing for the cavaſione, i. e. the hollowing or underdigging, a ſixth part of the height of the whole fabric, unleſs there be cellars under-ground, in which caſe he would have it ſomewhat lower.

The *foundations* of buildings are either *natural* or *artificial*. *Natural*, as when we build on a rock, or a very ſolid earth; in which caſe we need not ſeek for any farther ſtrengthening. *Artificial*, where the ground is ſandy, or marſhy, or has lately been dug. In the former caſe, the architect muſt adjuſt the depth of the *foundation* by the height, weight, &c. of the building: a ſixth part of the whole height is looked on as a medium; and as to thickneſs, double that of the width of the wall, is a good rule. Architects ought to uſe the utmoſt diligence in regard to *foundations*, ſince of all errors which may happen in building, an error in this point is moſt pernicious.

The ground fit for building upon is of various kinds; ſometimes it is ſo hard as ſcarce to be cut with iron; in other places it is ſtiff, blackiſh, or whiriſh. This laſt is reckoned the weakeſt; and, in general, that is the beſt which requires moſt labour in cutting or digging.

When the ground is very bad, you muſt get large oaken piles of ſuch a length as may reach the ſound ground, and whoſe diameter muſt be about one twelfth part of their length: theſe muſt be driven down with a machine,

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as close to one another as possible, and that under the middle walls as well as the outer ones; and upon their tops large planks are to be pinned down. But if the ground be only faulty in some places, arches may be turned over them, by which means no part of the weight of the building will rest upon them.

As to the rules necessary to be observed in constructing the ground-work, they are these: 1. That the bottom of the trench be made exactly level. 2. That the lowest ledge or row be all of stone, laid close together. 3. That the breadth of the ground-work be at least double that of the wall that is to be raised on it. However, art ought always to give way to discretion, for the breadth may be regulated according to the goodness of the ground, and the weight of the intended edifice. 4. That the *foundation* be made to diminish as it rises, only care must be taken that it do so equally on both sides. 5. That you ought never to build upon the ruins of an old *foundation*, unless well assured of its depth and goodness.

In some places they *found* the piers of bridges, and other buildings near the water, on sacks of wool, laid like matrasses, which, being well pressed, and greasy, will never give way; nor rot in water. See BRIDGE, CAISSON, and COFFER-DAMS.

FOUNDATION is also used figuratively for the establishment of a city, empire, or the like.

The Romans reckoned their years from the *foundation* of Rome, *ab urbe condita*; which we sometimes express by *ab U. C.* Chronologers make 745 years from the Israelites passing out of Egypt, to the *foundation* of Rome.

FOUNDATION also denotes a donation, or legacy, either in money, or lands, for the maintenance and support of some community, hospital, school, lecture, or other work of piety.

Among the order of Augustines, there is a *foundation* for the marrying of poor maids; and another for the furnishing of trusses to poor people who have ruptures, or hernias.

The founding and building of a college or hospital, is called *foundatio, quasi fundatio*, or *fundamenti locatio. Co. lib.* 10. The king only can found a college; but there may be a college in reputation founded by others. *Dyer* 267. See FOUNDER.

FOUNDAY, in *Metallurgy*, a term used by the workers at the iron-mines, in many counties of England, for the space of six days, in which time they contrive to make a determinate quantity of iron, so that they count their work by these *foundays* or weeks.

FOUNDER, he who lays a foundation, or who *founds* and endows a church, school, religious house, or other work of charity and piety.

The *founders* of churches may preserve to themselves the right of patronage, or presentation to the living. The *founder* of all corporations in the strictest and original sense is the king alone, for he only can incorporate a society; and in civil incorporations, such as Mayor and Commonalty &c. where there are no possessions or endowments given to the body, there is no other *founder* but the king; but in eleemosynary foundations, such as colleges and hospitals, where there is an endowment of lands, the law distinguishes, and makes two species of foundation; the one *fundatio incipiens*, or the incorporation, in which sense the king is the general *founder* of all colleges and hospitals; the other *fundatio perficiens*, or the donation of it; in which sense the first gift of the revenues is the foundation, and he who gives them is in law the *founder*: but if the king and a private person join in endowing an eleemosynary foundation, the king alone shall be the *founder* of it.

FOUNDER is also an artist that melts or casts metals into various forms, for divers uses; as guns, bells, statues, bombs, types, or printing characters; and other small works, as candlesticks, buckles, &c.

The word in this sense is formed of the French *fondre*, to melt or fuse. In the Roman law they are called *statuarii*.

From the different productions, or works of the *founders*, they are differently denominated, as *founders of small works*; *bell-founders*; *gun-founders*; *letter-founders*; *figure-casters*, &c. What belongs to each, see under FOUNDERY.

FOUNDER, in *Glass-making*, is a term appropriated to the green-glass houses, and is the person there, who in the same office in the white-glass-making is called the CONCIATOR.

FOUNDER'*s furnace*, See FURNACE.

FOUNDERS, *moulds of*. See MOULDS.

FOUNDER'*s press*. See PRESS.

FOUNDER, in the *sea-language*. A ship is said to *founder* at sea, when by an extraordinary leak, or a great sea breaking in upon her, she is so filled with water, that she cannot be freed of it, nor is able to swim under it, but sinks with the weight thereof.

FOUNDERING, in the *Manege*, a disorder in horses, whereof there are two kinds, viz. in the feet, and in the chest.

FOUNDERING *in the feet*, arises from hard riding, severe labour, great heats, sudden colds, &c. which inflame the blood, and, as the farriers term it, melt the grease, and make it descend downward to the feet, and there settle; which causes such a numbness, and pricking in the hoof, that the horse has no sense or feeling in it, being hardly able to stand; or, when he does, shaking and trembling as if he had an ague.

A horse may likewise be *foundered*, by wearing streight shoes, and by travelling upon hard ground.

It may be known when he is *foundered* on his fore-feet, and not his hind-feet, by his treading firmly on his hind-feet, and sparing the other; or his going crouching or crippling on his buttocks.

Sometimes, though rarely, he is *foundered* in his hind-feet, and not his fore; which is known by his seeming weak behind; and resting, as much as possible, on the fore-feet.

The general methods of curing this distemper are, first, by paring all the horse's soles so thin, that the quick may be seen; then bleeding him well at the toes; stopping the vein with tallow and resin; and then, having tacked hollow shoes on his feet, stopping them with bran, tar, and tallow, as boiling hot as may be; which is to be renewed once in two days, for a week together; after which he is to have good exercise.

Or, after he is pared thin, and let blood at the toes, his feet are to be stopped with cows-dung, kitchin-fee, tar, and soot, boiled together, and poured, boiling hot, into them.

FOUNDERING *in the chest, or body*, usually befals a horse by eating too much provender suddenly, when too hot; as also by drinking too much upon travelling, when he is hot, and riding him after it.

The effect of which is, that the body is oppressed with ill humours, which take away his strength, and put him in such condition, that he can neither go, nor bow his joints; and, being once laid, he cannot rise again, &c. his legs swell; and, soon after begin to peel; he has a dry cough, which makes his eyes water; and his nose runs with white phlegmatic matter. For the cure of this disorder, take five or six pennyworth of oil of petre and mingle it with an equal quantity of ale or beer; then rub this mixture with the hand on the part affected and at the same time hold a red hot shovel before it.

FOUNDERY, or FOUNDRY, the art of melting and casting all sorts of metals; particularly brass, iron, bell metal, &c. The word is also used for a place, or work-house, furnished with furnaces, or forges for this purpose.

FOUNDERY *of small works, or the manner of* CASTING *in sand*.

The sand used by the founders, in casting brass, &c. is yellowish, and pretty soft; but, after it has been used, it becomes quite black, because of the charcoal-dust used in the moulds. Every time they would use this sand, they work and tew it, several times over, in a board about a foot square, placed over a kind of trunk, or box, into which it may fall from off the board. This tewing is performed with a roller, or cylinder, about two feet long, and two inches in diameter; and a kind of knife, made of the blade of a sword: with the two instruments they alternately roll and cut the sand; and, at length, turn it down into the box or trough underneath.

Then, taking a wooden board, or table, of a length and breadth proportional to the quantity of things to be cast; round this they put a frame or ledge; and thus make a sort of mould. This mould they fill with the sand before prepared, and moderately moistened: which done, they take wooden, or metalline models, or patterns of the things intended to be cast; apply them on the mould, and press them down in the sand, so as to leave their form indented; along the middle of the mould is laid half a little cylinder of brass, which is to be the master-jet, or canal for running the metal; being so disposed, as to touch the ledge on one side, and only to reach to the last pattern on the other: from this are placed several lesser jets, or branches, reaching to each pattern, whereby the metal is conveyed through the whole frame.

This first frame being thus finished, they turn it upside down, to take out the patterns from the sand; in order to which, they first loosen them a little all round, with a small cutting instrument.

After the same manner they proceed to work the counter-part, or other half of the mould, with the same patterns, in a frame exactly like the former; excepting that it has pins, which, entering holes corresponding thereto in the other, make, when the two are joined together, the two cavities of the pattern fall exactly on each other.

The frame, being thus moulded, is carried to the founder, or melter; who, after enlarging the principal jet, or canal, of the counter-part, with a kind of knife, adding the

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the croſs jets, or canals, to the ſeveral patterns in both, and ſprinkling them over with mill-duſt, ſets them to dry in an oven.

When both parts of the mould are ſufficiently dried, they join them together, by means of the pins; and, to prevent their ſtarting, or ſlipping aſide, by the force of the metal, which is to come in flaming hot, through a hole contrived at the maſter jet, they lock them in a kind of preſs, either with ſcrews; or, if the mould be too big for this, with wedges. The moulds, thus put in the preſs, are ranged near the furnace, to be in readineſs to receive the metal as it comes out of the crucible.

While the moulds are thus preparing, the metal is put in fuſion in an earthen crucible, about ten inches high, and four in diameter.

The furnace wherein the fuſion is made, is much like the ſmith's forge; having, like that, a chimney, to carry off the ſmoke; a pair of bellows to blow up the fire; and a hearth where the fire is made, and the crucible placed. It is the uſe of this hearth, that chiefly diſtinguiſhes the furnace from the forge.

In the middle thereof is a ſquare cavity, ten or twelve inches wide, which goes to the very bottom: it is divided into two, by an iron grate; the upper partition ſerves to hold the crucible, and the fuel; and the lower to receive the aſhes.

When the fuel, which is to be of dry wood, is pretty well lighted, they put the crucible full of metal in the middle, and cover it with an earthen lid; and, to increaſe the force of the fire, beſides blowing it up with the bellows, they lay a tile over part of the aperture or cavity of the furnace.

The metal firſt put in being brought to a fuſion, they fill the crucible with pieces of braſs beaten in a mortar; to put them in they make uſe of a kind of iron ladle, with a long ſhank at the end thereof, formed into a kind of hollow cylinder, out of which the piece is dropped.

Nothing now remains, but for the founder to take the crucible out of the fire, and carry it in a pair of iron tongs (whoſe feet are bent, the better to embrace the top of the crucible), to the mould; into which he pours the melted metal, through the hole anſwering to the maſter-jet of each mould.

Thus he goes ſucceſſively, from one to another, till his crucible is emptied, or there is not matter enough left for another mould.

Then, caſting cold water on the moulds, they take the frames out of the preſſes, and the caſtworks out of the ſand: which afterwards they work again, for another caſting. Laſtly, they cut off the jets, or caſts, and ſell or deliver the work to thoſe who beſpoke it, without any farther repairing.

FOUNDERY *of ſtatues, great guns, and bells.* The art of caſting ſtatues in braſs is very ancient; inſomuch that its origin was too remote and obſcure, even for the reſearch of Pliny; an author admirably ſkilled at diſcovering the inventors of other arts.

All we can learn for certain, is, that it was practiſed, in all its perfection, firſt among the Greeks; and afterwards, among the Romans; and that the number of their ſtatues conſecrated to their gods and heroes ſurpaſſed all belief. See STATUE.

The ſingle cities of Athens, Delphos, Rhodes, &c. had each three thouſand ſtatues; and Marcus Scaurus alone, though only ædile, adorned the circus with no leſs than three thouſand ſtatues of braſs, for the time of the Circenſian games. This taſte for ſtatues was finally carried to ſuch a pitch, that it became a proverb, that in Rome the people of braſs were not leſs numerous than the Roman people.

Among us, the caſting of ſtatues was but little known, or practiſed, before the ſeventeenth century.

As to the *caſting of guns*, it is quite modern; and it were, perhaps, to be wiſhed, we were as ignorant of it as the ancients. All authors agree, that the firſt cannon were caſt in the fourteenth century; though ſome affix the event to the year 1338, and others to 1380. See CANNON and GUNNERY.

The *caſting of bells* is of a middle ſtanding, between the other two. The uſe of bells is certainly very ancient in the weſtern church; and the ſame were likewiſe once uſed in the church of the Eaſt. But, at preſent, F. Vanſleb aſſures us, in his ſecond account of Egypt, he had found but one bell in all the eaſtern church, and that in a monaſtery in the Upper Egypt. See BELL.

The matter of theſe large works is rarely any ſimple metal, but commonly a mixture of ſeveral. We ſhall here give the proceſs in the *foundery* of each.

Method of caſting ſtatues, or figures. See BRONZE.

There are three things chiefly required in caſting of ſtatues, buſts, baſſo-relievos, vaſes, and other works of ſculpture; viz. the mould, the wax, and ſhell, or coat.

The inner mould, or core (thus called from *cœur*, as being in the heart or middle of the ſtatue,) is a rude lumpiſh figure, to which is given the attitudes and contours of the ſtatue intended: it is raiſed on an iron grate, ſtrong enough to ſuſtain it; and is ſtrengthened withinſide by ſeveral bars, or ribs, of iron.

It may be made at the diſcretion of the workmen; of potters clay, mixed up with horſe-dung and hair; or of plaſter of Paris, mixed with fine brickduſt.

The uſe of the core in ſtatues is to ſupport the wax and ſhell, to leſſen the weight and to ſave metal. In bells it takes up all the inſide, and preſerves the ſpace vacant where the clapper is hung. In great guns it forms the whole chace, from the mouth to the breech: and, in mortars, the chace, and chamber. The iron bars and the core are taken out of the braſs figure, through an aperture left in it, which is afterwards ſoldered up: but it is neceſſary to leave ſome of the iron bars of the core that contribute to the ſteadineſs of the projecting parts, within the braſs figure.

The wax is a repreſentation of the intended ſtatue. If it be a piece of ſculpture, the wax muſt be all of the ſculptor's own hand, who uſually faſhions it on the core itſelf; though it may be wrought ſeparately, in cavities, moulded, or formed, on a model, and afterwards diſpoſed and arranged on the ribs of iron over the grate, as before; filling the vacant ſpace in the middle with liquid plaſter, and brick-duſt; by which means the inner mould, or core, is formed in proportion as the ſculptor carries on the wax.

When the wax (which is to be of the intended thickneſs of the metal) is finiſhed, they fix little waxen tubes perpendicularly to it, from top to bottom; to ſerve, both as jets, for the conveyance of the metal to all parts of the work: and as vent-holes, to give paſſage to the air, which would, otherwiſe, occaſion great diſorder, when the hot metal came to encompaſs it. By the weight of the wax uſed herein, is that of the metal adjuſted; ten pounds of this laſt being the proportion to one pound of the former.

The work brought thus far, wants nothing but to be covered with its ſhell; which is a kind of coat, or cruſt, laid over the wax; and which, being of a ſoft matter, and even, at firſt, liquid, eaſily takes and preſerves the impreſſion of every part thereof; which it afterwards communicates to the metal, upon its taking the place of the wax, between the ſhell and the core. The matter of this outer mould, or ſhell, is varied according as different layers, or ſtrata, are applied. The firſt is a compoſition of clay, and old white crucibles, well ground and ſifted, and mixed up with water, to the conſiſtence of a colour fit for painting: accordingly, they apply it with a pencil, laying it ſeven or eight times over, letting it dry between whiles. For the ſecond impreſſion, they add horſes dung and natural earth to the former compoſition. The third impreſſion is only horſes dung and earth. Laſtly, the ſhell is finiſhed by laying on ſeveral more impreſſions of this laſt matter, made very thick with the hand.

The ſhell, thus finiſhed, is ſecured and ſtrengthened by ſeveral bands, or girts, of iron, wound around it at half a foot's diſtance from one another, and faſtened at bottom to the grate under the ſtatue; and at the top to a circle of iron, where they all terminate.

Here it muſt be obſerved, that if the ſtatue be ſo big, that it would not be eaſy to move the moulds, when thus provided, it muſt be wrought on the ſpot where it is to be caſt.

This is performed two ways; in the firſt, a ſquare hole is dug under-ground, much bigger than the mould to be made therein, and its inſides lined with walls of freeſtone, or brick. At the bottom is made a hole, of the ſame materials, with a kind of furnace, having its aperture outwards: in this is a fire to be lighted, to dry the mould; and, afterwards, to melt the wax. Over this furnace is placed the grate; and on this the mould, &c. framed as above explained. Laſtly, at one of the edges of the ſquare pit is made another large furnace, to melt the metal, as hereafter mentioned.

In the other way, it is ſufficient to work the mould above-ground: but with the ſame precaution of a furnace, and grate, underneath: when finiſhed, four walls are to be run up around it: and, by the ſide thereof, a maſſive made, for a melting furnace. For the reſt, the method is the ſame in both. The mould being finiſhed, and incloſed between four walls, whether under-ground, or above it, a moderate fire is lighted in the furnace under it, and the hole covered with planks, that the wax may melt gently down, and run out at pipes contrived for the purpoſe, at the foot of the mould; which are afterwards very exactly cloſed with earth, as ſoon as all the wax is carried off.

This done, the hole is filled up with bricks thrown in at random, and the fire in the furnace is augmented till ſuch time

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time as both the bricks and the mould become red-hot; which ordinarily happens in twenty-four hours. Then, the fire being extinguiſhed, and every thing cold again, they take out the bricks, and fill up their place with earth, moiſtened, and a litttle beaten, to the top of the mould, in order to make it the more firm and ſteady.

Things being in this condition, there remains nothing but to melt the metal, and run it into the mould: this is the office of the furnace above, which is made in manner of an oven, with three apertures; one to put in the wood; another for a vent; and a third to run the metal out at. From this laſt aperture, which is kept very cloſe whilſt the metal is in fuſion, a little tube or canal is laid, whereby the melted metal is conveyed into a large earthen baſon over the mould; into the bottom of which all the big branches of the jets, or caſts, which are to carry the metal into all the parts of the mould, are inſerted.

It muſt be added, that theſe jets are all terminated, or ſtopped with a kind of plugs, which are kept cloſe, that, upon opening the furnace, the braſs, which guſhes out like a torrent of fire, may not enter any of them till the baſon be full enough of matter to run into them all at once; upon which occaſion they pull out the plugs, which are long iron rods, with a head at one end, capable of filling the whole diameter of each tube. The hole of the furnace is opened with a long piece of iron, fitted at the end of a pole; and the mould is then filled in an inſtant. The work is now finiſhed, at leaſt ſo much as belongs to the caſting, the reſt being the ſculptor's, or carver's buſineſs; who, taking the figure out of the mould and earth with which it is encompaſſed, ſaws off the jets, wherewith it appears covered over; and repairs it, with inſtruments proper to his art; as chiſſels, gravers, puncheons, &c.

FOUNDERY. *The manner of caſting bells.* What has been hitherto ſhewn of the caſting of ſtatues, holds, in proportion, of the caſting of bells: that which is particular in theſe latter, is as follows: firſt, then, the metal is different; there being no tin in the metal of ſtatues, but no leſs than a fifth part of tin in that of bells. Secondly, the dimenſions of the core, and the wax of bells, eſpecially if it be a ring of ſeveral bells that is to be caſt, are not left to chance, or the caprice of the workman; but muſt be meaſured, on a kind of ſcale, or DIAPASON; which gives the height, aperture, and thickneſs, neceſſary for the ſeveral tones required.

It need not be added, that it is on the wax that the ſeveral mouldings and other ornaments, and inſcriptions, to be repreſented in relievo, on the outſide of the bell, are formed. The clapper, or tongue, is not properly a part of the bell, but is furniſhed from other hands. In Europe, it is uſually of iron, with a large knob at the extreme; and is ſuſpended in the middle of the bell. In China, it is only a huge wooden mallet, ſtruck by force of arm againſt the bell; whence they can have but little of that conſonancy ſo much admired in ſome of our rings of bells. The Chineſe have an extraordinary way of increaſing the ſound of their bells; viz. by leaving a hole under the cannon; which our bell-founders would reckon a defect.

The proportions of our bells differ very much from thoſe of the Chineſe. In our's, the modern proportions are, to make the diameter fifteen times the thickneſs of the brim, and the height twelve times. The parts of a bell are 1. the ſounding bow, terminated by an inferior circle, which grows thinner and thinner, 2. the brim or that part of a bell whereon the clapper ſtrikes, and which is thicker than the reſt. 3. The outward ſinking of the middle of the bell, or the point under which it grows wider to the brim. 4. The waiſt or furniture, and the part that grows wider and thicker quite to the brim. 5. The upper vaſe, or that part which is above the waiſt. 6. The pallet which ſupports the ſtaple of the clapper within. 7. The bent and hollowed branches of metal uniting with the cannons, to receive the iron keys, whereby the bell is hung up to the beam which is its ſupport and counterpoiſe, when rung out. The buſineſs of bell-*foundery* is reducible to three particulars. 1. The proportion of a bell. 2. The forming of the mould. And, 3. the melting of the metal. There are two kinds of proportions, viz. the ſimple and the relative; the former are thoſe proportions only that are between the ſeveral parts of a bell to render it ſonorous; the relative proportions eſtabliſh a requiſite harmony between ſeveral bells. The method of forming the profile of a bell, previous to its being caſt, in which the proportion of the ſeveral parts may be ſeen, is as follows: the thickneſs of the brim, C1 (See *Tab. Miſcellan. fig.* 12.) is the foundation of every other meaſure, and is divided into three equal parts. Firſt, draw the line HD, which repreſents the diameter of the bell; biſect it in F and erect the perpendicular Ff; let DF and HF be alſo biſected in E and G, and two other perpendiculars Ee, Ga be erected at E and G: GE will be the diameter of the top or upper vaſe, i. e. the diameter of the top will be half that of the bell; and it will, therefore, be the diameter of a bell which will ſound an octave to the other. Divide the diameter of the bell or the line HD into fifteen equal parts, and one of theſe will give C1 the thickneſs of the brim; divide again each of theſe fifteen equal parts into three other equal parts, and then form a ſcale. From this ſcale take twelve of the larger diviſions or $\frac{2}{15}$ of the whole ſcale in the compaſs, and ſetting one leg in D deſcribe an arc to cut the line Ee in N, draw ND, and divide this line into twelve equal parts; at the point 1 erect the perpendicular 1C=10, and C1 will be the thickneſs of the brim $=\frac{1}{15}$ of the diameter: draw the line CD: biſect DN and at the point of biſection 6 erect the perpendicular 6K=$1\frac{1}{2}$ of the larger diviſions on the ſcale. With an opening of the compaſs equal to twice the length of the ſcale or thirty brims, ſetting one leg in N, deſcribe an arc of a circle, and with the ſame leg in K and the ſame opening deſcribe another arc to interſect the former: on this point of interſection, as a center, and with a radius equal to thirty brims deſcribe the arc NK; in 6K produced take KB $=\frac{1}{3}$ of the larger meaſure of the ſcale or $\frac{1}{5}$ of the brim, and on the ſame center with the radius 30 $\frac{1}{3}$ brims deſcribe an arc AB parallel to NK. For the arc BC, take twelve diviſions of the ſcale or twelve brims in the compaſs, find a center, and from that center, with this opening, deſcribe the arc BC, in the ſame manner as NK or AB were deſcribed. There are various ways of deſcribing the arc Kp; ſome deſcribe it on a center at the diſtance of nine brims from the points p and K; others, as it is done in the figure, on a center at the diſtance only of ſeven brims from thoſe points. But it is neceſſary firſt to find the point p and to determine the rounding of the bell p1. For this purpoſe, on the point C as a center and with the radius C1 deſcribe the arc 1pn; biſect the part 1, 2 of the line Dn, and erecting the perpendicular pm, this perpendicular will cut the arc 1pn in m, which terminates the rounding 1p. Some founders make the bendings K a third of a brim lower than the middle of the line DN; others make the part C1D more acute, and inſtead of making C1 perpendicular to DN at 1, draw it $\frac{1}{6}$th of a brim higher, making it ſtill equal to one brim; ſo that the line 1D is longer than the brim C1. In order to trace out the top-part N*a*, take in the compaſs eight diviſions of the ſcale or eight brims, and on the points N and D, as centers, deſcribe arcs to interſect each other in 8; on this point 8, with a radius of eight brims, deſcribe the arc Nb; this arc will be the exterior curve of the top or crown; on the ſame point 8, as a center and with a radius equal to 7 $\frac{2}{3}$ brims, deſcribe the arc Ae, and this will be the interior curve of the crown, and its whole thickneſs will be one third of the brim. As the point 8 does not fall in the axis of the bell, a center M may be found in the axis by deſcribing, with the interval of eight brims on the centers D and H arcs which will interſect in M; and this point may be made the center of the inner and outer curves of the crown, as before. The thickneſs of the cap which ſtrengthens the crown at Q is about one third of the thickneſs of the brim; and the hollow branches or ears about one ſixth of the diameter of the bell. The height of the bell is in proportion to its diameter as twelve to fifteen, or in the proportion of the fundamental ſound to its third major; whence it follows that the ſound of a bell is principally compoſed of the ſound of its extremity or brim, as a fundamental, of the ſound of the crown which is an octave to it, and of that of the height which is a third. Encyclopedie, Art. CLOCHE. See BELL.

The particulars neceſſary for making the mould of a bell, are, 1. The earth: the moſt coheſive is the beſt; it muſt be well ground and ſifted, to prevent any chinks. 2. Brick-ſtone; which muſt be uſed for the mine, mould, or core, and for the furnace. 3. Horſe dung, hair, and hemp, mixed with the earth, to render the cement more binding. 4. The wax for inſcriptions, coats of arms, &c. 5. The tallow equally mixed with the wax, in order to put a ſlight lay of it upon the outer mould, before any letters are applied to it. 6. The coals to dry the mould.

For making the mould, they have a ſcaffold conſiſting of four boards, ranged upon treſſels. Upon this they carry the earth, groſly diluted, to mix it with horſe-dung, beating the whole with a large ſpatula.

The compaſſes of conſtruction is the chief inſtrument for making the mould, which conſiſt of two different legs, joined by a third piece. And laſt of all, the founders ſhelves,

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ſhelves, on which are the engravings of the letters, cartridges, coats of arms, &c.

They firſt dig a hole, of a ſufficient depth to contain the mould of the bell, together with the caſe, or cannon, under ground; and about ſix inches lower than the terre-plein, where the work is performed. The hole muſt be wide enough for a free paſſage between the mould and walls of the hole; or between one mould and another, when ſeveral bells are to be caſt. At the center of the hole is a ſtake erected, that is ſtrongly faſtened in the ground. This ſupports an iron-peg, on which the pivot of the ſecond branch of the compaſſes turns. The ſtake is encompaſſed with a ſolid brick-work, perfectly round, about half a foot high, and of the propoſed bell's diameter. This they call a mill ſtone. The parts of the mould are the core, the model of the bell, and the ſhell. When the outer ſurface of the core is formed, they begin to raiſe the core, which is made of bricks that are laid in courſes of equal height upon a lay of plain earth. At the laying each brick, they bring near it the branch of the compaſſes, on which the curve of the core is ſhaped, ſo as that there may remain between it and the curve the diſtance of a line, to be afterwards filled up with layers of cement. The work is continued to the top, only leaving an opening for the coals to bake the core. This work is covered with a layer of cement, made of earth and horſe-dung, on which they move the compaſſes of conſtruction, to make it of an even ſmoothneſs every where.

The firſt layer being finiſhed, they put the fire to the core, by filling it half with coals, through an opening that is kept ſhut, during the baking, with a cake of earth, that has been ſeparately baked. The firſt fire conſumes the ſtake, and the fire is left in the core half, or, ſometimes, a whole day: the firſt layer being thoroughly dry, they cover it with a ſecond, third, and fourth; each being ſmoothed by the board of the compaſſes, and thoroughly dried before they proceed to another.

The core being completed, they take the compaſſes to pieces, with intent to cut off the thickneſs of the model, and the compaſſes are immediately put in their place, to begin a ſecond piece of the mould. It conſiſts of a mixture of earth and hair, applied with the hand on the core, in ſeveral cakes that cloſe together. This work is finiſhed by ſeveral layers of a thinner cement of the ſame matter, ſmoothed by the compaſſes, and thoroughly dried, before another is laid on. The laſt layer of the model is a mixture of wax and greaſe ſpread over the whole. After which are applied the inſcriptions, coats of arms, &c. beſmeared with a pencil dipped in a veſſel of wax on a chaffing-diſh: this is done for every letter. Before the ſhell is begun, the compaſſes are taken to pieces, to cut off all the wood that fills the place of the thickneſs to be given to the ſhell.

The firſt layer is the ſame earth with the reſt, ſifted very fine; whilſt it is tempering in water, it is mixed with cow's hair, to make it cohere. The whole being a thin cullis, is gently poured on the model, that fills exactly all the ſinuoſities of the figures, &c. and this is repeated till the whole is two lines thick over the model. When this layer is thoroughly dried, they cover it with a ſecond of the ſame matter, but ſomething thicker: when this ſecond layer becomes of ſome conſiſtence, they apply the compaſſes again, and light a fire in the core, ſo as to melt off the wax of the inſcriptions, &c.

After this, they go on with other layers of the ſhell, by means of the compaſſes. Here they add to the cow's hair a quantity of hemp, ſpread upon the layers, and afterwards ſmoothed by the board of the compaſſes. The thickneſs of the ſhell comes to four or five inches lower than the mill-ſtone before obſerved, and ſurrounds it quite cloſe, which prevents the extravaſation of the metal. The wax ſhould be taken out before the melting of the metal.

The ear of the bell requires a ſeparate work, which is done during the drying of the ſeveral incruſtations of the cement. It has ſeven rings, the ſeventh is called the bridge, and unites the others, being a perpendicular ſupport to ſtrengthen the curves. It has an aperture at the top, to admit a large iron-peg, bent at the bottom; and this is introduced into two holes in the beam, faſtened with two ſtrong iron-keys. There are models made of the rings, with maſſes of beaten earth, that are dried in the fire, in order to have the hollow of them. Theſe rings are gently preſſed upon a layer of earth and cow's hair, one half of its depth; and then taken out, without breaking the mould. This operation is repeated twelve times for twelve half-moulds, that two and two united may make the hollows of the ſix rings: the ſame they do for the hollow of the bridge, and bake them all, to unite them together.

Upon the open place left for the coals to be put in, are placed the rings that conſtitute the ear. They firſt put into this open place the iron-ring to ſupport the clapper of the bell; then they make a round cake of clay, to fill up the diameter of the thickneſs of the core. This cake, after baking, it is clapped upon the opening, and ſoldered with a thin mortar ſpread over it, which binds the cover cloſe to the core.

The hollow of the model is filled with an earth, ſufficiently moiſt, to fix on the place, which is ſtrewed, at ſeveral times, upon the cover of the core; and they beat it gently with a peſtle, to a proper height; and a workman ſmooths the earth at top with a wooden trowel dipped in water.

Upon this cover, to be taken off afterwards, they aſſemble the hollows of the rings. When every thing is in its proper place, they ſtrengthen the outſides of the hollows with mortar, in order to bind them with the bridge, and keep them ſteady at the bottom, by means of a cake of the ſame mortar, which fills up the whole aperture of the ſhell. This they let dry, that it may be removed without breaking. To make room for the metal they pull off the hollows of the rings, through which the metal is to paſs, before it enters into the vacuity of the mould. The ſhell being unloaded of its ear, they range under the mill-ſtone five or ſix pieces of wood, about two feet long, and thick enough to reach almoſt the lower part of the ſhell; between theſe and the mould they drive in wooden wedges with a mallet, to ſhake the ſhell of the model whereon it reſts, ſo as to be pulled up, and got out of the pit.

When this and the wax are removed, they break the model and layer of earth, through which the metal muſt run, from the hollow of the rings, between the bell and the core. They ſmoke the inſide of the ſhell, by burning ſtraw under it, that helps to ſmooth the ſurface of the bell. Then they put the ſhell in the place, ſo as to leave the ſame interval between that and the core; and before the hollows of the rings or the cap are put on again, they add two vents, that are united to the rings, and to each other, by a maſs of baked cement. After which they put on this maſs of the cap, the rings, and vents, over the ſhell, and ſolder it with thin cement, which is dried gradually by covering it with burning coals. Then they fill up the pit with earth, beating it ſtrongly all the time, round the mould.

The furnace has a place for the fire, and another for the metal. The fire-place has a large chimney, with a ſpacious aſh-hole; the furnace which contains the metal is vaulted, whoſe bottom is made of earth, rammed down; the reſt is built with brick. It has four apertures; the firſt, through which the flame reverberates; the ſecond is cloſed with a ſtopple, that is opened for the metal to run; the others are to ſeparate the droſs, or ſcoriæ, of the metal by wooden rakes; through theſe laſt apertures paſſes the thick ſmoke. The ground of the furnace is built ſloping, for the metal to run down. See Dict. Commerc. Eng. edit. art. FOUNDERY.

FOUNDERY. *Manner of caſting great guns, or pieces of artillery.* The caſting of cannons, mortars, and other pieces of artillery, is performed much like that of ſtatues, and bells; eſpecially as to what regards the wax, ſhell, and furnaces.

All pieces of artillery are now caſt ſolid, and bored afterwards by means of a machine invented at Straſburgh, (ſee *Boring of* CANNON) and much improved by Mr. Verbruggen, the preſent head founder at Woolwich. The gun to be bored was at firſt placed in a perpendicular poſition; but the machines uſed for this purpoſe have lately been made to bore horizontally, and much more exactly than thoſe that bore in a vertical ſituation. Whilſt the inſide is bored, the outſide is turned and poliſhed at the ſame time.

As to the metal, it is ſomewhat different from both; as having a mixture of tin, which is not in that of ſtatues; and only having half the quantity of tin that is in bells, i. e. at the rate of ten pound of tin to an hundred of copper. The reſpective quantities of different metals that ſhould enter into the compoſition for braſs cannon is not abſolutely decided; the moſt common proportions of the ingredients are the following; viz. to 240 lb of metal fit for caſting, they put 68 lb of copper, 52 lb of braſs, and 12 lb of tin. To 4200 lb of metal fit for caſting, the Germans put 3687 $\frac{3}{7}$ lb of copper, 204 $\frac{13}{41}$ lb of braſs, and 307 $\frac{36}{41}$ lb of tin. Others, again, uſe 100 lb of copper, 6 lb of braſs, and 9 lb of tin; and laſtly, others make uſe of 100 lb of copper, 10 lb of braſs, and 15 lb of tin. See CANNON.

A cannon is always ſhaped a little conical, being thickeſt of metal at the breech, where the greateſt effort of the gunpowder is made, and diminiſhing thence to the muzzle;

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zle; ſo that if the mouth be two inches thick of metal, the breech is ſix. See CANNON.

Its length is meaſured in calibers, i. e. in diameters of the muzzle. Six inches at the muzzle requires twenty calibers, or ten feet in length; there is always about the ſixth of an inch allowed play for the ball. For the parts, and their reſpective proportions of different ſorts of guns, ſee CANNON and GUN. The method of caſting iron cannon differs very little from that of braſs.

FOUNDERY, *Letter, or the manner of caſting printing letters.* The invention of printing letters we ſhall ſpeak of under PRINTING, and LETTER.

Their difference, kind, &c. has already been explained under the articles CHARACTER, &c.

In the buſineſs of cutting, caſting, &c. letters for printing, the letter-cutter muſt be provided with a vice, hand-vice, hammers and files of all ſorts for watch-makers uſe; as alſo gravers and ſculpters of all ſorts, and an oil-ſtone, &c. ſuitable and ſizeable to the ſeveral letters to be cut: a flat gage made of box to hold a rod of ſteel, or the body of a mould, &c. exactly perpendicular to the flat of the uſing-file: a ſliding gage, whoſe uſe is to meaſure and ſet off diſtances between the ſhoulder and the tooth, and to mark it off from the end, or from the edge of the work; a face-gage, which is a ſquare notch cut with a file into the edge of a thin plate of ſteel, iron, or braſs, of the thickneſs of a piece of common tin, whoſe uſe is to proportion the face of each ſort of letter, viz. Long letters, aſcending letters, and ſhort letters. So there muſt be three gages, and the gage for the long letters is the length of the whole body ſuppoſed to be divided into forty-two equal parts. The gage for the aſcending letters Roman and Italic are $\frac{5}{7}$ or 30 parts of 42, and 33 parts for the Engliſh face. The gage for the ſhort letters is $\frac{3}{7}$ or 18 parts of 42 of the whole body for the Roman and Italic, and 22 parts for the Engliſh face.

The Italic and other ſtanding gages are to meaſure the ſcope of the Italic ſtems, by applying the top and bottom of the gage to the top and bottom lines of the letters, and the other ſide of the gage to the ſtem; for when the letter complies with theſe three ſides of the gage, that letter has its true ſhape.

The next care of the letter-cutter is to prepare good ſteel punches, well tempered, and quite free from all veins of iron; on the face of which he draws or marks the exact ſhape of the letter, with pen and ink, if the letter be large; or with a ſmooth blunted point of a needle, if it be ſmall; and then with ſizeable and proper ſhaped and pointed gravers and ſculpters, digs or ſculps out the ſteel between the ſtrokes or marks he made on the face of the punch, and leaves the marks ſtanding on the face. Having well ſhaped the inſide ſtrokes of his letter, he deepens the hollows with the ſame tools: for if a letter be not deep in proportion to its width, it will, when uſed at preſs, print black, and be good for nothing. This work is generally regulated by the depth of the counter-punch. Then he works the outſide with proper files till it be fit for the matrice.

But, before we proceed to the ſinking and juſtifying of the matrices, we muſt provide a mould to juſtify them by, of which you have a draught in *Tab. Miſcellany, fig.* 13, 14,

Every mould is compoſed of an upper and an under part. The under part is delineated in *fig.* 13. The upper part is marked *fig.* 14, and is in all reſpects made like the under part, excepting the ſtool behind, and the bow, or ſpring, alſo behind; and excepting a ſmall roundiſh wire between the body and carriage, near the break where the under part hath a ſmall rounding groove made in the body. This wire, or rather half-wire, in the upper part makes the nick in the ſhank of the letter, when part of it is received into the groove in the under part. Theſe two parts are ſo exactly fitted and gaged into one another (viz. the male gage, marked c in *fig.* 14, into the female marked g in *fig.* 13, that when the upper part of the mould is properly placed on, and in the under part of the mould, both together, make the entire mould, and may be ſlid backwards for uſe ſo far, till the edge of either of the bodies on the middle of either carriage comes juſt to the edge of the female gages, cut in each carriage: and they may be ſlid forwards ſo far, till the bodies on either carriage touch each other: and the ſliding of theſe two parts of the mould backwards makes the ſhank of the letter thicker, becauſe the bodies in each part ſtand wider aſunder, and the ſliding them forwards makes the ſhank of the letter thinner, becauſe the bodies on each part of the mould ſtand cloſer together.

The parts of the mould are as follow: viz.

a The carriage.
b The body.
c The male gage.
d e The mouth-piece.
f i The regiſter.
g The female gage.
h The hag.
a a a a The bottom plate.
b b b The wood, on which the bottom plate lies.
c c e The mouth.
d d The throat.
e d d The pallat.
f The nick.
g g The ſtool.
h h The ſpring or bow.

Then the mould muſt be juſtified; and firſt the founder juſtifies the body, by caſting about twenty proofs, or ſamples of letters: which are ſet up in a compoſing ſtick, with all their nicks towards the right hand; and then by comparing theſe with the pattern letters, ſet up in the ſame manner, he finds the exact meaſure of the body to be caſt. He alſo tries if the two ſides of the body are parallel, or that the body be no bigger at the head than at the foot; by taking half the number of his proofs, and turning them with their heads to the feet of the other half; and if then the heads and the feet be found exactly even upon each other, and neither to drive out nor get in, the two ſides may be pronounced parallel. He farther tries whether the two ſides of the thickneſs of the letter be parallel by firſt ſetting his proofs in the compoſing ſtick with their nicks upwards; and then turning one half with their heads to the feet of the other half: and if the heads and feet lie exactly upon each other, and neither drive out nor get in, the two ſides of the thickneſs are parallel.

The mould thus juſtified, the next buſineſs is to prepare the matrices. A matrice is a piece of braſs or copper of about an inch and a half long, and of a thickneſs in proportion to the ſize of the letter it is to contain. In this metal is ſunk the face of the letter intended to be caſt, by ſtriking the letter punch about the depth of an n. After this the ſides and face of the matrice muſt be juſtified and cleared, with files, of all bunchings made by ſinking the punch.

Every thing thus prepared, it is brought to the furnace, which is built of brick upright, with four ſquare ſides, and a ſtone on the top, in which ſtone is a wide round hole for the pan to ſtand in. A *foundery* of any conſequence has ſeveral of theſe furnaces in it.

As to the metal of which the types are to be caſt, this, in extenſive founderies, is always prepared in large quantities; but caſt into ſmall bars, of about twenty pounds weight, to be delivered out to the workmen as occaſion requires. In the *letter foundery* which has been long carried on with reputation, under the direction of Dr. Alex. Wilſon, and ſons, at Glaſgow, we are informed, that a ſtock of metal is made up at two different times of the year, ſufficient to ſerve the caſters at the furnace for ſix months each time. For this purpoſe a large furnace is built under a ſhade, furniſhed with a wheel vent, in order the more equally to heat the ſides of a ſtrong pot of caſt iron which holds, when full, fifteen hundred weight of the metal. The fire being kindled below, the bars of lead are let ſoftly down into the pot, and their fuſion promoted by throwing in ſome pitch and tallow, which ſoon inflame. An outer chimney, which is built ſo as to project about a foot over the fartheſt lip of the pot, catches hold of the flame by a ſtrong draught, and makes it act very powerfully in melting lead; whilſt it ſerves at the ſame time to convey away all the fumes, &c. from the workmen, to whom this laborious part of the buſineſs is committed. When the lead is thoroughly melted, a due proportion of the regulus of antimony and other ingredients are put in, and ſome more tallow is inflamed, to make the whole incorporate ſooner. The workmen now having mixed the contents of the pot very thoroughly, by ſtirring long with a large iron ladle, next proceed to draw the metal off into the ſmall troughs of caſt iron which are ranged, to the number of fourſcore, upon a level platform, faced with ſtone, built towards the right hand. In the courſe of a day fifteen hundred weight of metal can be eaſily prepared in this manner; and the operation is continued for as many days as are neceſſary to prepare a ſtock of metal, of all the various degrees of hardneſs. After this the whole is diſpoſed into preſſes, according to its quality, to be delivered out occaſionally to the workmen.

The founder muſt be now provided with a ladle, which differs nothing from other iron ladles, but in its ſize. And he is provided always with ladles of ſeveral ſizes, which he uſes according to the ſize of the letters he is to caſt. Before the caſter begins to caſt, he muſt kindle his fire in the furnace to melt the metal in the pan. Therefore he takes the pan out of the hole in the ſtone, and

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there lays in coals and kindles them; and, when they are well kindled, he ſets the pan in again and puts in metal into it to melt: if it be a ſmall bodied letter he caſts, or a thin letter of great bodies, his metal muſt be very hot; nay ſometimes red-hot, to make the letter come. Then having choſe a ladle that will hold about ſo much as the letter and break is, he lays it at the ſtoking-hole, where the flame burſts out, to heat. Then he ties a thin leather, cut with its narrow end againſt the face to the leather groove of the matrice, by whipping a brown thread twice about the leather-groove, and faſtening the thread with a knot. Then he puts both halves of the mould together, and puts the matrice into the matrice-cheek, and places the foot of the matrice on the ſtool of the mould, and the broad end of the leather upon the wood of the upper half of the mould, but not tight up, leſt it might hinder the foot of the matrice from ſinking cloſe down upon the ſtool in a train of work. Then laying a little roſin on the upper wood of the mould, and having his caſting-ladle hot, he with the bolling-ſide of it melts the roſin: and, when it is yet melted, preſſes the broad end of the leather hard down on the wood, and ſo faſtens it to the wood; all this is the preparation.

Now he comes to caſting. Wherefore placing the under half of the mould in his left hand, with the hook or hag forward, he clutches the ends of its wood between the lower part of the ball of his thumb and his three hind fingers; then he lays the upper half of the mould upon the under half, ſo that the male gages may fall into the female gages, and at the ſame time the foot of the matrice places itſelf upon the ſtool; and, claſping his left hand thumb ſtrong over the upper half of the mould, he nimbly catches hold of the bow or ſpring with his right hand fingers at the top of it, and his thumb under it, and places the point of it againſt the middle of the notch in the backſide of the matrice, preſſing it as well forwards towards the mould, as downwards, by the ſhoulder of the notch cloſe upon the ſtool, while at the ſame time with his hinder fingers, as aforeſaid, he draws the under half of the mould towards the ball of his thumb, and thruſts by the ball of his thumb the upper part towards his fingers, that both the regiſters of the mould may preſs againſt both ſides of the matrice, and his thumb and fingers preſs both halves of the mould cloſe together.

Then he takes the handle of his ladle in his right hand, and with the boll of it gives a ſtroke, two or three, outwards upon the ſurface of the melted metal, to ſcum or clear it from the film or duſt that may ſwim upon it; then takes up the ladle full of metal, and having his mould, as aforeſaid, in his left hand, he a little twiſts the left ſide of his body from the furnace, and brings the geat of his ladle (full of metal) to the mouth of the mould, and twiſts the upper part of his right hand towards him to turn the metal into it, while at the ſame moment of time he jilts the mould in his left hand forwards, to receive the metal with a ſtrong ſhake (as it is called); not only into the bodies of the mould, but while the metal is yet hot running, ſwift and ſtrongly, into the very face of the matrice, to receive its perfect form there, as well as in the ſhank.

Then he takes the upper half of the mould off the under half, by placing his right hand thumb on the end of the wood next his left hand thumb, and his two middle-fingers at the other end of the wood; and finding the letter, and break lie in the under half of the mould (as moſt commonly by reaſon of its weight it does) he throws or toſſes the letter, break and all, upon a ſheet of waſte paper laid for that purpoſe on the bench, juſt a little beyond his left hand, and is then ready to caſt another letter as before; and alſo, the whole number that is to be caſt with that matrice.

A workman will ordinarily caſt about three thouſand of theſe letters in a day.

When the caſters at the furnace have got a ſufficient number of types upon the tables, a ſet of boys come, and nimbly break away the jets from them: the jets are thrown into the pots, and the types are carried away in parcels to other boys, who paſs them ſwiftly under their fingers, defended by leather, upon ſmooth flat ſtones, in order to poliſh their broad-ſides. This is a very dextrous operation, and is a remarkable inſtance of what may be effected by the power of habit and long practice; for theſe boys, in turning up the other ſide of the type, do it ſo quickly by a mere touch of the fingers of the left hand, as not to require the leaſt perceptible intermiſſion in the motion of the right hand upon the ſtone. The types, thus finely ſmoothed and flattened on the broad-ſides, are next carried to another ſet of boys, who ſit at a ſquare table, two on each ſide, and there are ranged up on long rulers, or ſticks, fitted with a ſmall projection, to hinder them from ſliding off backwards. When theſe ſticks are ſo filled, they are placed, two and two, upon a ſet of wooden pins fixed into the wall, near the dreſſer, ſometimes to the amount of a hundred, in order to undergo the finiſhing operations. This workman, who is always the moſt expert and ſkilful in all the different branches carried on at the *foundery*, begins by taking one of theſe ſticks, and, with a peculiar addreſs, ſlides the whole column of types off upon the dreſſing-ſtick: this is made of well ſeaſoned mahogany, and furniſhed with two end-pieces of ſteel, a little lower than the body of the types, one of which is moveable, ſo as to approach the other by means of a long ſcrew-pin, inſerted in the end of the ſtick. The types are put into this ſtick with their faces next to the back or projection; and after they are adjuſted to one another ſo as to ſtand even, they are then bound up, by ſcrewing home the moveable end-piece. It is here where the great and requiſite accuracy of the moulds comes to be perceived; for in this caſe the whole column, ſo bound up, lies flat and true upon the ſtick, the two extreme types being quite parallel, and the whole has the appearance of one ſolid continuous plate of metal. The leaſt inaccuracy in the exact paralleliſm of the individual type, when multiplied ſo many times, would render it impoſſible to bind them up in this manner, by diſpoſing them to riſe or ſpring from the ſtick by the ſmalleſt preſſure from the ſcrew. Now, when lying ſo conveniently with the narrow edges uppermoſt, which cannot poſſibly be ſmoothed in the manner before mentioned by the ſtones, the workman does this more effectually by ſcraping the ſurface of the column with a thick-edged but ſharp razor, which at every ſtroke brings on a very fine ſmooth ſkin, like to poliſhed ſilver; and thus he proceeds till in about half a minute he comes to the farther end of the ſtick. The other edges of the types are next turned upwards, and poliſhed in the ſame manner. It is whilſt the types thus lie in the dreſſing-ſtick that the operation of bearding or barbing is performed, which is effected by running a plane, faced with ſteel, along the ſhoulder of the body next to the face, which takes more or leſs off the corner, as occaſion may require. Whilſt in the dreſſing-ſtick they are alſo grooved, which is a very material operation. In order to underſtand this, it muſt be remembered, that when the types are firſt broken off from the jets, ſome ſuperfluous metal always remains, which would make them bear very unequally againſt the paper whilſt under the printing-preſs, and effectually mar the impreſſion. That all theſe inequalities may, therefore, be taken away, and that the bearings of every type may be regulated by the ſhoulders imparted to them all alike from the mould, the workman or dreſſer proceeds in the following manner. The types being ſcrewed up in the ſtick, as before mentioned, with the jet-end outermoſt, and projecting beyond the wood about one eighth of an inch, the ſtick is put into an open preſs, ſo as to preſent the jet-end uppermoſt, and then every thing is made faſt by driving a long wedge, which bears upon a ſlip of wood, which lies cloſe to the types the whole length: then a plough or plane is applied, which is ſo conſtructed as to embrace the projecting part of the types betwixt its long ſides, which are made of poliſhed iron. When the plane is thus applied, the ſteel cutter bearing upon that part between the ſhoulders of the types, where the inequalities lie, the dreſſer dextrouſly glides it along, and by this means ſtrips off every irregular part that comes in the way, and ſo makes an uniform groove the whole length, and leaves the two ſhoulders ſtanding; by which means every type becomes preciſely like to another, as to the height againſt paper. The types being now finiſhed, the ſtick is taken out of the preſs, and the whole column replaced upon the other ſtick; and after the whole are ſo dreſſed he proceeds to pick out the bad letters, previous to putting them up into pages and papers. In doing this he takes the ſtick into his left hand, and turning the faces near to the light, he examines them carefully, and whenever an imperfect or damaged letter occurs, he nimbly plucks it out with a ſharp bodkin, which he holds in the right hand for that purpoſe. Thoſe letters which, from their form, project over the body of the type, and which cannot on this account be rubbed on the ſtones, are ſcraped on the broad-ſides with a knife or file, and ſome of the metal next the face pared away with a pen-knife, in order to allow the type to come cloſe to any other. This operation is called kerning.

The excellence of printing types conſiſts not only in the due performance of all the operations above deſcribed, but alſo in the hardneſs of the metal, form, and fine proportion of the character, and in the exact bearing and ranging of the letters in relation to one another.

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FOUNDLING *hoſpital.* See *Foundling* HOSPITAL.

FOUNT, or FONT, among *Printers*, &c. a ſet, or quantity, of CHARACTERS, or LETTERS, of each kind, caſt by a letter-founder, and ſorted.

We ſay, a founder has caſt a *fount* of pica, of engliſh, of pearl, &c. meaning that he has caſt a ſet of characters of theſe kinds.

A complete *fount* does not only include the running letter, but alſo majuſcules, or large and ſmall capitals, ſingle letters, double letters, points, commas, lines, borders, head-pieces, tail-pieces, and numeral characters.

Founts are large or ſmall, according to the demand of the printer, who orders them by the hundred weight, or by ſheets. When the printer orders a *fount* of five hundred, he means that the *fount* ſhall weigh five hundred pounds. When he demands a *fount* of ten ſheets, it is underſtood, that with that *fount* he ſhall be able to compoſe ten ſheets, or twenty forms, without being obliged to diſtribute. The founder takes his meaſures accordingly; he reckons a hundred and twenty pounds for a ſheet, including the quadrates, &c. or ſixty pounds for a form, which is half a ſheet: not that the ſheet always weighs a hundred and twenty pounds, or the form ſixty pounds; on the contrary, it varies according to the ſize of the form; beſides, it is always ſuppoſed that there are letters left in the cafes.

The letter-founders have a kind of liſt, or tariff, whereby they regulate their *founts:* the occaſion thereof is, that ſome letters being in much more uſe, and oftener repeated, than others, their cells, or caſes, ſhould be better filled and ſtored, than thoſe of the letters which do not return ſo frequently.

Thus the *o*, and *i*, for inſtance, are always in greater quantity than the *k*, or *z*.

This difference will be beſt perceived from a proportional compariſon of thoſe letters with themſelves, or ſome others. Suppoſe a *fount* of a hundred thouſand characters, which is a common *fount*; here the *a* ſhould have five thouſand; the *c*, three thouſand; the *e*, eleven thouſand; the *i*, ſix thouſand; the *m*, three thouſand; the *k*, only thirty; and the *x*, *y*, and *z*, not many more. But this is only to be underſtood of the letters of the lower-caſe; thoſe of the upper having other proportions, which it would be, here, too long to inſiſt on.

FOUNTAIN, FONS, in *Philoſophy*, a ſpring, or ſource, of water, riſing out of the ground.

For the phenomena, theory, origin, &c. of ſprings, or *fountains*, ſee SPRING.

Among the ancients, the *fountains*, or ſources of rivers, were held ſacred, and even worſhipped, as a kind of divinities.

Seneca obſerves as much, in his forty-firſt epiſtle; and Cicero, lib. iii. De Nat. Deor. cap. 20. mentions, that the Roman prieſts, and augurs, uſed, in their prayers and invocations, to call on the names of the Tyber, and other rivers, brooks, and ſprings, about Rome. And the ſeventh inſcription, in p. 94. of Gruter, has *FONTI* DIVINO ET GENIO NVMINIS *FONTIS.*

It was a point of religion, not to diſturb, or make muddy, theſe waters in waſhing or bathing: Tacitus gives an inſtance hereof in Nero, Annal. lib. xiv. cap. 22.

FOUNTAIN, or *artificial* FOUNTAIN, in *Hydraulics*, a machine or contrivance, whereby water is violently ſpouted, or darted up; called alſo a *jet d'eau.* See JET *d'Eau*, FLUID, &c.

There are divers kinds of artificial *fountains*; ſome founded on the ſpring, or elaſticity, of the air; and others, on the preſſure, or weight, of the water, &c.

The ſtructure of each of theſe being pretty and curious, and affording a good illuſtration of the doctrine of hydraulics, and pneumatics, ſhall be here explained.

The theory of *fountains* may be collected from the articles AIR, FLUID, &c. and other particulars relating to their ajutages, and pipes of conduct, &c. may be found under JET *d'Eau*, and *Motion of* WATER.

FOUNTAIN. *Conſtruction of an artificial* FOUNTAIN, *playing by the ſpring, or elaſticity, of the air.* A veſſel, proper for a reſervoir, as AB, *Tab.* II. *Hydraulics*, *fig.* 24. is provided, of metal, glaſs, or the like, ending in a ſmall neck *c*, at the top: through this neck a tube is put, *c d*, traverſing the middle of the veſſel, till its lower orifice *d*, nearly, but not abſolutely, reach the bottom of the veſſel; the veſſel being firſt half filled with water. The neck is ſo contrived, as that a ſyringe, or condenſing pipe, may be ſcrewed upon the tube; by means whereof a large quantity of air may be intruded through the tube into the water, out of which it will diſengage itſelf, and emerge into the vacant part of the veſſel, and lie over the ſurface of the water CD.

Now, the water here contained being thus preſſed by the air, which is, e. gr. twice as denſe as the external air; and the elaſtic force of air being equal to its gravitating force; the effect will be the ſame, as if the weight of the column of air over the ſurface of the water were double that of the column preſſing in the tube; ſo that the water muſt, of neceſſity, ſpout up, through the tube, when the ſyringe is removed, with a force equal to the exceſs of preſſure of the included, above that of the external air.

FOUNTAIN. *Conſtruction of an artificial* FOUNTAIN, *playing by the preſſure of the water.* Having the conveniency of a fund, or reſervoir of water, in a place conſiderably higher than that where the *fountain* is to be (whether that fund hath been placed there by nature, or whether it hath been raiſed for the purpoſe, by a proper engine, as a pump, ſiphon, ſpiral ſcrew, or the like): from the reſervoir lay vertical tubes, for the water to deſcend through; and, to theſe vertical tubes, fit other horizontal ones, under ground, to carry the water to the place where the *fountain* is to play. Laſtly, from theſe horizontal tubes, erect other vertical ones, by way of ajurages, jets, or ſpouts, their altitude being much leſs than that of the tubes whereby the water was carried to the horizontal ones.

Then will the water, by the preſſure of the ſuperincumbent column, be ſpouted up at theſe jets; and that to the height, or level, of the water in the reſervoir; and this will be the caſe, howſoever any of the tubes be bent or incurvated. The demonſtration hereof, ſee under FLUIDS.

Thus may water be ſpouted to any given height at pleaſure; and the tubes may be ſo proportioned as to yield any given quantity of water, in a given time; or ſeveral tubes, of the ſame *fountain*, may be made to yield water in any given ratio; or, laſtly, different tubes may project the water to different altitudes. Rules for all which, the reader will find among the laws of FLUIDS and JETS *d'Eau.*

Theſe aereal or aquatic *fountains* may be applied in various manners, ſo as to exhibit various appearances; and, from theſe alone, ariſes the greateſt part of our artificial water-works. An inſtance, or two, will not be diſagreeable.

FOUNTAIN *ſpouting the water in various directions.* Suppoſe the vertical tube, or ſpout, in which the water riſes, to be AB (*Tab.* II. *Hydraulics*, *fig* 25.) into this fit ſeveral other tubes; ſome horizontal, others oblique; ſome inclining, others reclining, as OP, MN, FL, &c.

Then, as all water retains the direction of the aperture through which it is ſpouted, that iſſuing through A will riſe perpendicularly; and that through L, H, N, P, E, will deſcribe arches of different magnitudes, and tending different ways.

Or thus: ſuppoſe the vertical tube AB, *fig.* 26. through which the water riſes, to be ſtopped at the top, as in A; and, inſtead of pipes, or jets, let it be only perforated with little holes all round, or only round half its ſurface: then will the water ſpin forth, in all directions, through the little apertures, and to a diſtance proportional to the height of the fall of the water.

And hence, if the tube AB be ſuppoſed the height of a man, and be furniſhed with an epiſtomium, or cock, at C, upon opening the cock, the ſpectators will be covered unexpectedly with a ſhower.

It muſt be here obſerved, that the diameters of the apertures by which the water is emitted, muſt be conſiderably leſs than thoſe of the tubes in which the water is brought; leſt the reſiſtance of the air, and other impediments, ſpecified under FLUID and JET *d'Eau*, break the force of the water.

FOUNTAIN *playing by the draught of the breath.* Suppoſe AB, *Tab.* II. *fig.* 27. a glaſs, or metalline ſphere, wherein is fitted a tube CD, having a little orifice in C, and reaching almoſt to D, the bottom of the ſphere. If, now, the air be ſucked out of the tube CD, and the orifice C be immediately immerged under cold water, the water will aſcend through the tube into the ſphere.

Thus proceeding, by repeated exſuctions, till the veſſel be above half full of water; and then applying the mouth to C, and blowing air into the tube, upon removing the mouth the water will ſpout forth.

Or, if the ſphere be put in hot water, the air, being thereby rarefied, will make the water ſpout as before.

This kind of *fountain* is called *Pila Heronis*, or Hero's ball, from the name of its inventor.

FOUNTAIN, *the ſtream whereof raiſes and plays a braſs ball.* Provide a hollow braſs ball A, *Tab.* III. *Hydraulics*, *fig.* 28. made of a thin plate, that its weight may not be too great for the force of the water. Let the tube BC, through which the water riſes, be exactly perpendicular to the horizon.

Then the ball, being laid in the bottom of the cup, or baſon, B, will be taken up in the ſtream, and ſuſtained at a conſiderable height, as A, alternately vibrating, or playing up and down.

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Hence, as the figure of the ball contributes nothing to its reciprocal riſe and fall, any other body, not too heavy, may be ſubſtituted in lieu thereof; e. gr. a bird, with its wings ſtretched forth.

But note, that, as it is neceſſary the ball, when on the deſcent, ſhould keep the ſame preciſe perpendicular wherein it roſe (ſince, otherwiſe, it would miſs the ſtream, and fall downright), ſuch a *fountain* can only be played in a place free from wind.

FOUNTAIN *which ſpouts water in form of a ſhower.* To the tube wherein the water is to riſe, fit a ſpherical, or lenticular head, AB, *fig.* 29. made of a plate of metal, and perforated at the top with a great number of little holes.

The water riſing with vehemence towards AB, will be there divided into innumerable little threads, and afterwards broke, and diſperſed into the fineſt drops.

FOUNTAIN *which ſpreads the water in form of a table-cloth.* To the tube AB, *fig.* 30. ſolder two ſpherical ſegments, C and D, almoſt touching each other, with a ſcrew E, to contract or amplify the interſtice or chink, at pleaſure.

Others chuſe to make a ſmooth, even cleft, in a ſpherical or lenticular head, fitted upon the tube.

The water ſpouting through this chink or cleft will expand itſelf in manner of a cloth.

FOUNTAINS, *wherein the water ſpouts out of the figures of men, and other animals.* Since water may be derived, or conveyed, by tubes in any ſituation, and always retains the direction of the aperture, all here required is, to incloſe tubes within the figures of men, or other animals, having their orifices in thoſe parts whence the water is intended to ſpout forth.

From the principles hitherto laid down, it will be very eaſy to deduce whatever relates to the furniture of *fountains*, and the various forms water may be put into by their means; all depending on the magnitude, figure, and direction, of the ajutages, or apertures.

FOUNTAIN, *which, when it has done ſpouting, may be turned like an hour-glaſs.* Provide two veſſels, A and B, *fig.* 31. to be ſo much the bigger as the *fountain* is to play the longer; and placed at ſo much the greater diſtance from each other, as the water is deſired to ſpout the higher. Let CDE be a crooked tube, furniſhed in E with a jet; and GHI another bent tube, furniſhed with a jet in I: KL and GF are to be other leſſer tubes, open at both ends, and reaching near to the bottom of the veſſels B and A, to which the tubes GH and CD are likewiſe to reach.

If, now, the veſſel A be filled with water, it will deſcend through the tube CD; and will ſpout up through the jet E, by the preſſure of the column of water CD. But unleſs the pipe GF was open at G, to let the air run up to F, and preſs at the top of the ſurface of the water in the cavity A, the water could not run down and ſpout at E. After its fall again, it will ſink through the little tube KL, into the veſſel B, and expel the air through the tube GI. At length, when all the water is emptied out of the veſſel A, by turning the machine upſide down, the veſſel B will be the reſervoir, and make the water ſpout up through the jet I, the pipe KL ſupplying B with air to let the water deſcend in the direction GHI.

Hence, if the veſſels A and B contain juſt as much water as will be ſpouted up in an hour's time, we ſhall have a ſpouting clepſydra, or water-clock; which may be graduated, or divided, into quarters, minutes, &c. as ſhewn under CLEPSYDRA.

FOUNTAIN *of command.* This depends on the ſame principles with thoſe of the former: CAE, *fig.* 32. is a veſſel of water ſecured againſt the entrance of the air, except through the pipe GF, when the cock C, by which it was filled, is ſhut. There is another pipe EDHB, which goes from the bottom of the water to the jet B in the baſon DB, but this is ſtopped by the cock H. At the loweſt part of the baſon DB, there is a ſmall hole at I to let the water of the baſon DB run into the baſon GH under it; there is alſo a ſmall triangular hole, or notch, in the bottom of the pipe FG, at G. Turn the cock H, and the *fountain* will play for ſome time, then ſtop, then play again alternately for ſeveral times together. When thoſe times of playing and ſtopping are known before-hand, you may command the *fountain* to play or ſtop, whence its name. The cauſe of this phenomenon is as follows: the water coming down the pipe EDHB, would not come out at B, if the air S s, above the water, was not ſupplied as it dilated: now it is ſupplied by the pipe GF, which takes in at the notch G, and delivers it out at F; but after ſome time the water, which has ſpouted out at B, falling down into the baſon DB, riſes high enough to come above the notch G, which ſtops the paſſage of the air; ſo that the air S s, above the water in the veſſel CAE, wanting a ſupply, cannot ſufficiently preſs, and the *fountain* ceaſes playing: But when the water of DB has run down into the lower baſon HG, through the hole I, till it falls below the top of the notch G, the air runs up into the upper receptacle, and ſupplies that at S s, and the *fountain* plays again. This is ſeen a little before-hand, by a ſkin of water on the notch G, before the air finds a paſſage, and then you may command the *fountain* to play. It is evident, that the hole I muſt be leſs than the hole of the jet, or elſe all the water would run out into the lower baſon, without riſing high enough to ſtop the notch G.

FOUNTAIN *that begins to play upon the lighting of candles, and ceaſes as they go out.* Provide two cylindrical veſſels, AB and CD, *fig.* 33. connect them by tubes, open at both ends, KL, BE, &c. ſo that the air may deſcend out of the higher into the lower: to the tubes ſolder candleſticks, H, &c. and to the hollow cover of the lower veſſel, CE, fit a little tube, or jet, FG, furniſhed with a cock G, and reaching almoſt to the bottom of the veſſel. In G let there be an aperture, furniſhed with a ſcrew, whereby water may be poured into CD.

Then, upon lighting the candles H, &c. the air in the contiguous tubes becoming rarefied thereby, the water will begin to ſpout through GF.

By the ſame contrivance may a ſtatue be made to ſhed tears upon the preſence of the ſun, or on the lighting of a candle, &c. all here required being only to lay tubes from the cavity wherein the air is rarefied, to ſome other cavities placed near the eyes, full of water.

A FOUNTAIN may be made by the rarefaction of the air in the following manner: let AB and CD, *fig.* 34. be two pipes fixed to a braſs head C, made to ſcrew into a glaſs veſſel E, which, having a little water in it, is inverted till the pipes are ſcrewed on; then reverting it ſuddenly, ſo as to put A, the lower end of the ſpouting pipe AB, into a jar of water A, and the lower end of the deſcending pipe CD, into a receiving veſſel D, the water will ſpout up from the jar A into the tall glaſs veſſel E, from which it will go down at the mouth C, through CD, into the veſſel D, till the water is wholly emptied out of A, making a *fountain* in E, into D. The reaſon of the play of the *fountain* is this: the pipe CD, being two foot nine inches long, lets down a column of water, which rarefies the air $\frac{1}{72}$ part in the veſſel E, where it preſſes againſt the water ſpouting at B with $\frac{1}{72}$ of the force by which the water is puſhed up at the hole A, by the preſſure of the common air on the water in the veſſel A; ſo that the water ſpouts up into E, when the air is rarefied $\frac{1}{72}$, with the difference of the preſſure of the atmoſphere, and the forementioned rarefied air; i. e. of 33 to $2\frac{3}{4}$. This would raiſe the water two foot nine inches; but the length of the pipe A, nine inches being deducted, the jet will only riſe two foot. This, ſays Deſaguliers, may be called a ſyphon *fountain*, where AB is the driving leg, and CD the iſſuing leg.

FOUNTAIN *of Hero of Alexandria*, ſo called, becauſe it was contrived by him. In the firſt *fountain* already deſcribed, the air is compreſſed by a ſyringe; in this, ſee *fig.* 35. the air, being only compreſſed by the concealed fall of water, makes a jet, which, after ſome continuance, is conſidered by the ignorant as a perpetual motion; becauſe they imagine that the ſame water which fell from the jet riſes again. The boxes CE and DYX, being cloſe, we ſee only the baſon ABW, with a hole at W, into which the water ſpouting at B falls; but that water does not come up again; for it runs down through the pipe WX into the box DYX, from whence it drives out the air, through the aſcending pipe YZ, into the cavity of the box CE, where, preſſing upon the water that is in it, it forces it out through the ſpouting pipe OB, as long as there is any water in CE; ſo that this whole play is only whilſt the water contained in CE, having ſpouted out, falls down through the pipe WX into the cavity DYX. The force of the jet is proportional to the height of the pipe WX, or of the boxes CE and DY above one another: the height of the water, meaſured from the baſon ABW to the ſurface of the water in the lower box DYX, is always equal to the height meaſured from the top of the jet to the ſurface of the water in the middle cavity at CE. Now, ſince the ſurface CE is always falling, and the water in DY always riſing, the height of the jet muſt continually decreaſe, till it is ſhorter by the height of the depth of the cavity CE, which is emptying, added to the depth of the cavity DY, which is always filling; and when the jet is fallen ſo low, it immediately ceaſes. The air is repreſented by the points in this figure. To prepare this *fountain* for playing, which ſhould be done unobſerved, pour in water at W, till the cavity DXY is filled; then invert the *fountain*, and the water will run from the cavity DXY into the cavity CE, which may be known to be full, when the water

runs

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runs out at B held down. Set the *fountain* up again, and, in order to make it play, pour in about a pint of water into the baſon ABW; and, as ſoon as it has filled the pipe WX, it will begin to play, and continue as long as there is any water in CE. You may then pour back the water left in the baſon ABW, into any veſſel, and invert the *fountain*, which, being ſet upright again, will be made to play, by putting back the water poured out into ABW; and ſo on as often as you pleaſe.

The FOUNTAIN, *fig.* 36. is of the ſame kind; but, having double the number of pipes and concealed cavities, it plays as high again. In order to underſtand its ſtructure, ſee *fig.* 37. The baſon is A, the four cavities are B, C, D, and E, from which the water, through the pipe fG, ſpouts up to double the height of the *fountain*, the air at E, which drives it, being doubly condenſed. The water going down the pipe 1 (e. gr. three foot long), condenſes the air that goes up into the cavity C through the pipe 2, ſo as to make it $\frac{1}{10}$ ſtronger than the common air; then the water, which falling in the pipe 3 from C to D, is capable, by the height of its fall, of condenſing the air at E, ſo as to make it $\frac{1}{10}$ ſtronger, being puſhed at C by air already condenſed into $\frac{1}{10}$ leſs ſpace, cauſes the air at E to be condenſed twice as much; that is, to be $\frac{1}{5}$ ſtronger than common air; and, therefore, it will make the water at G ſpout out with twice the force, and riſe twice as high as it would do, if the *fountain* had been of the ſame ſtructure as the former. In playing this *fountain*, turn it upſide down, and taking out the plugs g, h, fill the two cavities C and E, and, having ſhut the holes again, ſet the *fountain* upright, and pour ſome water into the baſon A, and the jet will play out at G: but the *fountain* will begin to play too ſoon; and, therefore, the beſt way is to have a cock in the pipe 3, which, being open, whilſt the cavities C and E are filled, and ſhut again before the *fountain* is ſet up, will keep the water thrown into the baſon from going down the pipe 1, and that of the cavity C from going down the pipe 3, by which means the *fountain* will not play before its time, which will be as ſoon as the cock is opened.

FOUNTAIN, *dial, of Deſaguliers*, is contrived to play by the ſpring of the air, increaſed by the heat of the ſun, and ſerves alſo for a dial at the ſame time. GNS, *fig.* 38. is a hollow globe of thin copper, eighteen inches in diameter, ſupported by a ſmall inverted baſon, reſting on a frame ABC, with four legs, between which there is a large baſon of two foot diameter. In the leg C there is a concealed pipe, proceeding from G, the bottom of the inſide of the globe, along HV, and joining an upright pipe uI, for making a jet at I. The ſhort pipe Iu, going to the bottom of the baſon, has a valve at u under the horizontal part HV, and another valve at V above it, and under the cock &. At the north pole N, there is a ſcrew for opening a hole, through which the globe is ſupplied with water. When the globe is half filled, let the machine be ſet in a garden, and, as the ſun heats the copper and rarefies the included air, the air will preſs upon the water, which, deſcending through the pipe GCHV, will lift up the valve V, and ſhut the valve u, and, the cock being open, ſpout out at I, and continue to do ſo for a long time, if the ſun ſhines, and the ajutage be ſmall. At night, as the air condenſes again by the cold, the outward air, preſſing into the ajutage I, will ſhut the valve V, but, by its preſſure on the baſon DuH, puſh up the water, which has been played in the day-time, through the valve u, and the pipe uHG into the globe, ſo as to fill it up again to the ſame height which it had at firſt, and the next ſun-ſhine will cauſe the *fountain* to play again, &c. The uſe of the cock is to keep the *fountain* from playing till you think proper: a ſmall jet will play ſix or eight hours. If the globe be ſet for the latitude of the place, and rectified before it be fixed, with the hour-lines or meridians drawn upon it, the hours marked, and the countries painted upon it, as in the common globe, it will be a good dial; the ſun ſhining upon the ſame places in this globe, as it does upon the earth itſelf. Deſaguliers, Exper. Phil. vol. ii. lect. 9, p. 205.

FOUNTAIN, with regard to *Architecture*, is an aſſemblage of maſonry, ſculpture, &c. either for the decoration or conveniency of a city, garden, or the like.

Fountains acquire various denominations, according to their form and ſituation: as,

FOUNTAIN, *arched*, that whoſe baſon and jet are placed perpendicularly under the arch. Such are the *fountains* of the Colonade, and the triumphal water-arch at Verſailles.

FOUNTAIN, *baſon*, is that with only a ſimple baſon, of any figure whatever; in the middle whereof is a jet, or ſpout, or perhaps a ſtatue, or even a group of figures. Such was formerly the *fountain* in the court of Buckingham-houſe.

FOUNTAIN, *covered*, a kind of pavilion, built of ſtone, either inſulate, and ſquare, or round, or multilateral, or backed; and that either with a projecture, or indenture, incloſing a reſervoir, and ſpouting or darting forth the water thereof through one or more cocks, in the middle of a ſtreet, ſquare, garden, court, or the like. Such was that in Lincoln's-inn new ſquare, London.

FOUNTAIN, *cup*, is that which, beſide a baſon, has likewiſe a cup of one ſingle piece of ſtone, or marble, ſupported on a ſhaft or pedeſtal, and receiving a jet, or ſpout, riſing out of the middle thereof.

As the *fountain* in the court of the Vatican; the cup whereof is of granite, and antique, being brought from the baths of Titus at Rome.

FOUNTAIN, *marine*, that compoſed of aquatic figures, as ſea divinities, naiads, tritons, rivers, dolphins, and other fiſhes, and ſhells. Such is the *fountain* of the palace of Paleſtrina at Rome, where a ſhell, ſupported by four dolphins, ſerves as a cup, and ſupports a triton, that ſpouts water out of his concha marina.

FOUNTAIN, *naval*, is that made in the form of a veſſel. Such is that of the place D'Eſpagne, at Paris, repreſenting a bark; that at Monte-Cavello, repreſenting a galley; or that before the vineyard Mattei, at Rome, reſembling a boat.

FOUNTAIN, *open*, is any ſpouting *fountain* with a baſon, cup, or other ornaments, all open; ſuch as are met with frequently in our gardens, and in the vineyards at Rome.

FOUNTAIN, *pyramidal*, that formed of ſeveral baſons, or cups, ranged in ſtories over each other, and diminiſhing all the way, being ſupported by a hollow ſtem, or ſhaft. As the *fountain* of Monte-Dragone at Freſcati.

Or elſe ſupported by figures, fiſhes, or conſoles; the water whereof, in its fall, makes nets in divers ſtories, and repreſents a kind of water pyramid. As that at the head of the caſcades at Verſailles.

FOUNTAIN, *ruſtic*, is that formed, or enriched, with rock-work, ſhell-work, petrifactions, &c.

FOUNTAIN, *ſatyric*, is a kind of ruſtic *fountain*, in the manner of a grotto, adorned with termini, maſcaroons, fauns, ſylvans, bacchantes, and other ſatyrical figures, ſerving for ornaments, as well as jets d'eau.

FOUNTAIN, *ſpouting*, or *jet d'eau*, is any *fountain*, whoſe water is darted forth impetuouſly through one or more jets, or ajutages, and returns in form of rains, nets, folds, or the like. See JET *d'Eau*.

FOUNTAIN, *ſpring*, a kind of plain ſpout, or ſtream of water, iſſuing out of ſtone, or a hole in a wall, without any decoration. Such is the *fountain* of Trevi at Rome.

FOUNTAIN, *ſtatuary*, that which, being opened and inſulated, or even-backed, is adorned with one or more ſtatues, by way of finiſhing, or crowning. As the *fountain* of Latona, at Verſailles; and that at the Shepherd at Caprarola.

There are, alſo, ſtatues which ſpout forth water at ſome of their parts; or at ſea-ſhells, vaſes, urns, and other attributes of the ſea.

FOUNTAIN, *ſymbolical*, that where the principal ornaments are the attributes, arms, or cognizances, of the perſon who erected it. Such are the *fountain* of St. Peter in Montorio, reſembling a caſtle flanked with towers, and donjons, repreſenting the arms of Caſtile; and ſome other *fountains* at Rome, among which are the fleur-de-lis, and the dove, the bearings of the family of pope Innocent X.

FOUNTAIN-*pen*, is a ſort of pen contrived to contain a great quantity of ink, and let it flow, by gentle degrees, ſo as to ſupply the writer a long time without a neceſſity of taking freſh ink.

The *fountain*-pen, repreſented *Tab. Miſcellan. fig.* 15, conſiſts of divers pieces, F, G, H, of braſs, ſilver, &c. whereof the middle piece F carries the pen, which is ſcrewed into the inſide of a little pipe; which, again, is ſoldered to another pipe of the ſame bigneſs, as the lid G; in which lid is ſoldered a male ſcrew, for ſcrewing on the cover; as, alſo, for ſtopping a little hole at the place, and hindering the ink from paſſing through it: at the other end of the piece F is a little pipe, on the outſide whereof the top cover H may be ſcrewed. In the cover there goes a porte-craion, to be ſcrewed into the laſt-mentioned pipe, in order to ſtop the end of the pipe into which the ink is to be poured by a funnel.

To uſe the pen, the cover G muſt be taken off, and the pen a little ſhaken, to make the ink run more freely.

FOUR-*corners*, in the *Manege*, or to work upon the *four corners*, is to divide in imagination the volt or round into four quarters; ſo that, upon each of theſe quarters, the horſe makes a round or two at trot or gallop; and when he has done ſo upon each quarter, he has made the *four corners*.

FOUR, *cul de four*. See CUL.

FOURCHEE, or FOURCHY, in *Heraldry*. A croſs *fourchee* is that forked at the ends.

Upton rather repreſents it as anchored, the extremities turning

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turning in a circular manner to ſharp points; whereas the true croſs *fourchee*, i. e forked, has its forks compoſed of ſtrait lines, and blunt ends. See *Tab. Herald. fig.* 33.

FOURCHER, an ancient law term, ſignifying a putting off, prolonging, or delaying, an action.

As by ſtammering we draw out our ſpeech, not delivering that we have to ſay in ordinary time; ſo by *fourchin* we prolong a ſuit, that might be ended in a ſhorter ſpace.

In Stat. Weſtm. 1. cap. 42. we have theſe words: "Co-"parceners and joint-tenants ſhall be no more *fourch*, "but only ſhall have one eſſoin," &c. And anno 6 Edw. I. cap. 10. it is uſed in the ſame ſenſe: "The defendants "ſhall be put to anſwer without *fourchin*," &c. In the Latin it is called *furcare*, and is uſed where a man and his wife do eſſoin ſeverally. *Caveat vir & mulier implacitati, quod ſemper in iſſonio alterius alter compareat, quamdiu* furcare *poſſint*; *& cum ultra non poſſint, concurrant coram eſſonio in ſuis locis: alter autem earum tantum unum eſſonium de malo lecti habere poteſt.* Hengham mag. cap. 9.

FOURCHETTE. *Fer de* FOURCHETTE. See FER.

FOURMILLIER, in *Zoology*, the name given by Buffon to the *myrmecophaga didactyla* of Linnæus, or the little ant-eater; or leſſer yellowiſh *tamandua*; or the white American *coati*. This animal has a conic noſe bending a little downwards, ears that are ſmall and hid in the fur, two hooked claws on the fore-feet, and four on the hind-feet; the head, body, limbs, and upper part and ſides of the tail, are covered with long, ſoft, ſilky hair, or rather wool, of a yellowiſh brown colour; the tail is thick at the baſe, and tapers to a point. This ſpecies inhabits Guiana, and climbs trees in ſearch of ants, which build their neſts in the branches. *Tab.* II. *Quadrupeds*, N° 11. See ANT-*eater*.

FOURTH, in *Muſic*, one of the harmonic intervals, or concords.

The *fourth* is the fourth in order of the concords. It conſiſts in the mixture of two ſounds, which are in the ratio of 4 to 3; i. e. of ſounds produced by chords, whoſe lengths are to each other as 4:3.

It is called *fourth*, becauſe containing *four* terms, or ſounds, between its extremes, and three degrees; or, as being the *fourth*, in the order of the natural ſcale, from the fundamental.

The ancients call the *fourth* DIATESSARON, and ſpeak of it as the firſt and principal of all concords; and yet the moderns find it one of the moſt imperfect. It is ſo very barren and jejune, that it affords nothing good, either by multiplication or diviſion.

Some modern muſicians have doubted whether the *fourth* ſhould be received among the number of concords, or not. The ancients expreſsly admitted it as ſuch, and Andreas Papius wrote a treatiſe againſt thoſe moderns who reject it. Merſen. Harm. lib. iv. prop. 8. Wallis, Append. Ptolem. Harm. p. 182.

FOURTH, *diminiſhed*, in *Muſic*. See DIMINISHED *fourth*.

The *redundant* FOURTH is a diſcord compoſed of the ratios of 27 to 20, and of 4 to 5.

Arches of the FOURTH *point*. See ARCH.

FOURTH *rate*. See RATE.

FOUTGELD, or FOOTGELD. See FOOTGELD.

FOWL, in a general ſenſe, is of equal import with BIRD.

FOWL is, in a more peculiar manner, underſtood of poultry, or the larger ſort of birds, both domeſtic and wild, either bred up, or hunted, for the table.

Such as turkeys, geeſe, cocks, hens, and ducks both wild and tame, pheaſants, partridges, pigeons, ſnipes, &c.

Our common poultry came originally from Perſia and India. Ariſtophanes calls the cock the Perſian bird, and that it was known in that country before Darius and Megabyzus; and theſe birds are now found wild in the iſle of Tinian, and other iſlands in the Indian ocean: in this ſtate their plumage is black and yellow, and their combs and wattles purple and yellow. They have been naturalized in this country before the arrival of the Romans; for Cæſar informs us, that they were one of the forbidden foods of the old Britons. They were probably imported by the Phœnicians, who traded to Britain about five hundred years before Chriſt. For all other domeſtic *fowls*, turkies, geeſe, and ducks excepted, we ſeem to be indebted to our conquerors, the Romans. The wild *fowl* were our own from the earlieſt period. Pennant.

The belly of a living *fowl* being ript up, the creature is thus applied to a part bit by a rattle-ſnake, to draw out ſome of the poiſon. It ſeems to have ſome effect this way. We find an inſtance in the Philoſophical Tranſactions, where a *fowl* thus applied to a hand bit by that moſt venomous ſnake, immediately ſwelled, grew black, and ſtunk. N° 479. p. 144.

The *ſea-fowls* which come on ſhore in immenſe numbers to rooſt, in the north iſlands of Scotland, ſet their watches and centinels at diſtant poſts, to give them notice of any danger; on the leaſt alarm from theſe, the whole body riſes, but without ſuch notice they are not to be alarmed by almoſt any thing. The people of the country know this; and when they go out to take them, they employ all their art to take the centinels without noiſe; this they ſometimes ſucceed in, and when they do, they often afterwards catch three hundred of the others, or more, in one night. Phil. Tranſ. N° 233.

The laying of theſe ſea birds is leſs certain as to time than might be imagined. They can occaſionally defer it; and as they uſually lay in a rainy ſeaſon, if the rain does not come on at the uſual time, they will defer it ſome weeks; and if the April moon goes far in May, that alſo has been obſerved to hinder them from laying ten or twelve days longer than ordinary. See BIRD.

FOWL, *tame*, are a neceſſary part of the ſtock of a country farm; and yield conſiderable ſervice and profit, by their EGGS, BROOD, FEATHERS, DUNG, &c.

They may be kept at a very eaſy expence near any high-way-ſide; as being able to ſhift for themſelves, during the greateſt part of the year, by their feeding on inſects, worms, ſnails, and almoſt any thing eatable.

The oldeſt hens are always the beſt for ſitting, and the youngeſt for laying; but no ſort will be good for either, if kept too fat.

The beſt age to ſet a hen for CHICKENS, is, from two years old to five; and the moſt proper month to ſet them in, is February; though it may be done, to good purpoſe, at any time between that and Michaelmas. One cock will ſerve ten hens. A hen ſits but twenty days; whereas geeſe, ducks, and turkeys, ſit thirty.

Buckwheat, or French wheat, or hempſeed, it is ſaid, makes them lay faſter than any other food; and the ſame buckwheat, either whole, or ground, and made into a paſte, fats them apace; though the common food, for that purpoſe, is barley-meal, or pollard mixed up with hot water or milk. A gooſe will ſcarce ſit on any but her own eggs; a hen will ſit indifferently on all.

The lighteſt coloured geeſe are the beſt, and thoſe that begin to lay the ſooneſt; as they have a chance of hatching twice in one year. They begin to lay in the ſpring, and lay twelve or ſixteen eggs. Green geeſe are begun to be fattened at a month old, and will be fat in a month more. Old geeſe are chiefly fattened at ſix months old, in or after the harveſt. A wild gooſe, if red-footed and hairy, is old; but if white-footed, and not hairy, ſhe is young.

When the eggs are ſet under a hen, or other *fowl*, it is adviſeable to mark the upper ſides thereof; and when ſhe goes to feed, to note whether ſhe minds to turn them up-ſide down, or not; that if ſhe neglect that office, it may be done for her.

FOWL, *water*, may be taken in great abundance by nets properly managed. The net for this purpoſe ſhould be always made of the ſmalleſt and ſtrongeſt packthread that can be got. The meſhes may be large, but the nets ſhould be lined on both ſides with other ſmaller nets, every meſh of which is to be about an inch and a half ſquare each way, that as the *fowl* ſtrike either through them or againſt them, the ſmaller may paſs through the great meſhes, and ſo ſtreighten and entangle the *fowl*.

Theſe nets are to be pitched for every evening flight of *fowl*, about an hour before ſun-ſet, ſtaking them on each ſide of the river, about half a foot within the water, the lower ſide of the net being ſo plummed, that it may ſink ſo far and no farther; place the upper ſide of the net ſlantwiſe, ſhoaling againſt the water, but not touching it by near two foot; and let the ſtrings, which ſupport this upper ſide of the net, be faſtened to ſmall yielding ſticks ſet in the bank; theſe, as the *fowl* ſtrikes, will give the net liberty to play, and to entangle them. Several of theſe nets ſhould be placed at once over different parts of the river, at about twelve-ſcore fathom diſtance one from another; and if any *fowl* come that way, the ſportſman will have a ſhare of them. It is a good method, when the nets are ſet, to go to places ſufficiently diſtant from them with a gun, to fright them toward the places where the nets are; and wherever any of the *fowl* are ſtarted from, it may not be amiſs to plant ſome nets alſo there, to take them as they return. The nets are to be left thus placed all night, and in the morning the ſportſman is to go and ſee what is caught; he ſhould viſit the river firſt, and take up what are caught there, and, frightening the reſt away to the other places where his nets are, he is next to viſit them, and take what are there ſecured.

The Ceiloneſe have great plenty of water-*fowl* wild on their iſland, and have a very remarkable way of catching them, which is this: the fowler enters a lake or other water which has a good bottom, and is not very deep; he puts an earthen pot upon his head, in which there

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are bored holes, through which he can ſee; he keeps himſelf ſo bent down in the water, that only the pot is above the ſurface; in this manner he enters the place where the wild-*fowl* are in cluſters, and they think it is only ſome floating block. He then takes ſome one by the legs, and gently draws it under water, and wrings its neck till he has killed it; then putting it into his bag, which is faſtened about his middle, he takes hold of another in the ſame manner, and ſo on, till he has got as many as he can carry off, and then he goes back in the ſame manner in which he came, not diſturbing the reſt of the birds, who never miſs their companions, but only ſuppoſe that they dive down for their diverſion, when the fowler pulls them under. In places where this has been practiſed ſo long or ſo careleſsly that the birds are ſhy, the fowler uſes a gun; but this he does in the following manner: he makes a ſcreen of about five foot high, and three foot wide, which he carries in one hand ſtraight between himſelf and his game, and in the other hand his gun. The birds are not alarmed at what appears only a buſh; for this ſcreen is always covered with branches of trees freſh cut down, and full of leaves, ſo that the ſportſman behind advances as near as he pleaſes, and then putting the gun through ſome crevice of the ſcreen, he fires. See DECOY. See an account of experiments on water-*fowl*, with regard to their faculty of reſpiration, under the article DUCK.

FOWL, *wild, driving of.* See DRIVING.

FOWLING, the act, or art, of catching birds with NETS, BIRDLIME, DECOYS, and other devices; as alſo of breeding up the ſame.

FOWLING is alſo uſed for the purſuing and taking of birds with hawks, falcons, and other birds of prey; more properly called FALCONRY and HAWKING.

FOWLING-*piece*, a portable fire-arm for the ſhooting of birds. Of *fowling*-pieces, thoſe are reputed the beſt, which have the longeſt barrel, viz. from 5½ feet to 6, with a moderate bore; though, for different occaſions, they ſhould be of different ſorts and ſizes: but in all, it is eſſential the barrel be well poliſhed, and ſmooth within, and the bore of an uniform bigneſs, from one end to another; which may be proved by thruſting in a piece of wood, cut exactly to the bore of the muzzle, down to the touch-hole; for if this goes down without ſtoppage, you may conclude that the bore is good. The bridge-pan ſhould be a little above the touch-hole, and ought to have a notch to let down a little powder, which will prevent the piece from recoiling. The locks ſhould be accurately filed, and their ſprings be neither too ſtrong nor too weak. The hammer ought to be well hardened, and pliable, ſo as to go down to the pan with a quick motion. In ſhooting, obſerve to do it with the wind, if poſſible, and rather ſide-ways, or behind the fowl, than full in their faces. Obſerve alſo to chuſe the moſt convenient ſhelter, as a hedge, bank, or tree. If you have not ſhelter enough, you muſt creep on your hands and knees, or uſe a ſtalking-horſe. Let your dogs be under good command. See SETTING *Dog*, *Water* DOG, and SPANIEL.

FOX, *Vulpes*, in *Zoology*, an animal of the dog kind; much reſembling the common dog in form, and of the ſize of the ſpaniel. It is chiefly diſtinguiſhed by its long ſtrait tail, with a white tip to it. See CANIS, and DOG.

It differs, however, from the common dog in the length, denſe diſpoſition, and ſoftneſs of its hairs, eſpecially thoſe about its tail, which is buſhy, much admired by the animal itſelf, and in cold weather wrapped round its noſe; and in its ſmell, which is peculiarly rank and diſagreeable. The ſmell of its urine is remarkably fœtid; inſomuch that the animal covers it in the earth. It is ſaid that the *fox* makes uſe of its urine as an expedient to force the cleanly badger from its habitation; however, it makes uſe of the badger's hole. Its uſual colour is a reddiſh tawney, though it is ſometimes found white, and ſometimes black. Its manner of digging itſelf a hole in the earth, is alſo a cuſtom wholly different from all the dog-kind; and it is far from the tameneſs of that animal, being with difficulty made to loſe its fierceneſs. Of all animals the *fox* has the moſt ſignificant eye, by which it expreſſes every paſſion of love, fear, hatred, &c. The *fox* is a crafty, lively, libidinous animal: it breeds only once in a year, unleſs ſome accident befalls its firſt litter, and brings four or five young, which, like puppies are born blind.

The *fox* is a native of moſt northern countries, and there are three varieties of it, differing a little in form, but not in colour. They are diſtinguiſhed in Wales by different names. The greyhound *fox* is the largeſt, talleſt, and boldeſt, and will attack a grown ſheep or wether; the maſtiff *fox* is leſs, but more ſtrongly built; the cur *fox* is the leaſt, lurks about hedges, out-houſes, &c. and is the moſt pernicious to the feathered tribe. The firſt of theſe has a white tip to the tail; the laſt a black. The ſkin of this animal is furniſhed with a ſoft and warm fur, which in many parts of Europe is uſed to make muffs and fine cloths.

A *fox* in the firſt year is called a cub; in the ſecond, a *fox*, and afterward an old *fox*. It is a beaſt of chaſe, uſually very prejudicial to the huſbandman, by taking away and deſtroying his lambs, geeſe, and poultry. It will feed on fleſh of any kind; and when urged by hunger eat carrots and inſects; and, near the ſea-coaſts, for want of other food, eat crabs, ſhrimps, or ſhell-fiſh. In France and Italy it does incredible damage in the vineyards, by eating the grapes, of which it is very fond. The *fox* is a great deſtroyer of rats, and field animals. It ſecures its booty by digging holes in ſeveral places; and if a whole flock of poultry ſhould happen to be its prey, will bring them one by one, thruſt them in with its noſe, and conceal them by ramming the looſe earth upon them, till the calls of hunger induce him to devour them. The common way to catch him is by gins, which being baited, and a train made by drawing raw fleſh acroſs his uſual paths or haunts to the gin, it proves an inducement to lure him to the place of deſtruction. They are alſo taken with greyhounds, hounds, terriers, and nets: it is a commendable exerciſe to hunt theſe miſchievous beaſts, the nature of which in many reſpects is like that of wolves. See HUNTING.

FOX, *field.* See ALOPEX.

FOX, *Siberian.* See LAGOPUS.

FOX, *ſea*, *vulpes marina*, in *Ichthyology*, the name given by authors to a large fiſh, called the *ſea-fox* by us. In the Artedian ſyſtem it is the SQUALUS, with a tail longer than the body. It is ſaid by many authors to have naturally the rank ſmell of the *fox*, and to be one of the worſt-taſted fiſhes; but this does not appear to be true, on a ſtrict inquiry; for its ſmell ſeems very little different from that of other fiſhes, and its fleſh is well-taſted; ſo that theſe things ſeem only to have been ſaid, in order to ſtrengthen the reſemblance with the *fox*; a name which ſeems, upon the whole, to have been given it only from the length of its tail; and even that, though very long for a fiſh of this kind, has no reſemblance with the tail of a fox. The length of this fiſh is about nine foot, ſometimes twelve or thirteen, and its breadth, in the broadeſt part of the belly, fourteen inches. Its tail is nearly as long as the whole body beſide, and is of the ſhape of a ſcythe, and is bent downwards. Near the origin of the tail, it has a ſingle fin below, and the ſpine is more moveable up and down in this part, than in any other; ſo that the tail is, by this means, eaſily elevated or depreſſed. It has two eminences on the back, a large one near the middle, and a ſmall one near the tail. It has three fins on each ſide; the pair near the head are large, and reſemble the wings of a bird; the others are ſmaller. The ſkin is ſmooth, and without ſcales; and the fins and eminences on the back are compoſed of a ſort of ribs, held together by a tough and ſtrong membrane. The tongue adheres inſeparably to the lower jaw; and is compoſed of a great number of bones, articulated together by a fleſhy ſubſtance of a fibroſe texture, and covered with a membrane, in which there are ſeveral prominences, which, when viewed with the microſcope, appears as pellucid as the fineſt cryſtal. Its throat and ſtomach are remarkably large; and authors ſay, that when in a fright it will ſwallow its young ones into its ſtomach, and afterwards caſt them up again when the danger is over. Others, who ſpeak largely of its cunning, ſay, that when it has ſwallowed a bait at a hook, it will take in the whole line, till it comes to a weak place, where it can bite it aſunder. This is a tale very well calculated for the carrying on a reſemblance with the *fox* in cunning; but it is very ill adapted to this fiſh, which has no teeth with which it can bite any thing aſunder. The heart of this fiſh is remarkably ſmall, nothing larger than a hen's egg; it is alſo much of the ſame ſhape, and has no pericardium; but the aorta for a little way is covered with a membrane analogous to a pericardium. The head ſeems a mere lump of fleſh, being covered with muſcles, of which ſome are four inches thick; and though the head is ſo large, the ſkull is not bigger than a man's fiſt; it is thick, and is divided within into three cavities, each of which contains a ſmall quantity of a mucous matter mixed with blood; ſo that the fiſh ſeems ſcarce to have any brain at all, what little matter of it there is being quite ſoft, and having very few windings. The eyes are as large as thoſe of an ox, and are only hemiſpheric in figure, being flat before, ſo that they appear of a very ſingular ſhape. Mem. pour Hiſt. Anim. p. 114.

The teeth are triangular, ſmall, and placed in three rows; the back is an aſh-colour, and the belly white. The guts of this fiſh have a very peculiar ſtructure. In the upper part of them, inſtead of the ordinary circumvolutions of the guts of animals, the cavity is diſtinguiſhed by many tranſverſe ſeparations, compoſed of the membranes of the inteſtine turned inwards; theſe ſepa-

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rations ſtand at about half an inch diſtance from one another, and turn helically like a ſnail-ſhell. The conſequence of this is, that the food is detained a long time in its paſſage, though the way it has to go be very ſhort. This creature feeds both on other fiſh, and on ſea-plants. Ouvrage adoptez de l'Acad. Par. vol. i.

This fiſh has been ſometimes taken in our ſeas, and imagined to be the fiſh called the fluſher, from its attacking and beating the grampus with its long tail, when it riſes to the ſurface to breathe.

FOX, in *Sea Language*, ſignifies a ſort of ſtrand, formed by twiſting ſeveral rope-yarns together, and uſed as a ſeizing, or to weave a mat or paunch, &c.

FOX-*glove*, *Digitalis*, in *Botany*, a genus of the *didynamia angioſpermia* claſs. Its characters are theſe: the flower is bell-ſhaped, of one petal, with a large open tube, whoſe brim is ſlightly divided into five parts; it has four ſtamina, which are inſerted in the baſe of the petal; two being longer than the other. The germen afterward ſwells to an oval capſule, having two cells incloſing many ſmall angular ſeeds. There are nine ſpecies, which are great ornaments to a garden.

All theſe ſorts ſhould be ſown in autumn; for if the ſeeds are ſown in the ſpring, they commonly fail, or at leaſt lie a whole year in the ground before they begin to vegetate. The plants, one ſpecies excepted, are biennial, and periſh as ſoon as the ſeeds are ripe. Miller.

The common *fox-glove*, or the purple *fox-glove*, with a rough leaf, grows wild in woods, and on heaths; flowers in June, and the ſeeds ripen in autumn. The leaves communicate a bitteriſh and nauſeous taſte both to watery and ſpirituous menſtrua; and have been ſtrongly recommended in epileptic diſorders. It operates by ſtool and vomit; but with ſuch violence, that it is now diſuſed. Boerhaave judges it to be of a poiſonous nature; Dr. Alſton, on the contrary, ranks it among thoſe indigenous vegetables, which, though now diſregarded, are medicines of great virtue, and ſcarcely inferior to any that the Indies afford. Externally, the leaves and flowers have been employed with great ſafety, and with ſucceſs, in cataplaſms and unguents for ill-conditioned ulcers The *unguentum digitale* takes its name from this plant. Lewis's Mat. Med.

FOX-*tail graſs*. See GRASS.

FOYLING *of land*, among *Farmers*, the FALLOWING it in ſummer and autumn.

FOYLING, among *Sportſmen*, a term uſed for the footſteps of a ſtag, on the graſs or leaves.

FOYNA, in *Zoology*, a name given by many to the MARTIN or *martes*, an animal of the weaſel-kind, common with us.

FRACHES, in the *Glaſs Trade*, are the flat iron pans into which the glaſs veſſels already formed are put, when in the tower over the working furnace, and by means of which they are drawn out through the leers, that they may be taken gradually from the fire, and cool by degrees.

FRACTION, in *Arithmetic* and *Algebra*, a part or diviſion of an unit, or integer; or, a number which ſtands to an unit in the relation of a part to its whole.

The word literally imports a broken number.

Fractions are uſually divided into *decimal*, *ſexageſimal*, and *vulgar*.

For *decimal*, *and ſexageſimal fractions*, ſee DECIMAL, and SEXAGESIMAL.

FRACTIONS, *Vulgar*, called alſo ſimply, *fractions*, are always expreſſed by two numbers, the one wrote over the other, with a line between them.

The lower, called the *denominator of the fraction*, denotes the unit, or whole, that is divided into parts; and the upper, called the *numerator of the fraction*, expreſſes the parts given in the preſent caſe.

Thus, two-third parts of a line, or other thing, are wrote $\frac{2}{3}$; where the denominator 3 ſhews, that the whole line is ſuppoſed to be divided into three equal parts; and the numerator 2 indicates or aſſigns two of ſuch parts.

Again, twenty-nine ſixtieths is wrote $\frac{29}{60}$; where the numerator 29 expreſſes 29 parts of an integer divided into 60; and the denominator 60 gives the denomination to theſe parts, which are called *ſixtieths*.

The real deſign of adding the denominator is, to ſhew what aliquot part the broken number has in common with unity.

In all *fractions*, as the numerator is to the denominator, ſo is the *fraction* itſelf, to the whole whereof it is a *fraction*.

Thus, ſuppoſing $\frac{1}{4}$ of a pound equal to 15*s.* it is evident, that 3 : 4 :: 15 : 20. Whence it follows, 1°, That there may be infinite *fractions* of the ſame value, one with another; inaſmuch as there may be infinite numbers found, which ſhall have the ratio of 3 : 4.

Fractions are either *proper*, or *improper*.

FRACTION, *Proper*, is that where the numerator is leſs than the denominator; and, conſequently the *fraction* leſs than the whole, or integer as $\frac{25}{60}$.

FRACTION, *Improper*, is where the numerator is either equal to, or bigger than the denominator; and of courſe the *fraction* equal to, or greater than the whole, or integer, as $\frac{25}{25}$ or $\frac{27}{26}$; or $\frac{90}{42}$.

Fractions, again, are either *ſimple*, or *compound*.

FRACTIONS, *Simple*, are ſuch, as conſiſt of only one numerator, and one denominator; as $\frac{2}{7}$, or $\frac{48}{360}$, &c.

FRACTIONS, *Compound*, called alſo *fractions of fractions*, are ſuch as conſiſt of ſeveral numerators, and denominators; as $\frac{4}{7}$ of $\frac{12}{15}$ of $\frac{5}{9}$ of $\frac{15}{80}$, &c.

Of *fractions*, thoſe are equal to each other, whoſe numerators have the ſame ratio to their denominators.—Thoſe are greater, whoſe numerators have a greater ratio; and thoſe leſs which have leſs: thus, $\frac{3}{6}=\frac{4}{8}=\frac{5}{10}=\frac{25}{50}=\frac{1}{2}$. But $\frac{3}{7}$ is greater than $\frac{2}{6}$; and $\frac{4}{6}$ leſs than $\frac{10}{18}$.

Hence if both the numerator, and denominator of a *fraction*, as $\frac{4}{6}$, be multiplied or divided by the ſame number, 2; the facta in the former caſe, $\frac{8}{12}$, and the quotients in the latter, $\frac{2}{3}$, will conſtitute *fractions* equal to the firſt *fraction* given.

The arithmetic of *fractions* conſiſts in the *reduction*, *addition*, *ſubtraction*, and *multiplication* thereof.

FRACTIONS, *reduction of*. 1. *To reduce a given whole number into a* fraction *of any given denominator*. Multiply the given integer, by the given denominator, the factum will be the numerator. Thus we ſhall find $3=\frac{24}{8}$ and $5=\frac{30}{6}$; and $7=\frac{28}{4}$, &c.

If no denominator be given, the number is reduced to a *fraction*, by writing 1 underneath it, as a denominator. Thus $\frac{3}{1}$, $\frac{4}{1}$, $\frac{5}{1}$.

2. *To reduce a given* fraction *to a* fraction *equal to it, that ſhall have a given denominator*. Multiply the numerator by the given denominator, and divide the product by the former denominator, and the quotient ſet over the given denominator is the *fraction* required. Let it be propoſed to reduce $\frac{3}{4}$ to an equal *fraction* with the denominator 8; $8\times3\div4=6$ and $\frac{6}{8}=\frac{3}{4}$.

3. *To reduce a given* fraction *to its loweſt terms*; i. e. to find a *fraction*, equivalent to a given *fraction* $(\frac{20}{48})$, but expreſſed in leſs numbers, divide both the numerator 20, and denominator 48, by ſome one number, that will divide them both without any remainder, as here by 4. The quotients 5 and 12 make a new *fraction* $\frac{5}{12}$, equal to $\frac{20}{48}$.

And if the diviſion be performed with the greateſt number that will divide them both, the *fraction* is reduced to its loweſt terms. See COMMON *Meaſure*.

If it happens that unity is the only common meaſure of the numerator and denominator; then is the *fraction* incapable of being reduced any lower: and numbers, whoſe greateſt common meaſure is unit, are ſaid to be PRIME to each other.

4. *To reduce two or more* fractions *to the ſame denomination*; i. e. to find *fractions* equal to the given ones, and with the ſame denominator. Multiply each numerator, ſeparately taken, into all the denominators but its own, and the products ſhall give the new numerators. Then multiply all the denominators into one another, and the product will be the common denominator. Thus, $\frac{2}{3}$ and $\frac{4}{5}$ are $\frac{10}{15}$ and $\frac{12}{15}$; and $\frac{2}{3}$, $\frac{3}{4}$ and $\frac{4}{5}$ are reſpectively $\frac{40}{60}$, $\frac{45}{60}$, and $\frac{48}{60}$.

5. *To find the value of a* fraction, *in the known parts of its integer*. Suppoſe, e. gr. it were required to know what is $\frac{9}{16}$ of a pound; multiply the numerator 9 by 20, the number of known parts in a pound, and divide the product by the denominator 16, the quotient gives 11*s.* Then multiply the remainder 4 by 12, the number of known parts in the next inferior denomination; and dividing the product by 16, as before, the quotient is 3*d.* So that $\frac{9}{16}$ of a pound $=11s.\ 3d.$

6. *To reduce a mixed number*, i. e. *a number partly integral and partly fractional, as* $4\frac{11}{12}$ *into an improper* fraction *of the ſame value*. Multiply the integer, 4, by 12, the denominator of the *fraction*; and to the product 48 add the numerator; the ſum 59 ſet over the former denominator, $\frac{59}{12}$ conſtitutes the *fraction*.

7. *To reduce an improper* fraction *into its equivalent mixed number*. Suppoſe the given *fraction* $\frac{59}{12}$; divide the numerator by the denominator; the quotient is the integral part, and the remainder ſet over the denominator will be the fractional part. Thus, $\frac{59}{12}=4\frac{11}{12}$.

8. *To reduce a compound* fraction *into a ſimple one*. Multiply all the numerators into each other for a new numerator; and all the denominators for a new denominator. Thus $\frac{1}{2}$ of $\frac{3}{4}$ of $\frac{5}{6}$ reduced will be $\frac{15}{48}$.

9. *To reduce a vulgar* fraction *to a decimal of the ſame value*. See DECIMAL.

FRACTIONS, *addition of vulgar*. 1. If the given *fractions* have different denominators, reduce them to the ſame. Then add the numerators together, and under the ſum write

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write the common denominator. Thus, e. gr. $\frac{1}{3}+\frac{4}{5}=\frac{15}{15}+\frac{12}{15}=1\frac{7}{15}$.

2. If compound *fractions* are given to be added, they muſt firſt be reduced to ſimple ones: and if the *fractions* be of different denominations, as $\frac{6}{8}$ of a pound, and $\frac{1}{3}$ of a ſhilling, they muſt firſt be reduced to *fractions* of the ſame denomination of pounds.

3. *To add mixed numbers.* The integers are firſt to be added, then the fractional parts: and if the ſum be a proper *fraction*, only annex it to the ſum of the integers. If it be an improper *fraction*, reduce it to a mixed number, adding the integral part thereof to the ſum, of the integers, and the fractional part after it. Thus, $5\frac{2}{3}+4\frac{1}{2}=10\frac{1}{6}$.

FRACTIONS, *ſubtraction of.* 1. If they have the ſame common denominator, ſubtract the leſſer numerator from the greater, and ſet the remainder over the common denominator. Thus from $\frac{9}{16}$ take $\frac{5}{16}$, and there remains $\frac{4}{16}=\frac{1}{4}$.

2. If they have not a common denominator, they muſt be reduced to *fractions* of the ſame value, having a common denominator, and then, as in the firſt rule. Thus, $\frac{6}{1}-\frac{2}{5}=\frac{30}{35}-\frac{10}{35}=\frac{16}{35}$.

3. *To ſubſtract a whole number from a mixed number, or one mixed number from another.* Reduce the whole, or mixed numbers to improper *fractions*, and then proceed as in the firſt and ſecond rule.

FRACTIONS, *multiplication of.* 1. If the *fractions* propoſed be both ſimple, multiply the numerators one by another for a new numerator, and the denominators for a new denominator. Thus $\frac{3}{4}$ into $\frac{5}{8}$ produces $\frac{15}{32}$.

2. If one of them be a mixed, or whole number, it muſt be reduced to an improper *fraction*; and then proceed as in the laſt rule. Thus $\frac{2}{8}$ into $5\frac{2}{3}$, gives $\frac{34}{24}$, and $\frac{4}{9}$ into $\frac{10}{1}=\frac{40}{9}$.

In multiplication of *fractions*, obſerve that the product is leſs in value, than either the multiplicand, or multiplicator; becauſe in all multiplications, as unity is to the multiplicator, ſo is the multiplicand, to the product: or, as unity is to either factor, ſo is the other factor, to the product. But unity is bigger than either factor, if the *fractions* be proper; and therefore either of them muſt be greater than the product.

Thus in whole numbers, if 5 be multiplied by 8, it will be as 1 : 5 :: 8 : 40; or 1 : 8 :: 5 : 40. Wherefore in *fractions*, alſo, as $1:\frac{3}{4}::\frac{5}{8}:\frac{15}{32}$; or as $1:\frac{5}{8}::\frac{3}{4}:\frac{15}{32}$. But 1 is greater than either $\frac{3}{4}$, or $\frac{5}{8}$: wherefore either of them muſt be bigger than $\frac{15}{32}$.

FRACTIONS, *diviſion of.* 1. If the *fractions* propoſed be both ſimple, multiply the denominator of the diviſor by the numerator of the dividend; the product is the numerator of the quotient: then multiply the numerator of the diviſor by the denominator of the dividend, the product, is the denominator of the quotient. Thus $\frac{3}{5})\frac{4}{5}(\frac{20}{27}$. Or, invert the diviſor and proceed as in multiplication.

2. If either dividend, diviſor, or both, be whole, or mixed, numbers, reduce them to improper *fractions*; and if they be compound *fractions*, reduce them to ſimple ones, and proceed as in the firſt rule.

In diviſion of *fractions* obſerve, that the quotient is always greater than the dividend; becauſe in all diviſion, as the diviſor is to unity, ſo is the dividend to the quotient: as if 3 divide 12, it will be, as 3 : 1 :: 12 : 4. Now 3 is greater than 1; wherefore 12 muſt be greater than 4: but in *fractions*, as $\frac{3}{5}:1::\frac{4}{5}:\frac{20}{27}$; where, $\frac{3}{5}$ is leſs than 1; wherefore $\frac{4}{5}$ muſt alſo be leſs than $\frac{20}{27}$.

FRACTIONS *in ſpecies*, or *algebraic quantities*. 1. *To reduce* fractions *in ſpecies to their leaſt terms.* The numerators and denominators are to be divided by the greateſt common diviſor, as in numbers.

Thus the *fraction* $\frac{aac}{bc}$ is reduced to a more ſimple one $\frac{aa}{b}$ by dividing both $a\,a\,c$, and $a\,b\,c$, by c: and $\frac{203}{667}$ is reduced to a more ſimple one $\frac{7}{23}$ by dividing both 203 and 667 by 29; and $\frac{203\,aac}{667\,bc}$ is reduced to $\frac{7\,aa}{23\,b}$ by dividing by $29c$. And ſo $\frac{6a^3-9acc}{6aa+3ac}$ becomes $\frac{2aa-3cc}{2a+c}$ by dividing by $3a$. And $\frac{a^3-aab+abb-b^3}{aa-ab}$ becomes $\frac{aa+bb}{a}$ by dividing by $a-b$. See COMMON *Meaſure.*

2. *To reduce* fractions *in ſpecies to a common denominator.* The terms of each are to be multiplied by the denominator of the other.

Thus, having $\frac{a}{b}$ and $\frac{c}{d}$; multiply the terms of one $\frac{a}{b}$ by d, and alſo the terms of the other $\frac{c}{d}$ by b, and they will become $\frac{ad}{bd}$ and $\frac{bc}{bd}$, whereof the common denominator is bd. And thus a and $\frac{ab}{c}$; or $\frac{a}{1}$ and $\frac{ab}{c}$, become $\frac{ac}{c}$ and $\frac{ab}{c}$.

But where the denominators have a common diviſor, it is ſufficient to multiply them alternately by the quotients.

Thus the *fraction* $\frac{a^3}{bc}$ and $\frac{a^3}{bd}$ are reduced to theſe $\frac{a^3d}{bcd}$ and $\frac{a^3c}{bcd}$ by multiplying alternately by the quotients c and d, ariſing by the diviſion of the denominators by the common diviſor b. The other operations, with reſpect to numbers, are eaſily applied to algebraic quantities.

Addition and ſubtraction of fractions *in ſpecies.* The proceſs is, in all reſpects, the ſame in ſpecies as in numbers. E. gr.

Suppoſe it be required to add the *fractions* $\frac{a}{b}$ and $\frac{c}{d}$. Theſe, when reduced to the ſame denomination, will be $\frac{ad}{bd}$ and $\frac{bc}{bd}$; conſequently their ſum is $\frac{dd+bc}{bd}$.

So, if the *fraction* $\frac{a}{b}$ were to be ſubtracted from $\frac{c}{d}$; having reduced them they will be $\frac{ad}{bd}$ and $\frac{bc}{bd}$, as before. Their difference, therefore, is $\frac{bc-ad}{bd}$.

Multiplication and diviſion of fractions *in ſpecies.* Here, too, the proceſs is perfectly the ſame as in vulgar arithmetic. Thus, e. gr. ſuppoſe the factors, or *fractions* to be multiplied, $\frac{a}{b}$ and $\frac{c}{d}$: the product will be, $\frac{dc}{bd}$.

Or ſuppoſe the *fractions*, required to be divided, $\frac{ac}{bd}$ and $\frac{a}{b}$; the quotient will be, $\frac{ac}{bd}\times\frac{b}{a}=\frac{abc}{abd}=\frac{c}{d}$.

Hence, as $a=\frac{a}{1}$; the product of a into $\frac{c}{d}$, that is, of an integral quantity ino a *fraction*, $\frac{c}{d}\times\frac{a}{1}=\frac{ac}{d}$. Whence it appears, that the numerator of the *fraction* is to be multiplied by the integer.

Hence, alſo, the quotient of $\frac{c}{d}$ by a, that is, of the broken quantity, divided by the whole one, $\frac{c}{d}\times\frac{1}{a}=\frac{c}{ad}$.

Beſide the common notion of a *fraction*, there is another neceſſary to be underſtood. Thus,

Suppoſe $\frac{3}{4}$ of 20*s.* or a pound ſterling, were the *fraction*: this *fraction*, inſtead of three quarters of one pound, may be conſidered as a fourth part of three pounds; that is, by taking as many of the integers as the numerator expreſſes (viz. 3), and dividing them by 4, the denominator, for then the quotient of the ſame value will ariſe; for 4) 60*s.* (15*s.* This ſhews that the reaſon of that manner of expreſſion uſed by geometers and algebraiſts, who read $\frac{a}{b}$, thus, a divided by b.

FRACTION, *continued*, is uſed for a *fraction* the denominator of which is a whole number with a *fraction*, the denominator of which is again a whole number and a *fraction*, and ſo on, whether this affection be continued *ad infinitum*, or whether the ſeries breaks off after a finite number of terms. Thus,

$\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+$, &c. or $\frac{1}{2}+\frac{2}{3}+\frac{3}{4}+\frac{4}{5}+$, &c. are *continued fractions.*

If we make uſe of letters inſtead of numbers, we ſhall have general expreſſions of theſe *fractions*, thus,

$$a+\frac{1}{b}+\frac{1}{c}+\frac{1}{d}+\frac{1}{e}+\frac{1}{f}+, \text{ \&c.}$$

and

$$a+\frac{\alpha}{b}+\frac{\beta}{c}+\frac{\gamma}{d}+\frac{\delta}{e}+\frac{\varepsilon}{f}+, \text{ \&c.}$$

The reduction of theſe *continued fractions* to thoſe of a common form, is not difficult by the uſual rules of arithmetic

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arithmetic and algebra. Thus, to give an example, which may at the ſame time ſhew the uſe of theſe *continued fractions*, ſuppoſe the *continued fraction*,

$$3+\cfrac{1}{7+\cfrac{1}{15+\cfrac{1}{1+\cfrac{1}{292+\cfrac{1}{1+\cfrac{1}{1+}}}}}},$$ &c. which expreſſes the circumference of a circle, when the diameter is one; if we ſtop at $\frac{1}{7}$, we ſhall have $3+\frac{1}{7}=\frac{21+1}{7}=\frac{22}{7}$. If we ſtop at $\frac{1}{15}$, we ſhall have

$$3+\frac{1}{7+\frac{1}{15}}=3+\frac{1}{\frac{106}{15}}=3+\frac{15}{106}=\frac{318+15}{106}=\frac{333}{106}$$

But if we ſtop at $\frac{1}{1}$, which is convenient on account of the ſmall *fraction* $\frac{1}{292}$, added to the laſt denominator 1, we ſhall then find, $3+\cfrac{1}{7+\cfrac{1}{15+\cfrac{1}{1}}}=\frac{355}{113}$. The firſt of the reductions gives the proportion of Archimedes, and the laſt that of Adrian Metius.

But as beginning at the laſt denominator of the *continued fraction* makes the computation ſomewhat tedious, ſhorter methods have been contrived for the reduction of theſe *fractions*, and for a continued approximation to their true value. And Mr. Cotes's method for the reduction of ratios to ſmaller terms, may be here applied. (See RATIO) For it is to be obſerved, that when the numerators of the *continued fraction* are each units, the denominators will be the quotients ariſing from the continued diviſions in Mr. Cotes's method: or in the common, for reducing *fractions* to a lower denomination, which is in effect the ſame as Euclid's method for finding the greateſt common meaſure of two magnitudes, lib. x. prop. 3. But a detail of theſe things would lead us too far, we therefore refer the reader for a farther account of theſe *continued fractions* to Dr. Wallis's Arithmet. infinit. prop. 191. Oper. vol. i. p. 469, ſeq. Huygens, Deſcript. Automat. Planetar. in Oper. poſthum. p. 173, ſeq. edit. Amſtelod. 1728. and particularly to Mr. Euler's Analyſ. Infinit. vol I cap. xviii. p. 295, ſeq. who has ſhewn the uſe and application of this doctrine in many inſtances.

Lord Brouncker ſeems to have been the firſt who conſidered *continued fractions*, or at leaſt who firſt applied them to the quadrature of curves. The hint ſeems uſeful, but has been pretty much neglected, excepting in approximations to *fractions* or ratios expreſſed in great numbers. See the article RATIO. His ſeries for the quadrature of the circle, is

$$\square = 1\frac{1}{2}\frac{9}{2}\frac{25}{2}\frac{49}{2}\frac{81}{2}, \text{ \&c.}$$

in his and Dr. Wallis's notation, which amounts to the ſame thing as $1+\cfrac{1}{2+\cfrac{9}{2+\cfrac{25}{2+}}}$, &c. in the notatio of Huygens and Euler.

The ſymbol $\square$ denotes, as before, the ratio of the ſquare of the diameter to the area of the circle.

FRACTION *repetend of a decimal.* See REPETEND.

FRACTION, *logarithm of a.* See LOGARITHM.

FRACTIONS, *ſumming of infinite.* See CALCULUS and FLUXIONS.

FRACTURE, in *Medicine* and *Surgery*, a breach, or rupture, of a bone; or a ſolution of continuity in a bone, when it is cruſhed, or broken, by ſome external cauſe.

This may be diſcovered by the eye, when the injured part is apparently ſhorter than the ſound one, or when the patient cannot make uſe of it; by the touch, when a preternatural inequality of the bone may be perceived, or where it bends in a part where nature did not deſign it ſhould; or by the ear, when, upon moving of the limb, the grating of the broken bones may be heard.

Fractures may be diſtinguiſhed into ſeveral claſſes or ſpecies. Firſt, every *fracture* is either *ſimple*, that is, when no other parts beſide the bone are injured; or *compound*, that is, when you have at the ſame time a wound, a diſlocation, hæmorrhage, inflammation, fever, caries or contuſion of the bone; or where the bone is fractured in ſeveral places at the ſame time. Other differences ariſe with regard to the ſituation of the *fracture*, and from its poſition: ſome are tranſverſe, others longitudinal, called FISSURES, and others oblique; in which caſe it frequently happens, that the point of the bones wound or puſh themſelves through the neighbouring parts. Violent CONTUSIONS alſo may be claſſed under the head

of *fractures*; for in theſe the bones are frequently broken into ſplinters, by the falling of any heavy body upon the part, or other ſuch accidents. When the ſituation of the bone is not altered by a *fracture*, or the broken parts ſtart very little from their proper ſituation, they are much eaſier replaced than when they are entirely ſeparated from one another, and a great ſpace intervenes between them. Tranſverſe *fractures* admit of an eaſier cure than oblique ones. A *fracture* in the middle of a bone is leſs dangerous than one towards the articulation. When two bones of the ſame limb are fractured, the cure is uſually much more difficult than when only one. When the bone is broken into ſeveral pieces, the patient ſeldom eſcapes a gangrene, at leaſt the cure in theſe caſes requires a longer time, and the limb ſeldom recovers its true ſhape.

When the broken bones are inſtantly reduced, the cure will be much ſooner performed, than when they have been ſome time ſeparated. *Fractures* in the neighbourhood of parts of great conſequence to the animal œconomy, are always attended with great danger, ſuch as *fractures* of the cranium from the vicinity of the brain; of the vertebræ, from the medulla ſpinalis; and of the ribs or ſternum, or the oſſa ilei and pubis, from the ſituation of the viſcera of the thorax and abdomen. *Fractures* of the bones to which the larger arteries are connected, are alſo very dangerous; more particularly, when one ſplinter or point of the bone vellicates or wounds large veſſels, or when the bone is broken into ſeveral fragments, the conſequences are generally inflammations, ſuppurations, or fiſtulæ, which will admit of no remedy, till the ſplinter of the bone is removed. *Fractures* proceeding from internal diſorders or caries of the bones, as ſuch ſometimes happen, are cured with much more difficulty than thoſe ariſing from external injuries; nay this, indeed, is frequently an incurable caſe, unleſs the internal cauſe be firſt removed. This is uſually either a ſcorbutic habit of body, or a venereal taint. When a large piece of the bone is driven away by a piſtol or muſket-ball, the limb muſt be taken off, for the two ends of the bone are never likely to unite, unleſs it be a very ſmall piece that is thus taken away; for in that caſe the bone will ſometimes join, but then the limb always becomes ſomething ſhorter than it was before. When the blood inſinuates itſelf by a fiſſure into the internal part of the bone, by corrupting there it produces a caries, a ſpina ventoſa, or elſe incurable fiſtulæ, tabes, and a ſphacelus, which always require amputation of the limb, and frequently deſtroy the patient. The ſame accidents will happen in *fractures* of any kind, when the extravaſated blood mixes with the marrow and corrodes it. Heiſter's Surg. p. 103.

Inſtances have been known of the *fracture* of the patella in perſons thoroughly ſound, where the part itſelf has received no hurt. The cauſe of this is aſcribed to the action of the muſcles only. And many inſtances might be given of *fractures* in the neck of the os femoris, in the middle of the humerus, tibia, and perone, by the power of the muſcles only, or ſuch power at leaſt as ſhewed they have as great a ſhare in ſeveral *fractures* aſcribed to outward cauſes, as they are frequently known to have in the *fracture* of the tendo Achillis. We have an obſervation of a *fracture* of the os humerus, by the power of the muſcles only, in the Philoſophical Tranſactions, N°. 475. ſect. 15.

In the cure of *fractures* the ſurgeon has two things to attend to: firſt, to reſtore the fractured bone into its natural ſituation; and then, to keep it ſtrait and eaſy with ferulæ, or ſplinters, and bandages, which ſhould by no means be tight: in which caſe, nature takes on herſelf the office of healing and conglutinating it, by forming a callus upon it.

The beſt method of retention is by two or more ſplints made of leather or paſteboard. Theſe, if moiſtened before they be applied, ſoon aſſume the ſhape of the included member, and are ſufficient, with the aſſiſtance of a very ſlight bandage, for all the purpoſes of retention. The beſt BANDAGE is that made with twelve or eighteen tails; this is much eaſier applied and taken off than rollers, and anſwers all the purpoſes of retention equally well; the ſplints ſhould always be as long as the limb, with holes cut for the ancles when the *fracture* is in the leg. In *fractures* of the ribs, where a bandage cannot be properly uſed, an adheſive plaſter may be applied over the part. The moſt proper external application for a *fracture* is oxycrate, or a mixture of vinegar and water; with which the bandages ſhould be moiſtened at every dreſſing.

If there be an inflammation, it muſt be cured before any thing be attempted about the *fracture*: if the bone happen to be broken again, it never breaks in the callus, but at a diſtance from it. After ſetting, or replacing, the

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fractured bone, the bleeding is required, to prevent any lodgment of blood on the part aggrieved, by the violence upon the fibres.

With regard to the regimen and general treatment of the patient in theſe circumſtances, we may obſerve, that, when a large bone is broken, his diet ſhould in all reſpects be the ſame as in an inflammatory fever: he ſhould likewiſe be kept quiet and cool, and his body open by emollient clyſters, or by food of an opening quality. However, perſons that have been accuſtomed to high living ſhould not be ſuddenly reduced to a low diet. It will generally be neceſſary to bleed the patient immediately after a *fracture*, eſpecially if he be young, of a full habit, and has received any contuſion: and if the patient be very feveriſh, bleeding may be repeated the next day. In *fractures* of the ribs, bleeding is peculiarly neceſſary when any of the large bones, by which the body is ſupported, are broken, the patient ſhould keep his bed for ſeveral weeks; reclining in an eaſy poſture. When a *fracture* is accompanied with a wound, it muſt be dreſſed in all reſpects as a common wound. When the fractured bone is much ſhattered, it will ſometimes be neceſſary to have the limb taken off, leaſt a gangrene or mortification enſue.

FRACTURE *of the carpus*, or *wriſt*, *clavicle*, *cubit*, *finger*, *foot*, *humerus*, *jaw*, *leg*, *metacarpus*, *neck*, *noſe*, *os innominatum*, *os ſacrum*, *patella*, *ribs*, *ſcapula*, *ſkull*, *ſternum*, *thigh*, and *vertebræ*. See WRIST, CLAVICLE, CUBITUS, &c.

FRACTURE, *capillary*. See CAPILLATION.

FRACTURED *limbs*, *extenſion of*. See EXTENSION.

FRÆNA, a word uſed by ſome anatomical writers, as a name for the ſockets of the teeth.

FRÆNUM, or FRENUM, *bridle*, in *Anatomy*, a name given to divers ligaments, from their office in retaining and curbing the motions of the parts they are fitted to.

FRÆNUM *linguæ*, or *bridle of the tongue*, is a membranous ligament, which ties the tongue to the os hyoides, larynx, fauces, and lower part of the mouth.

In ſome ſubjects the *frænum* runs the whole length of the tongue, to the very tip; in which caſes, if it were not cut, it would take away all poſſibility of ſpeech. See TONGUE-*tied*.

FRÆNUM *of the penis* is a ſlender ligament, whereby the prepuce is tied to the lower part of the glans of the PENIS.

Nature varies in the make of this part; it being ſo ſhort in ſome, that, unleſs divided, it would not admit of perfect erection. There is alſo a kind of little *frænum*, faſtened to the lower part of the CLITORIS.

FRAGARIA. See STRAWBERRY.

FRAIGHT, or FREIGHT, in *Navigation* and *Commerce*, the hire of a ſhip, or of a part of it, for the conveyance and carriage of goods from one part, or place, to another; or the ſum agreed on, between the owner and the merchant, for the hire and uſe of a veſſel.

The word is formed of the French *fret*, ſignifying the ſame thing; or from *fret*, of *fretum*, an arm of the ſea: though others chuſe to derive it from the German *fracht*, or the Flemiſh *vracht*, ſignifying *carriage*.

The *fraight* of a veſſel is uſually agreed on either at the rate of ſo much for the voyage, or by the month, or per ton.

Fraighting, or letting out veſſels on *fraight*, or hire, is one of the principal articles in the trade of the Hollanders: they are the carriers of all the nations of Europe, and their purveyors; notwithſtanding that their country produces little or nothing, and that they are forced to have every thing neceſſary for the building of a veſſel from other countries.

The principal laws and rules relating to *fraighting* are, that if a whole veſſel be hired, and the merchant, or perſon who hires it, do not give it its full load, or burthen, the maſter of the veſſel cannot, without his conſent, take in any other goods, without accounting to him for *fraight*.

That, though the merchant do not load the full quantity of goods agreed on in the CHARTER-*party*, yet he ſhall pay the whole *fraight*; and if he load more, he ſhall pay for the exceſs.

If a time be appointed by charter-party, and either the ſhip be not ready to take in, or the merchant to put on board, the parties are at liberty, with remedy by action for the detriment.

If part be on board, and ſome misfortune prevent the merchant's ſending the whole in time, the maſter may contract with another, and have *fraight* as damage for the time they were on board longer than limited.

On the other hand, if the veſſel is not ready, the merchant may ſhip the remainder of his goods aboard another, and recover damages againſt the firſt maſter or owners: therefore, by the law marine, chance, or other notorious neceſſity, will excuſe the maſter, but he loſes his *fraight* till he breaks ground. But if the merchant be in fault, he muſt anſwer the damage, or be liable to maintain the crew ten days; and, if after that, the full *fraight*; if damage afterwards, it is the merchants riſque: but by the common law, while the goods are on board, the maſter muſt ſee them forth-coming.

If goods are fully laded, and the ſhip hath broke ground, but the merchant afterwards declines the adventure, and unlades again, by the law marine the *fraight* is due.

If a ſet time be agreed on between the merchant and maſter, to begin and end the voyage, it may not be altered by the ſupercargo, without ſpecial commiſſion: and if a maſter ſhall ſail on his voyage, after the time agreed on for his departure, and damage happens afterwards, he ſhall make it good. If a ſhip be freighted from one port to another, thence to a third, &c. and ſo home to the port whence ſhe firſt ſailed (commonly called a trading voyage), the whole is one and the ſame voyage, if performed according to the charter-party. If the ſhip be freighted out and in, no *fraight* is due till the voyage is performed; if, therefore the ſhip periſh coming home, the whole *fraight* is loſt.

The maſter may ſet aſhore ſuch goods as he finds in his veſſel, which were not notified to him; or take them at a higher rate than was agreed on for the reſt. But if the maſter *fraight* his ſhip, and afterwards ſecretly take in other goods, he loſes his *fraight*; and if any of the freighter's goods ſhould, for the ſhip's ſafety, be caſt overboard, the reſt ſhall not be ſubject to AVERAGE, but the maſter muſt make it good.

If a ſhip be ſtopped or detained in its courſe, either through the maſter's, or the merchant's default, the delinquent ſhall be accountable to the other. Thus, if the freighter load the ſhip with prohibited goods, he ſhall anſwer the *fraight* contracted: but if the ſhip put into any other port than ſhe is freighted to, the maſter ſhall anſwer damage to the merchant; but if forced in by ſtorm, enemy, or pirates, he muſt then ſail to the ſtipulated port at his own coſts.

If the maſter be obliged to refit his veſſel during the voyage, the merchant ſhall wait, or elſe pay the whole *fraight*: if the veſſel could not be refitted, the maſter is obliged to hire another immediately, otherwiſe only to be paid his *fraight* in proportion to the part of the voyage performed; though, in caſe the merchant prove that the veſſel, at the time it ſet ſail, was not capable of the voyage, the maſter muſt loſe his *fraight*, and account for damages to the merchant.

Fraight ſhall be paid for merchandizes which the maſter was obliged to ſell for victuals, or refitting, or other neceſſary occaſions, paying for the goods at the rate the reſt were ſold at, where they were landed.

In caſe of a prohibition of commerce with the country whither the veſſel is bound, ſo that it is obliged to be brought back again, the maſter ſhall only be paid *fraight* for going.

And if a ſhip be ſtopped or detained in its voyage, by an embargo by order of the prince, there ſhall neither be any *fraight* paid for the time of the detention, in caſe it be hired per month; nor ſhall the *fraight* be increaſed, if hired for the voyage; but the pay and the victuals of the ſailors, during the detention, ſhall be deemed AVERAGE.

The maſter ſhall take no *fraight* for any goods loſt by ſhipwreck, plundered by pirates, or taken by the enemy, unleſs the ſhip and goods be redeemed; in which caſe he ſhall be paid his *fraight* to the place where he was taken, upon contributing to the redemption.

The maſter ſhall be paid his *fraight* for the goods ſaved from ſhipwreck; and in caſe he cannot get a veſſel to carry them unto the place where they were bound, he ſhall be paid in proportion to the part of the voyage already gone. The ſhip's lading, in conſtruction of law, is tacitly obliged for the *fraight*; this being, in point of payment, preferred before any other debts to which the goods laden are liable, though ſuch were precedent to the *freight*, becauſe the goods remain, as it were, bailed for the ſame.

The maſter may not detain any merchandize in his veſſel, in default of payment of *fraight*; though he may order them to be ſeized any time, or any where afterwards. If merchandizes in caſks, as wines, oils, &c. have ſo run out in carriage, that the veſſels are left empty, or almoſt empty, the merchant may relinquiſh them, and the maſter be obliged to take them for their *fraight*; though this does not hold of any other goods damaged, or diminiſhed of themſelves, or through accidents.

FRAIGHT is alſo uſed for the burthen, or lading of a ſhip, or the cargo of goods, &c. which ſhe has on board.

FRAIGHT is alſo a duty of fifty ſols per ton, paid to the crown

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crown of France by the maſters of all foreign veſſels, at their entrance into and going out of the ports and havens of that kingdom. And note, that all veſſels not built in France, however they may belong to the ſubjects of France, are reputed foreigners, and ſubject to this impoſt, unleſs it be made appear, that two thirds of the ſhip's crew are French.

By the eleventh article of the treaty of commerce, concluded at Utrecht between England and France, this duty of fifty ſols per ton was to have been remitted the Engliſh; and at the ſame time, the duty of five ſhillings ſterling to have been ſuppreſſed in favour of the French: but the execution of that article, as well as the tariff ſettled between the two nations, has been ſuſpended.

The Dutch, however, and the Hans towns, are exempted from the duty of *fraight*.

FRAIL, a baſket of ruſhes, or the like matter, wherein to pack up figs, raiſins, &c.

FRAIL alſo denotes a certain quantity of raiſins, about ſeventy-five pounds.

FRAISE, in *Fortification*, a kind of defence, conſiſting of pointed ſtakes, driven parallel to the horizon, into the retrenchments of a camp, a half-moon, or the like, to ward off and prevent any approach or ſcalade.

Fraiſes differ from paliſades chiefly in this, that the latter ſtand perpendicular to the horizon; and the former jet out parallel to the horizon, at leaſt nearly ſo, being uſually made a little ſloping, or with the points hanging down.

Fraiſes are chiefly uſed in retrenchments, and other works thrown up of earth: ſometimes they are found under the parapet of a rampart, ſerving inſtead of the cordon of ſtone uſed in ſtone works.

FRAISING *of a battalion*, is the lining it all round with pikes, in caſe of being charged by a body of horſe.

FRAMBOISE, a name uſed by ſome for the *rubus* or blackberry-buſh. See RASPBERRY.

FRAME, in *Joinery*, &c. a kind of caſe, wherein a thing is ſet, or incloſed, or even ſupported; as a window *frame*, a *frame* of a picture, of a table, &c.

FRAME is alſo a machine, uſed in divers arts. The printers *frame* is more uſually called a CASE.

The founders *frame* is a kind of ledge, incloſing a board, which being filled with wetted ſand, ſerves as a mould to caſt their work in. See FOUNDERY.

FRAME is more particularly uſed for a ſort of loom, whereon artizans ſtretch their linens, ſilks, ſtuffs, &c. to be embroidered, quilted, or the like.

FRAME, among *Painters*, &c. is a kind of ſquare, compoſed of four long pieces, or ſlips of wood, joined together; the intermediate ſpace whereof is divided by little ſtrings or threads, into a great number of little ſquares, like the maſhes of a net; and for that reaſon ſometimes called *reticula*.

Its uſe is in reducing of figures from great to ſmall, or augmenting their ſize from ſmall to great. See DESIGNING.

FRAMING *of a houſe*, all the timber-work therein, viz. the carcaſe, flooring, partitioning, roofing, cieling, beams, aſhlering, &c.

FRAMPOLE *fence*, a privilege enjoyed by the tenants of the manor of Writtel, in Eſſex; whereby they are entitled to the wood growing on the fence; and as many trees or poles as they can reach from the top of the ditch with the helve of an ax, toward the repair of their fence.

The chief juſtice Brampton, whilſt ſteward of this court, acknowleged he could not find out the reaſon why theſe fences were called *frampole*. It may come from the Saxon *fremful*, *profitable*; or may be a corruption of *franc-pole*, becauſe the poles are free for the tenant to take.

FRANC. See FRANK.

FRANCA, in *Botany*, the name given by Micheli to a genus of plants, ſince called by Linnæus FRANKENIA.

FRANCHISE, a privilege, or exemption from ordinary juriſdiction.

FRANCHISE is alſo uſed for an immunity from the ordinary tributes and taxes.

This is either real, or perſonal; that is, either belonging immediately to the perſon; or accruing on account of this or that place, or office of IMMUNITY.

Theſe *franchiſes*, being royal privileges, or branches of the king's prerogative, ſubſiſting in the hands of a ſubject, are derived from the crown by grant or charter, and, in ſome caſes, are held by preſcription and uſage. They may be veſted either in natural perſons, or bodies politic; in one man, or in many; but the ſame identical *franchiſe* that has before been granted to one, cannot be beſtowed on another, for that would prejudice the former grant. The principal kinds of *franchiſes* are the following: to be a COUNTY palatine is a *franchiſe* veſted in a number of perſons. It is likewiſe a *franchiſe* for a number of perſons to be incorporated, and ſubſiſt as a body politic, with a power to maintain perpetual ſucceſſion, and do other corporate acts; and each individual member of ſuch corporation is alſo ſaid to have a *franchiſe* or freedom. Other *franchiſes* are to hold a court leet; to have a manor or lordſhip; or, at leaſt, to have a lordſhip paramount; to have waifs, wrecks, eſtrays, treaſure-trove, royal-fiſh, forfeitures, and deodands; to have a court of one's own, or liberty of holding pleas and trying cauſes; to have the cognizance of pleas, which is a ſtill greater liberty, being an excluſive right, ſo that no other court ſhall try cauſes ariſing within that juriſdiction; to have a bailiwick, or liberty exempt from the ſheriff of the county, wherein the grantee only and his officers are to execute all proceſs; to have a fair or market, with the right of taking toll, either there or at any other public places, as bridges, wharfs, and the like; which tolls muſt have a reaſonable cauſe of commencement, elſe the *franchiſe* is illegal and void; or, laſtly, to have a foreſt, chaſe, park, warren, or fiſhery, endowed with privileges of royalty. See the ſeveral articles above recited.

FRANCHISE, *allowance of*. See QUO *warranto*.

FRANCHISE, *diſturbance of*, is remedied by ſuing for damages, by a ſpecial action on the caſe; or, in caſe of toll, the injured perſon may take a diſtreſs if he pleaſes.

FRANCHISE is alſo uſed for an aſylum, or ſanctuary, where people are ſecure of their perſons, &c.

Churches and monaſteries in Spain are *franchiſes* for criminals; ſo were they anciently in England, till they were abuſed to ſuch a degree, that there was a neceſſity for aboliſhing the cuſtom.

One of the moſt remarkable capitulars made by Charlemagne in his palace of Heriſtal, in 779, was that relating to the *franchiſes* of churches. The right of *franchiſe* was held ſo ſacred, that even the leſs religious kings obſerved it to a degree of ſcrupulouſneſs; but to ſuch exceſs in time was it carried, that Charlemagne reſolved to reduce it. Accordingly he forbad any proviſion being carried to criminals retired into churches for refuge.

FRANCHISE *of quarters*, is a certain ſpace, or diſtrict at Rome, wherein are the houſes of the ambaſſadors of the princes of Europe; and where ſuch as retire, cannot be arreſted, or ſeized by the ſbirri, or ſerjeants, nor proſecuted at law.

The people of Rome look on this as an old uſurpation, and a ſcandalous privilege, which ambaſſadors, out of a jealouſy of their power, carried to a great length in the fifteenth century, by enlarging inſenſibly the dependencies of their palaces or houſes, within which the right of *franchiſe* was anciently confined. Several of the popes, Julius III. Pius XIV. Gregory XIII. and Sixtus V. publiſhed bulls and ordinances againſt this abuſe; which had reſcued ſo conſiderable a part of the city from their authority, and rendered it a retreat for the moſt abandoned perſons.

At length Innocent XI. expreſly refuſed to receive any more ambaſſadors but ſuch as would make a formal renunciation of the *franchiſe of quarters*.

FRANCHISE *royal*, is a place where the king's writ runs not; as at Cheſter, and Durham; and anciently at Tyndal, and Hexamſhire in Northumberland. But Bracton ſays, that a *franchiſe royal* is where the king grants to one and his heirs an exemption of toll, &c. See FRANCHISE.

FRANCHISING. See ENFRANCHISEMENT, and MANUMISSION.

FRANCIGENA, or FRENCHMAN, in our *Ancient Cuſtoms*, was a general appellation of all foreigners; i. e. all perſons who could not prove themſelves Engliſhmen.

FRANCISCANS, in *Eccleſiaſtical Hiſtory*, are religious of the order of St. Francis, founded by him in the year 1209. Francis was the ſon of a merchant of Aſſiſi, in the province of Umbria, who, having led a diſſolute life, was reclaimed by a fit of ſickneſs; and afterwards fell into an extravagant kind of devotion, that looked leſs like religion than alienation of mind. Soon after this, viz. in the year 1208, hearing the paſſage repeated, Matt. x. 9, 10. in which Chriſt addreſſes his apoſtles, *Provide neither gold, nor ſilver*, &c. he was led to conſider a voluntary and abſolute poverty as the eſſence of the Goſpel, and to preſcribe this poverty as a ſacred rule both to himſelf and to the few that followed him. This new ſociety, which appeared to Innocent III. extremely adapted to the preſent ſtate of the church, and proper to reſtore its declining credit, was ſolemnly approved and confirmed by Honorius III. in 1223, and had made a conſiderable progreſs before the death of its founder in 1226. Francis, through an exceſſive humility, would not ſuffer the monks of his order to be called *fratres*, i. e. *brethren* or *friars*, but *fraterculi*, i. e. *little brethren*, or *friars-minor*, by which denomination they ſtill continue to be diſtinguiſhed. They are alſo called *grey friars*, on account of the colour of their cloathing, and CORDELIERS, &c.

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&c. The *Franciſcans* and DOMINICANS were zealous and active friends to the papal hierarchy, and, in return, were diſtinguiſhed by peculiar privileges and honourable employments. The *Franciſcans*, in particular, were inveſted with the treaſure of ample and extenſive indulgences, the diſtribution of which was committed to them by the popes, as a means of ſubſiſtence, and a rich indemnification for their voluntary poverty. In conſequence of this grant, the rule of the founder, which abſolutely prohibited both perſonal and collective property, ſo that neither the individual nor the community were permitted to poſſeſs either fund, revenue, or any worldly goods, was conſidered as too ſtrict and ſevere, and diſpenſed with ſoon after his death. In 1231, Gregory IX. publiſhed an interpretation of this rule, mitigating its rigour; which was farther confirmed by Innocent IV. in 1245, and by Alexander IV. in 1247. Theſe milder alterations were zealouſly oppoſed by a branch of the *Franciſcans*, called the *ſpiritual*; and their complaints were regarded by Nicolas III. who, in 1279, publiſhed a famous conſtitution, confirming the rule of St. Francis, and containing an elaborate explication of the maxims it recommended, and the duties it preſcribed. In 1287, Matthew of Aqua Sparta, being elected general of the order, diſcouraged the ancient diſcipline of the *Franciſcans*, and indulged his monks in abandoning even the appearance of poverty; and this conduct inflamed the indignation of the *ſpiritual* or auſterer *Franciſcans*; ſo that, from the year 1290, ſeditions and ſchiſms aroſe in an order, that had been ſo famous for its pretended diſintereſtedneſs and humility. Such was the enthuſiaſtic frenzy of the *Franciſcans*, that they impiouſly maintained, that the founder of their order was a ſecond Chriſt, in all reſpects ſimilar to the firſt; and that their inſtitution and diſcipline were the true goſpel of Jeſus. Accordingly, Albizi, a *Franciſcan* of Piſa, publiſhed a book, in 1383, with the applauſe of his order, entitled, The Book of the Conformities of St. Francis with Jeſus Chriſt. In the beginning of this century the whole *Franciſcan* order was divided into two parties; the one, embracing the ſevere diſcipline and abſolute poverty of St. Francis, were called *ſpirituals*; and the other, who inſiſted on mitigating the auſtere injunctions of their founder, were denominated *brethren of the community*. Theſe wore long, looſe, and good habits, with large hoods; the former were clad in a ſtrait, coarſe, and ſhort dreſs, pretending, that this dreſs was enjoined by St. Francis, and that no power on earth had a right to alter it. Neither the moderation of Clement V. nor the violence of John XXII. could appeaſe the tumult, occaſioned by theſe two parties: however, their rage ſubſided from the year 1329. In 1368 theſe two parties were formed into two large bodies, comprehending the whole *Franciſcan* order, which ſubſiſt to this day; viz. the CONVENTUAL *brethren*, and the *brethren of the* OBSERVANCE or *obſervation*, from whom ſprung the CAPUCHINS and RECOLLECTS. Moſh. Eccl. Hiſt. vol. iii. See *Nuns of St.* CLARE and FRIARS.

The general opinion is, that the *Franciſcans* came into England in the year 1224, and had their firſt houſe at Canterbury, and their ſecond at London; but there is no certain account of their being here till king Henry VII. built two or three houſes for them. At the diſſolution of the monaſteries, the conventual *Franciſcans* had about fifty-five houſes, which were under ſeven cuſtodies or wardenſhips; viz. thoſe of London, York, Cambridge, Briſtol, Oxford, Newcaſtle, and Worceſter.

FRANCOLIN, in *Ornithology*. See ATTAGEN.

FRANGIPANE, an exquiſite kind of perfume, frequently given to the leather whereof gloves, purſes, bags, &c. are made.

It takes its name from a Roman nobleman, of the ancient family of Frangipani, who was the inventor of it.

There is alſo a kind of perfumed liquor of the ſame denomination, ſaid to have been invented by a grandſon of Mutio Frangipani; and alſo a perfumed kind of *ros ſolis*, called by the ſame name.

FRANGULA, in *Botany*. See *Berry-bearing* ALDER.

FRANK, or FRANC, a term literally ſignifying free and open, or exempt from public impoſitions and charges; as *frank* confeſſion, *frank* fair, *frank* letter, &c.

The term *frank* is much uſed in our ancient cuſtoms and tenures; where it receives various particular modifications and meanings, according to the words it is combined with; as

FRANK *allen*, or *allodium*, is a land, tenement, or demeſne, that is not held of any ſuperior lord.

FRANK *almoin*, or *free alms*, is a tenure of lands or tenements beſtowed on God; that is, given to ſuch people as devote themſelves to the ſervice of God, in pure and perpetual alms; or, it is a tenure, whereby a religious corporation, aggregate or ſole, holdeth lands of the donor to them and their ſucceſſors for ever.

Whence the feoffers, or givers, cannot demand any terreſtrial ſervice, ſo long as the land remains in the hands of the feoffees.

The ſervice which the feoffees were bound to render for theſe lands is not certainly defined; but only, in general, to pray for the ſouls of the donor and his heirs, dead or alive; and, therefore, they did no fealty, which is incident to all other ſervices but this, becauſe this divine ſervice was of a more exalted nature. This is the tenure, by which all the ancient monaſteries and religious houſes held their lands; and by which the parochial clergy, and many eccleſiaſtical and eleemoſynary foundations, hold them at this day. This was an old Saxon tenure, and continued under the Norman revolution, on account of the reſpect ſhewn to religion, and religious men, in ancient times; and for this reaſon, tenants in *frank-almoign* were diſcharged of all other ſervices, except the *trinoda neceſſitas*, of repairing the highways, building caſtles, and repelling invaſions. And this tenure is ſtill diſtinct from all others, being not in the leaſt feodal, but merely ſpiritual; for, if the ſervice be neglected, the law gives no remedy by diſtreſs or otherwiſe to the lord of whom the lands are holden; but merely a complaint to the ordinary or viſitor to correct it.

Briton mentions another kind of land given in alms, but not free alms; the tenants being tied in certain ſervices to the feoffer: as to ſing ſo many maſſes, diſtribute ſuch a ſum in alms, and the like; and this tenure by divine ſervice differs from the former, becauſe for this, unperformed, the lord might diſtrain, without any complaint to the viſitor. All ſuch donations are now out of uſe; for ſince the ſtatute of *quia emptores*, 18 Edw. I. none but the king can give lands to be holden by this tenure.

FRANK *bank*. See FREE *bench*.

FRANK *chace* denotes liberty of free chace, in a circuit adjoining to a foreſt, on account of which, men, though they have land of their own within that compaſs, are forbidden to cut down wood, without the view of the foreſter; though it be their own demeſne. See CHASE.

FRANK *fee*, *feudum francum*, as defined by Brook, is that which is in the hands of the king, or lord of the manor; being ancient demeſne of the crown.

FRANK *fee*, *feudum liberum*, according to ſome, denotes that for which no ſervice is performed to any lord.

According to Fachin, lib. vii. cap. 39. lands held in *frank fee* were exempted from all ſervices, except homage.

In contradiſtinction to that in the tenants hands, which is only ancient demeſne.

In the reg. of writs, *frank fee* is ſaid to be that which a man holds at common law to him, and his heirs; and not by ſuch ſervice as is required in ancient demeſne, according to the cuſtom of the manor.

It is added, that the land in the hands of king Edward the Confeſſor, at the making of Domeſday book, is ancient demeſne; and all the reſt, *frank fee*. On which footing, all the lands in the realm are either ancient demeſne, or *frank fee*.

Others define *frank fee* to be a tenure in fee-ſimple, of lands pleadable at common law; and not in ancient demeſne. See FEE.

FRANK *ferm*, *firma libera*, denotes lands or tenements, wherein the nature of the fee is changed, by feoffment, from knight's ſervice, to a certain yearly ſervice; and whence neither homage, wardſhip, marriage, nor relief, may be demanded; nor any other ſervice not contained in the feoffment. See FEE *farm*, and SOCAGE.

FRANK *fold* is where the lord hath the benefit of folding his tenants ſheep, within his manor, for the manuring of his land.

FRANK *language*, or *lingua* FRANCA, is a kind of jargon, ſpoken on the Mediterranean, and particularly throughout the coaſts and ports of the Levant; compoſed of Italian, Spaniſh, French, vulgar Greek, and other languages.

The *lingua Franca* is the trading language; and is thus called from the *Franks*, a common appellation given in the Levant to all the European merchants and traders, who come thither to traffick.

In this language, if it may be ſo called, nothing but the infinitive mood of each verb is uſed; this ſerving for all the tenſes and moods of the conjugation; and yet this lame, mutilated diction, this barbarous medley, is learnt and underſtood by the merchants and mariners of all nations who repair thither.

FRANK *law*, *lex libera*, is the benefit of the free and common law of the land.

He that for any offence, as conſpiracy, &c. loſeth his *frank law*, incurs theſe inconveniencies: 1. That he may not be impanelled on any jury or aſſize; or otherwiſe uſed as an evidence, or witneſs to the truth. 2. That if he have any thing to do in the king's court, he muſt not approach it in perſon, but appoint his attorney. 3. That his

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his lands, goods, and chattels, be ſeized into the king's hands; and his lands be eſtreated, his trees rooted up, and his body committed to cuſtody.

FRANK *letters*, or *letters free of poſtage*. The privilege of ſuch letters was claimed by the houſe of commons in 1660, when the firſt legal ſettlement of the preſent POST-OFFICE was made; but afterwards dropped on a private aſſurance from the crown, that this privilege ſhould be allowed the members. Accordingly, a warrant was conſtantly iſſued to the poſt-maſter general, directing the allowance thereof to the extent of two ounces in weight; till at length it was expreſly confirmed by ſtatute 4 Geo. III. cap. 24. which adds many new regulations, rendered neceſſary by the abuſes crept into the practice of franking; whereby the annual amount of *franked letters* had gradually increaſed from 23,600*l.* in 1715, to 170,700*l.* in 1763. Blackſt. Com. vol. i. p. 322.

FRANK *marriage*, *liberum maritagium*, is a tenure in tail ſpecial, whereby lands, or tenements, are held to a perſon and his wife, and the heirs of their bodies, on condition of doing fealty to the donor, till the fourth degree of conſanguinity between the iſſues of the donor and donee.

Fleta gives this reaſon, why the heirs do no ſervice, till the fourth degree: *ne donatores, vel eorum hæredes, per homagii receptionem a reverſione repellantur*; and why, in the fourth deſcent, they ſhall do ſervice to the donor, *quia in quarto gradu vehementer præſumitur quod terra eſt pro defectu hæredum donotariorum reverſura.*

Frank marriage is expreſſed, by Bracton, to be that where the donor intends, that the land thus beſtowed ſhall remain quiet, and free from all ſecular ſervice that might be annexed to the fee; ſo that he who gave it ſhall claim no manner of ſervice from it, until the third heir, and the fourth deſcent, or degree; reckoning the donee in the firſt degree, his heir in the ſecond, the heir of him in the third, and his, again, in the fourth; but afterwards the ſame land to become ſubject to all the former ſervices; as being then ſuppoſed to revert to the lord, for want of heirs.

The lands otherwiſe given in marriage, viz. *ſervitio obligatæ*, were with a reſervation of the ſervices due to the lord, which the donee, and his heirs, were bound to perform for ever: only, homage was not to commence till the fourth degree, when both ſervice and homage were to be enjoined for ever.

FRANK-*pledge* ſignifies a pledge or ſurety for the behaviour of a freeman; called alſo FRIBURGH.

The ancient cuſtom of England, for preſervation of the public peace, was, that every free-born man, at fourteen years of age (religious perſons, clerks, knights, and their eldeſt ſons, excepted) ſhould find ſurety for his truth towards the king and his ſubjects, or elſe to be kept in priſon.

Accordingly, a number of neighbours became interchangeably bound for each other, to ſee each man of their pledge forthcoming at all times; or to anſwer for the offence committed by any one gone away; ſo that whenever one offended, it was preſently inquired in what *pledge* he was; and then thoſe of the pledge either brought him forth within one and thirty days to his anſwer; or they ſatisfied for his offence.

This cuſtom was called *frank-pledge*; and the circuit it extended to, *decenna*, becauſe it uſually conſiſted of ten houſholds; and every perſon thus bound for himſelf and neighbours was called a *decennier*. See DECINERS.

In obſervance of this cuſtom, the ſheriffs at every county-court did from time to time take the oaths of young perſons, as they arrived at the age of fourteen; and ſee they were ſettled in one *decenna*, or *dozein*, or another; whereupon this branch of the ſheriff's office and authority was called *viſus franci plegi*, i. e. *view of frank-pledge.*

Omnis homo, ſive liber, ſive ſervus, aut eſt, vel debet eſſe, in franco plegio, *aut de alicujus manupaſtu, niſi ſit aliquis itinerans de loco in locum, qui non plus ſe teneat ad unum quam ad alium, vel qui habet quod ſufficiat pro* franco plegio, *ſicut dignitatem, vel ordinem, vel liberum tenementum, vel in civitate rem immobilem*, &c. Bracton, lib. iii. Tract. de Corona, cap. 20.

FRANK *ſervice*. See SERVICE.

FRANK *tenement*. See TENEMENT, and FREEHOLD.

FRANK, or FRANC, alſo denotes an ancient coin, ſtruck, and current in France; thus called from its impreſſion, which repreſented a Frenchman, ſometimes on horſeback, and ſometimes on foot.

The *frank* was either of gold or ſilver: the firſt was worth ſomewhat more than the ecu d'or, or gold crown. See CROWN.

The ſecond was a third of the firſt; but theſe coins have been long diſuſed.

The term *frank*, however, is ſtill retained as the name of a money of account. In this ſenſe it is equivalent to a livre, or twenty ſols, or a third of a French crown.

Thus they ſay indifferently, a hundred *franks*, or a hundred livres.

FRANKENIA, in *Botany*, the name given by Linnæus to a genus of plants of the *hexandria monogynia* claſs, called by Micheli, *franca*. The perianthium is permanent, and is compoſed of one leaf of an oblong tubular form, divided into five ſegments at the edge. The flower conſiſts of five petals, the ungues of which are narrow, and of the length of the cup, and the tops roundiſh and expanded; the ſtamina are ten filaments longer than the tube; the apices are ſimple; the germen of the piſtil is roundiſh; the ſtyle is capillary, and of the length of the ſtamina; the ſtigma is divided into ſix parts; the fruit is an oval capſule covered with the cup, and formed of three valves, but containing only one cell, in which are a great number of ſmall ſeeds of an oval figure.

FRANKINCENSE, or ſimply INCENSE, an odoriferous aromatic gum, or reſin, anciently burnt in temples, as a perfume, and now uſed in pharmacy as an agglutinant and ſtrengthener.

The word is formed from the Latin *incenſum*, *burnt*; as alluding to its ancient uſe in temples.

Frankincenſe diſtils from inciſions made in a tree called *arbor thurifera*, during the heats of ſummer. But, notwithſtanding the great uſe of this gum, both in the ancient religion, and the modern medicine, the tree that produces it, or even the place where the tree grows, is but little known.

The moſt common opinion has always been, that it was brought from Arabia Felix, and was found near the city of Saba; whence its epithet *Sabæum*; and yet the name *olibanum*, which it ſometimes alſo bears, ſeems to intimate, that there are of theſe thuriferous or incenſe-bearing trees in the Holy Land near mount Lebanon. And travellers are poſitive, that there are others in the Eaſt Indies.

Nor are we leſs at a loſs as to the form or kind of the tree from which it flows. Pliny contents himſelf to ſay, that it at firſt reſembles the pear tree; then the maſtich tree; then the laurel; but that in reality it is a kind of turpentine-tree.

Frankincenſe is uſually divided into *male* and *female*.

The beſt *male incenſe*, *thus maſculum*, called alſo *olibanum*, is in fair white bits, or tears, a little yellowiſh, of a bitter diſagreeable taſte; and when chewed, it promotes the flux of ſaliva, which becomes white. When laid on coals, or a red-hot iron, it flames and burns with a ſtrong and not unpleaſant ſmell. On trituration with water, the greateſt part diſſolves into a milky liquor, which depoſits a reſinous matter, and being gently inſpiſſated, leaves a yellow extract, retaining the greateſt part of the ſmell as well as taſte of the *olibanum*. Rectified ſpirit diſſolves leſs than water.

It is called *male* in reſpect of its tears, which are larger than thoſe of the common or female.

That brought from the Indies is not near ſo good as that from Arabia, or mount Lebanon; it is ſometimes called *incenſe of Mocha*; though it be not brought from that city.

It is often in a maſs, but ſometimes in looſe drops or tears; ſomewhat reddiſh, and bitter to the taſte. Some ſell this for the true bdellium.

Male incenſe, or *olibanum*, is an ingredient in divers galenical and chemical preparations: it warms, dries, and binds; and is uſed not only in divers diſeaſes of the head and breaſt, but in vomitings, diarrhœas, and dyſenteries. The doſe is from a ſcruple to a dram or more. Externally it is applied to ſtrengthen the brain, and heal wounds. Some uſe it to aſſuage the tooth-ach; but it is apt to ſpoil the good teeth.

As for *female incenſe*, or *frankincenſe*, authors deſcribe it to be ſofter, and more reſinous, but of leſſer virtue than the former. This common *frankincenſe* is brought to us in little globes or maſſes, of a browniſh or yellowiſh colour on the outſide, internally whitiſh, and variegated with whitiſh ſpecks. It is ſuppoſed to be the produce of the pine that yields the common turpentine, and to concrete upon the ſurface of the terebinthinate juice, ſoon after it has iſſued from the tree. This reſin has a biteriſh, acid, unpleaſant taſte, and no conſiderable ſmell; it diſſolves totally in rectified ſpirit, but is ſcarcely acted upon by watery menſtrua. It may be looked upon as a mild corroborant; though at preſent it is little otherwiſe made uſe of than as an ingredient in theriaca, and externally in plaſters. Lewis, Mat. Med.

Bark of incenſe, *cortex thuris*, is the bark of the tree whence the *incenſe* flows, which has the ſame qualities with the *incenſe* itſelf.

There is another bark brought from the Indies, called alſo *bark of incenſe*, and ſometimes *Jews incenſe*, becauſe the Jews make frequent uſe thereof in their perfume: this is the *cortex eleutheriæ*.

Manna of incenſe is the flour or farina of *incenſe*, occaſioned

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ſioned by the friction of the grains againſt each other in the ſacks wherein they carry it.

There is alſo a ſoot of *incenſe*, which is a preparation of it, burnt like reſin to make lamp-black.

Frankincenſe was formerly burnt in the temples of all religions, to do honour to the divinities that were there adored. Many of the primitive Chriſtians were put to death, becauſe they would not offer *incenſe* to idols.

In the Romiſh church they ſtill retain the uſe of *incenſe* in ſome of their ceremonies; always at high-maſs, and at the elevation of the hoſt at veſpers; and at ſolemn funerals, beſtowing it on ſuch perſons as they would honour, as on prelates, &c. and ſometimes alſo on the people.

FRANKS, FRANCS, FRANKIS, or FRANQUIS, a name which the Turks, Arabs, Greeks, &c. give to all the people of the weſtern parts of Europe.

The appellation is commonly ſuppoſed to have had its riſe in Aſia, at the time of the croiſades; when the French made the moſt conſiderable figure among the croiſees; from which time the Turks, Saracens, Greeks, Abyſſinians, &c. uſed it as a common term for all the Chriſtians of Europe; and called Europe itſelf *Frankiſtan*.

The Arabs and Mahometans, ſays M. d'Herbelot, apply the term *Franks* not only to the French (to whom the name originally belonged) but alſo to the Latins and Europeans in general.

But F. Goar, in his notes on Condinus, cap. 5. n. 43. furniſhes another origin of the appellation *Franks*, of greater antiquity than the former. He obſerves, that the Greeks at firſt confined the name to the *Franci*, i. e. the German nations, who had ſettled themſelves in France or Gaul; but afterwards they gave the ſame name to the Apulians and Calabrians, after they had been conquered by the Normans; and at length the name was farther extended to all the Latins.

In this ſenſe is the word uſed by divers Greek writers; as Comnenus, &c. who, to diſtinguiſh the French, call them the *weſtern Franks*.

Du-Cange adds, that about the time of Charlemagne, they diſtinguiſhed eaſtern France, weſtern France, Latin, or Roman France; and German France, which was the ancient France, afterwards called Franconia.

FRAPPING, in *Sea-language*, denotes the art of croſſing and drawing together the ſeveral parts of a tackle, or other complication of ropes, which had been already ſtraitened to their utmoſt extent, reſembling the operation of bracing up a drum, &c. The *frapping* increaſes the tenſion, and adds to the ſecurity acquired by the purchaſe. Hence the cat-harpings are no other than *frappings* to the ſhrouds.

FRAPPING *a ſhip*, is the art of paſſing three, four, or five turns of a cable round the hull, or frame of a ſhip, in the middle, to ſupport her in a great ſtorm, when it is apprehended ſhe is not ſtrong enough to reſiſt the violent efforts of the ſea. This is ſeldom uſed, except in old ſhips. Falconer.

FRASSETUM, in *our old Writers*, is taken for a wood, or woody ground, where aſh grows. 1 Inſt. 4.

The word is a corruption of the Latin *fraxinetum*, which ſignifies the ſame.

FRATERIA, of *frater*, *brother*, a fraternity, brotherhood, or ſociety of religious perſons, who were bound to pray for the good health and life, &c. of their living brethren, and the ſouls of thoſe that were dead. In the ſtatutes of the cathedral church of St. Paul, London, collected by Ralph Baldock, dean, 1295, there is one chapter *De* frateria *beneficiorum eccleſiæ S. Pauli, &c.*

FRATERCULA, in *Zoology*, a name by which Geſner and Androvand have called the *anus arctica cluſii*. See PUFFIN.

FRATERNITY, *brotherhood*, the relation or union of brothers, friends, partners, aſſociates, &c.

FRATERNITY, in *a civil ſenſe*, is uſed for a guild, aſſociation, or ſociety of perſons, united into a body, for ſome common intereſt or advantage.

For the origin, uſe, &c. of *fraternities*, ſee COMPANY and GILD.

FRATERNITY, in *a religious ſenſe*, is a ſociety of perſons meeting together to perform ſome exerciſes of devotion, or divine worſhip.

In the Romiſh church, ſuch *fraternities* are very numerous and conſiderable, being moſt of them eſtabliſhed by royal patents; as the *fraternity* of the ROSARY; the *fraternity* of the SCAPULARY; of St. Francis's Cord: ſee CORDELIERS and FRANCISCANS. The biſhop may hinder the eſtabliſhment of any ſuch *fraternity* in his dioceſe.

At Rome there is a *fraternity*, called the *archi-fraternity*, or *grand fraternity*, under the title of *Our Lady of the Suffrages*, eſtabliſhed in favour of the ſouls in purgatory, approved and confirmed by a bull of pope Clement VIII. in 1594. See BRETHREN and BROTHERS.

There are nine different ſorts of *fraternities*, or confrairies, in France, viz. 1. Of Devotion. 2. Of Charity, or Mercy. 3. Of Penitents, under divers names. 4. Of Pilgrimages. 5. Of Merchants, to procure the divine favour on their endeavours. 6. Of Officers of Juſtice. 7. Of the Sufferings of Chriſt. 8. Of Arts and Trades of divers kinds. And, 9. Of Factions.

Fraternities, in Latin called *ſodalitates*, derive their origin from the heathens, as is ſhewn by Polydore Virgil, in his book De Inventoribus Rerum. But the good uſe made of them by the Chriſtians has effectually purged them of any impurities derived from ſo ill a ſource.

Numa Pompilius is ſaid to have eſtabliſhed *fraternities* of all arts and trades in ancient Rome, and to have preſcribed the ſacrifices each profeſſion was to perform to the patrons or tutelary gods he had aſſigned them.

FRATERNITY *of the holy Trinity*. See TRINITY.

FRATERNITY is alſo a title or quality which kings and emperors gave to each other; ſo alſo do biſhops and monks. We meet with it frequently in authors under the eaſtern empire, both Greek and Latin: the Greek term is ἀδελφοτης, *fraternitas*.

FRATERNITY *of arms* was an alliance, or aſſociation in arms, anciently concluded between two knights, who thereby agreed to go together, ſhare their fortune, and mutually aſſiſt each other againſt all the world.

Bertrand du Gueſclin and Oliver Cliſſon ſwore a *fraternity* of arms in the year 1579, laying their hands on the goſpels. Hiſt. de Bret. tom. i. p. 395.

FRATERNITY *of St. Catharine*. See CATHARINE.

FRATRES *Arvales*. See ARVALES.

FRATRES *conjurati*, in *our ancient Law-books*, &c. denote ſworn brothers, or companions.

Sometimes they are alſo ſo called who were ſworn to defend the king againſt his enemies, leg. W. 1. cap. 59. *Præcipimus, ut omnes liberi homines ſint* fratres conjurati *ad monarchiam noſtram & regnum noſtrum contra inimicos pro poſſe ſuo defendendam.*

FRATRES *gaudentes*. See *Joyful* BROTHERS.

FRATRIAGE, FRATRIAGIUM, or FRERAGE, the partition among brothers, or coheirs, coming to the ſame inheritance or ſucceſſion.

FRATRIAGE is more particularly uſed for that part of the inheritance which comes to the youngeſt brothers.

Whatever the cadets, or younger brothers, poſſeſs of the father's eſtate, they poſſeſs *ratione fratriagii*, and they are to do homage to the elder brother for it; in regard he is to do homage for the whole to the ſuperior lord.

FRATRICELLI, in *Eccleſiaſtical Hiſtory*, an enthuſiaſtic ſect of FRANCISCANS, which roſe in Italy, and particularly in the marquiſate of Ancona, about the year 1294.

The word is an Italian diminutive, ſignifying *fraterculi*, or little brothers; and was here uſed as a term of deriſion, as they were moſt of them apoſtate monks, whom the Italians call *fratelli*, or *fratricelli*.

For this reaſon the term *fratricelli*, as a nick-name, was given to many other ſects, as the Catharists, the Waldenſes, &c. however different in their opinions and in their conduct But this denomination applied to the auſtere part of the Franciſcans was conſidered as honourable. See FRANCISCANS.

The founders were P. Maurato, and P. de Foſſombroni, who having obtained of pope Celeſtin V. a permiſſion to live in ſolitude, after the manner of hermits, and to obſerve the rule of St. Francis in all its rigour, ſeveral idle vagabond monks joined them, who, living after their own fancies, and making all perfection to conſiſt in poverty, were ſoon condemned by pope Boniface VIII. and his ſucceſſor, and the inquiſitors ordered to proceed againſt them as heretics: which commiſſion they executed with their uſual barbarity. Upon this, retiring into Sicily, Peter John Oliva de Serignan had no ſooner publiſhed his Comment on the Apocalypſe, than they adopted his errors.

They held the Romiſh church to be Babylon, and propoſed to eſtabliſh another far more perfect one: they maintained, that the rule of St. Francis was the evangelical rule obſerved by Jeſus Chriſt, and his apoſtles.

They foretold the reformation of the church, and the reſtoration of the true goſpel of Chriſt, by the genuine followers of St. Francis, and declared their aſſent to almoſt all the doctrines which were publiſhed under the name of the abbot Joachim, in the Introduction to the everlaſting Goſpel, a book publiſhed in 1250, and explained by one of the *ſpiritual* friars whoſe name was Gerhard. Among other enormities inculcated in this book, it is pretended that St. Francis was the angel mentioned in Rev. xiv. 6. and had promulgated to the world the true and everlaſting goſpel of God; that the goſpel of Chriſt was to be abrogated in 1260, and to give place to this new and everlaſting goſpel, which was to be ſub-

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ſtituted in its room; and that the miniſters of this great reformation were to be humble and bare-footed friars, deſtitute of all worldly employments.

Some ſay they even elected a pope of their new church; at leaſt they appointed a general, with ſuperiors, and built monaſteries, &c. Beſide the opinions of Oliva, they held, that the ſacraments of the church were invalid; becauſe thoſe who adminiſtered them, had no longer any power or juriſdiction.

They were condemned afreſh by pope John XXII. in conſequence of whoſe cruelty they regarded him as the true antichriſt; but ſeveral of them returning into Germany, were ſheltered by Lewis, duke of Bavaria, the emperor.

There are authentic records, from which it appears, that no leſs than two thouſand perſons were burnt by the inquiſition, from the year 1318 to the time of Innocent VI. for their inflexible attachment to the poverty of St. Francis. The ſeverities againſt them were again revived towards the cloſe of the fifteenth century by pope Nicholas V. and his ſucceſſors. However, notwithſtanding all the perſecutions which this ſect endured, they were not ſufficient to extinguiſh it; for it ſubſiſted until the times of the reformation in Germany, when its remaining votaries adopted the cauſe, and embraced the doctrine and diſcipline of Luther. And this has led the popiſh writers to charge the *fratricelli* with many enormities, ſome of which are recounted by M. Bayle, art. *Fratricelli*.

The *fratricelli* had divers other denominations: they were called *fratricelli*, according to ſome, becauſe they lived in community, in imitation of the primitive Chriſtians, or rather through the humility of the founder of the Franciſcan order, to which the *fratricelli* originally belonged; *dulcini*, from one of their doctors; BIZOCHI, BEGUINS, and BEGHARDI.

FRATRICIDE, of *frater*, *brother*, and *cædo*, *I kill*, the crime of murdering one's brother. See PARRICIDE.

Cain committed the firſt *fratricide*; and the empire of Rome began with a *fratricide*.

FRAUD, FRAUS, a ſecret underhand deceit, or injury, done to any one.

To export or import goods by *fraud*, or fraudulently, is to do it by indirect ways, in order to avoid the paying of duty, &c. if they be permitted goods; or if they be contraband goods, to avoid the penalties adjudged by the laws.

A fraudulent conveyance of lands or goods to deceive creditors, or to defraud purchaſers, is void in law; and the perſons juſtifying or putting off ſuch grants as good, ſhall forfeit a year's value of the lands, and the full value of the goods and chattels, and likewiſe be impriſoned.

The ſeveral marks of *fraud* in a gift or grant of goods are the following: 1. If it be general, without exception of ſome things of neceſſity. 2. If the donor ſtill poſſeſſes and uſes the goods. 3. If the deed be made in ſecret. 4. If there be a truſt between the parties. 5. If it be made while the action is depending. When a perſon is party to a *fraud*, all that follows thereupon will be intended to be done by him, though *fraud* ſhall not be preſumed or adjudged to be ſo, until it be found by a jury. The ſtatute of *frauds*, 29 Car. II. cap. 3. requires that contracts and agreements, leaſes, and deviſes of land, be in writing. And deviſes of land, rents, &c. are deemed fraudulent and void, againſt creditors, upon bonds or other ſpecialties, 3 and 4 William and Mary, cap. 14. See CHEATS.

FRAUS *legis*; if a perſon, having no manner of title to a houſe, procure an affidavit of the ſervice of a declaration in ejectment, and thereupon gets judgment; and, by virtue of a writ of *hab. fac. poſſeſſionem*, turns the owner out of poſſeſſion of the houſe, and ſeizes and converts the goods therein to his own uſe; he may be puniſhed as a felon; becauſe he uſed the proceſs of the law with a felonious purpoſe, in *fraudem legis*.

FRAXINELLA, in *Botany*. See DITTANY.

FRAXINUS, in *Botany*. See ASH.

FRAY literally ſignifies to fret; as cloth or ſtuff does by rubbing, or over-much wearing.

Among hunters a deer is ſaid to *fray his head*, when he rubs it againſt a tree, to cauſe the ſkins of his new horns to come off.

FREAM, among *Farmers*, arable or ploughed land worn out of heart, and laid fallow till it recovers.

FREAM, among *Sportſmen*, a term uſed for the noiſe of a boar in rutting time.

FRECKLES, ſmall, duſky ſpots, ſprinkled on the ſkin of the face or hands; particularly in perſons of the faireſt ſkins, and during the hot ſeaſons, after being expoſed to the ſun and air. They are ſuppoſed to be formed of ſuliginous vapours, ſtopped and coagulated in the ſkin. Vide Turner's Diſcourſe of the Skin, p. 256.

They are called in Latin *lentigines*, from their reſemblance in ſize and colour to a lentil; by the French they are called *rouſſeurs*, and *bran de Judas*; by the Italians *roſſore* and *lentigine*.

Freckles ſeem to be only the earthy, oily, and ſaline part, of the ſweat, retained in the *plexus* or maſhes of the ſkin. While the aqueous liquor, which was their vehicle, is evaporated by the heat of the body, theſe groſſer parts are gradually accumulated, till the maſhes are full. Some part of this ſweat is continually ouſing through the cuticle; and, being of a viſcid nature, retains the dirt, duſt, &c. that fly about the face. This viſcid matter on the ſurface of the *freckles* will ſtick there, notwithſtanding any repeated wipings, which rather condenſe, and preſs it into the cavities thereof, than clear it off.

They are found more about the noſe, and backs of the hands, than any where elſe; becauſe the ſkin is more ſtretched there, and conſequently the pores more open to receive the duſt, &c.

It follows, that there can ſcarce be any ſuch thing as an adequate remedy, or preventive, of *freckles*. Temporary ones there may be, which ſhall draw out and diſſipate what matter is already gathered; but the ſpaces will fill up again in time.

Bullocks gall, mixed with alum, and, after the alum has precipitated, expoſed three or four months to the ſun in a cloſe phial, Monſ. Homberg ſhews, is one of the beſt remedies known for *freckles*. It acts as a lixivium, and enters the pores, and dilutes and diſſolves the coagulum of the *freckles*. Mem. de l'Acad. Royal. des Sciences, an. 1709, p. 472, &c. See the method of preparing and uſing it under GALL.

FREDUM, in *Antiquity*, a compoſition made by a criminal to be freed from proſecution, a third part of which was paid into the fiſcus or exchequer; or it was the price paid to the magiſtrate for protection againſt the violences of reſentment. Monteſq. de l'Eſprit des Loix, lib. xxx. cap. 20. and Robertſon's Hiſt. chap. v. of vol. i. p. 361.

FREE, a term variouſly uſed; but generally in oppoſition to conſtrained, confined, or neceſſitated. See FRANK.

Thus, a man is ſaid to be *free*, who is out of priſon; and a bird is *free*, when let out of the cage: *free* from pain, i. e. void of pain: we ſay, a *free* air, a *free* paſſage, &c.

FREE, in ſpeaking of things endowed with underſtanding, has a more peculiar relation to the will, and implies its being at full liberty.

The Stoics maintain, that their ſage or wiſe men alone are *free*.

FREE is alſo uſed in oppoſition to ſlave.

The moment a ſlave ſets foot on Engliſh ground, he becomes to ſome purpoſes *free*. The fineſt legacy the ancient Romans could leave their ſlaves, was their *freedom*.

FREE, *aboard a ſhip*. The ſeamen ſay the pump *frees* the ſhip, when it throws out more water than leaks into her; but, on the contrary, when it cannot throw out the water as faſt as it leaks in, they ſay the pump cannot *free* her: alſo bailing or lading out water out of a boat, is called *freeing* the boat.

FREE *agent*. See AGENT.

FREE *bench*, or *franc banc*, ſignifies that eſtate in copyhold lands, which the wife hath after the deceaſe of her huſband, for her dower, according to the cuſtom of the manor.

Fitzherbert calls *free bench* a cuſtom, whereby, in certain cities, the wife ſhall have her huſband's whole lands, &c. for her dower.

Thus, at Orleton, in the county of Hereford, the relict of a copyhold tenant is admitted to her *free bench*, i. e. to all her huſband's copyhold land, during her life, at the next court after her huſband's death.

In the manors of Eaſt and Weſt Enbourne, in Berks, if a cuſtomary tenant die, the widow ſhall have a *free bench* in all his copyhold lands, only *dum ſola & caſta fuerit*: if ſhe commits incontinency, ſhe forfeits her eſtate; but if ſhe will come into court, riding backwards on a black ram, with his tail in her hand, rehearſing a certain form of words, in the nature of a confeſſion and petition, the ſteward is bound by the cuſtom to reſtore her to her *free bench*. The words are theſe:

Here I am
Riding upon a black ram,
Like a whore as I am:
And for my crincum crancum
I have loſt my bincum bancum,
And for my tail's game
Have done this worldly ſhame;
Therefore, pray, Mr. Steward, let me have my land again.

The like cuſtoms hold alſo in the manor of Chadleworth, in Berks; that of Tor, in Devonſhire; and in ſome other parts of the Weſt.

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FREE-*booter*, or FLIBUSTER, a name given to the pirates, who ſcour the American ſeas; particularly ſuch as make war againſt the Spaniards.

The French call them *flybuſters*, deducing the word from the Engliſh *flibote*, or *flybote*; by reaſon the firſt adventurers of this kind were the people of St. Domingo, who made their excurſions with flybotes, which they had taken from the Engliſh. See BUCCANEER.

FREE *bord*, *franc bord*. In ſome places three feet, in others more, and in others leſs, is claimed by way of *free bord*, beyond or without the fence.

Et totum boſcum, quod vocatur brendewode, *cum* franc bordo *duorum pedum, & dimid. per circuitum illius boſci.* Mon. Ang. 2d part, fol. 241.

FREE *chapel*, is a chapel founded by the king, and by him exempted from the juriſdiction of the ordinary. See CHAPEL.

A ſubject may alſo be licenſed by the king to build ſuch a chapel, and by his charter may exempt it from the viſitation of the biſhop, &c.

FREE or *imperial cities* in Germany, are thoſe not ſubject to any particular prince; but governed, like republics, by their own magiſtrates.

There were *free cities*, *liberæ civitates*, even under the ancient Roman empire: ſuch were thoſe to whom the emperor, by the advice or conſent of the ſenate, gave the privilege of appointing their own magiſtrates, and governing themſelves by their own laws. See CITY.

FREE *fair*. See FAIR.

FREE *fee*. See FEE and FRANK.

FREE-*maſon*. See MASON.

FREE *port*. See PORT.

FREE *ſtate*, is a republic governed by magiſtrates, elected by the *free* ſuffrages of the inhabitants.

FREE-*ſtone*, a whitiſh ſtone, dug up in many parts of England, that works like alabaſter; but is more hard and durable, being of excellent uſe in building, &c.

It is a kind of the gritt ſtone, but finer ſanded, and a ſmoother ſtone; and is called *free-ſtone*, from its being of ſuch a conſtitution as to be cut freely in any direction. This is a ſpecies of the PSADURIA of Hill.

The qualities of the ſeveral kinds of *free-ſtone*, in common uſe in the ſeveral parts of Europe, are very different. They all agree in this general property indeed, that they are ſofter while in the quarry than when they have been ſome time expoſed to the air: but even this general property differs greatly in degree. They have a ſort of grey *free-ſtone* in uſe at Paris, of which we do not ſeem yet to have met with any quarries in England, though probably enough there are ſuch, which has this property in ſo eminent a degree, that the expence of working it is in a great meaſure ſaved.

This ſtone lies every where on the ſouth ſide of the river Seine, and is of a coarſe and large gritt. It is ſo ſoft when newly taken out of the ſtrata, that they cut it very conveniently with a ſort of broad axe, and faſhion as many ſtones for building in this manner in an hour, as an equal number of our people do in a day or two. Though this ſtone is as ſoft as dry clay when firſt taken up, it is found to harden ſo conſiderably in the air, that it becomes more than equal to our ordinary *free-ſtone*.

Our Portland ſtone, of the fineſt kind, which is white, and of a cloſe gritt, is very fit for hewing or carving, but it will neither reſiſt water nor fire, which is a very ſingular circumſtance in ſo denſe a ſtone; while the *free-ſtone* of Kent, which is leſs beautiful to the eye, and is of a greyiſh colour, and conſiderably cloſe, though of a larger grain, reſiſts the air and water very well.

The *free-ſtone* of Derbyſhire, on the other hand, is ſo brittle as to be unfit for any fine working, and ſo coarſe and open in its texture that it lets water through; yet it bears the fire extremely well, and is fit for ovens, hearths, &c. Phil. Tranſ. N° 93.

FREE-*ſtool*. See FRIDSTOLL.

FREE-*thinker*. See DEIST.

FREE-*warren*, the power of granting or denying licence to any one to hunt in ſuch and ſuch ground.

FREE-*will*. See WILL.

FREEDOM, the quality or ſtate of being *free*. See FREE.

FREEDOM *of a city*, *town*, &c. denotes a right or capacity of exerciſing a certain trade or employment in that city or town corporate, and of being elected to the dignities and offices thereof. It is procured regularly, by ſerving an apprenticeſhip; but ſometimes purchaſed with money, and ſometimes conferred as a favour or compliment.

FREEDOM *of the will*, a ſtate or faculty of the mind, wherein all the motions of our will are in our power, and we are enabled to determine on this or that; to do good or evil, without any force or conſtraint from any external cauſe whatever. See LIBERTY, and NECESSITY.

FREEDOM *of conſcience*. See LIBERTY, and TOLERATION.

The ſchoolmen diſtinguiſh two kinds of this *freedom*, viz.

FREEDOM *of contradiction*, whereby we are at our choice to will, or nill; to love, or not to love, &c.

Thus, if I give my friend a power to take my horſe, that friend has *freedom* of contradiction with reſpect to the horſe; ſince it is in his own power either to uſe him, or let him alone.

FREEDOM *of contrariety*, or of *contraries*, is that whereby we are at our choice to do good or evil, to be virtuous or vicious.

Thus, if I offer my friend a horſe, or a lion, and give him his option of the two, he is ſaid to have a *liberty of contrariety* over the horſe and lion.

But the logicians charge this as a faulty or unartful diviſion, in regard one member of the diviſion is contained in the other, as a ſpecies in the genus; for whatever is free, in reſpect of contradiction, is alſo free in reſpect of contrariety, though not vice verſa: for if it be free for my friend to take the horſe, or the lion, it is alſo free for them to let them both alone; but he may be free to take one of them, without a *freedom* of chuſing which to take.

Yet is the diſtinction of ſome uſe; as it intimates, that the will is not always poſſeſſed of both kinds of *freedom*, and that the matter or ſubject of the two is different.

The will, though it ſhould be allowed to be free, has not a liberty of contrariety: thus, any evident truth being propoſed to the mind, e. gr. that the whole is greater than a part, though we may have a power of not aſſenting thereto, by diverting our attention to ſomething elſe, yet we have not a power of diſſenting from that propoſition, and judging that the whole is not greater than the part.

Hence moraliſts commonly hold, that with reſpect to the ſupreme good, mankind has a liberty of contradiction, inaſmuch as he may abſtain from the love or purſuit thereof; but he has not a liberty of contrariety, whereby to hate goodneſs.

Add, that though the human mind may have a *freedom* of contradiction with reſpect to all objects, even the ſupreme good itſelf; yet the *freedom* of contrariety is reſtrained to certain particulars, which either are, or appear to be good; the will having ſuch a natural propenſity to good, that it cannot deſire evil, but under the notion and appearance of good.

FREEDOM *of thinking*. See DEISM.

FREEHOLD, FRANK TENEMENT, *liberum tenementum*, is land, or tenement, which a man holds in FEE-*ſimple*, FEE-*tail*, or for term of life.

Freehold is of two kinds, in *deed*, and in *law*.

The firſt is the real poſſeſſion of land or tenement in fee, fee-tail, or for life: the other is the right a man has to ſuch land or tenement before his entry or ſeizure.

A *freehold*, by the common law, cannot commence *in futuro*, but it muſt take effect preſently, either in poſſeſſion, reverſion, or remainder. Whatever is part of the *freehold* goes to the heir; and things fixed thereto may not be taken in diſtreſs for rent, or in execution, &c. No man ſhall be diſſeiſed of his *freehold* by ſtat. Magna Charta, cap. 29. but by judgment of his peers, or according to the laws of the land: nor ſhall any diſtrain freeholders to anſwer for their *freehold*, in any thing concerning the ſame, without the king's writ. *Freehold* eſtates, of certain value, are required by ſtatutes to qualify jurors, electors of the knights of the ſhire in parliament, &c. For the method of finding the value of *freehold* eſtates, ſee ANNUITIES and LIFE-ANNUITIES.

FREEHOLD is likewiſe extended to ſuch offices as a man holds in FEE, or for life.

FREEHOLD is alſo ſometimes taken in oppoſition to VILLENAGE.

Lambard obſerves, that land, in the Saxons time, was diſtinguiſhed into bockland, i. e. holden by book, or writing; and folkland, held without writing.

The former, he ſays, was held on far better condition, and by the better ſort of tenants, as noblemen and gentlemen; being ſuch as we now call *freehold*: the latter was moſtly in poſſeſſion of peaſants; being the ſame with what we now call *at the will of the lord*.

In the ancient laws of Scotland, *freeholders* are called *milites*, *knights*. In Reg. Judicial. it is expreſſed, that he who holds land upon an execution of a ſtatute merchant, until he hath ſatisfied the debt, *tenet ut liberum tenementum ſibi & aſſignatis ſuis*; and the ſame of a tenant per elegit: the meaning of which ſeems to be, not that ſuch tenants are *freeholders*, but as *freeholders* for the time, till they have received profits to the value of their debt.

FREEZE, or FRIZE, in *Architecture*, that part of the entablature of columns, between the architrave and corniche. See *Tab. Archit. fig.* 24, 25. N° 10. 26, 27, 28.

The *freeze* is properly a large, flat face, or member, ſeparating the architrave from the corniche.

The

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The ancients called it *zoophorus*, ζωοφορος, becauſe it was uſually enriched with figures of animals; and our denomination *freeze* has a like origin, being formed of the Latin *phrygio*, *an embroiderer*, becauſe it is commonly adorned with ſculptures in baſſo relievo, imitating embroidery.

The *freeze* is ſuppoſed to be intended to repreſent the heads of the tranſverſe beams that ſuſtain the roof or covering.

In the Tuſcan order it is quite plain; in the Doric, enriched with triglyphs, or channelled figures, with ſpaces between them, called metopes, which are often plain, and ſometimes ornamented; in the Ionic, it is ſometimes made arched, or ſwelled, in which caſe it is called by Vitruvius, *pulvinatus*, q. d. *bolſtered*; in the Corinthian, and Compoſite, it is frequently joined to the architrave, by a little ſweep, and ſometimes to the corniche: and in theſe richer orders it is uſually adorned with ſculpture, figures, compartiments, hiſtories, foliages, feſtoons, &c. The *freezes* of the Corinthian order at Palmyra are very richly decorated.

As to the height of the *freeze*, it is in general $\frac{3}{4}$ of that of the architrave; but not ſtrictly or exactly. The Tuſcan *freeze*, Vitruvius makes 30 minutes; Vignola, 35; Palladio, who makes it ſwelling, gives it but 26; and Scamozzi, 42. The Doric, in Vitruvius and Vignola, is 30 or 40 minutes; in Palladio, &c. 45. The Ionic, Vitruvius makes flat, adorned with acanthus-leaves, lions, &c. and makes it thirty minutes high; Vignola, who alſo makes it flat, gives it 45 minutes; and Palladio, who makes it convex, or ſwelling, 27 minutes; and Scamozzi, 28. The Corinthian, Vitruvius enriches with acanthus-leaves, human figures, &c. and makes its height 37 minutes; Vignola, 45; Palladio, 28; and Scamozzi, $31\frac{1}{4}$. Laſtly, the Compoſite, which in Vitruvius is ſet with cartoozes, and carved between them, is $52\frac{1}{2}$ minutes; Vignola, who makes it like Vitruvius, only gives it 45 minutes; Palladio, who makes it ſwelling, only 30; and Scamozzi, 32. See the table under art. COLUMN.

From the variety of enrichments practiſed on the *freezes*, they become variouſly denominated: as

FREEZES, *convex*, or *pulvinated*, are thoſe whoſe profile is a curve; the beſt proportion whereof is, when drawn on the baſe of an equilateral triangle.

In ſome, the ſwelling is only at the top, as in a conſole; in others at bottom, as in a baluſter.

FREEZES, *flouriſhed*, are thoſe enriched with rinds, or imaginary foliages, as the Corinthian *freeze* of the frontiſpiece of Nero; or with natural leaves, either in cluſters or garlands; or continued, as in the Ionic of the gallery of Apollo in the Louvre.

FREEZES, *hiſtorical*, are thoſe adorned with baſs-relievos, repreſenting hiſtories, ſacrifices, &c. as that of the arch of Titus at Rome.

FREEZES, *marine*, are thoſe repreſenting ſea-horſes, tritons, and other attributes of the ſea; or ſhells, baths, grottos, &c.

FREEZES, *ruſtic*, are thoſe whoſe courſes are ruſticated, or imboſſed; as the Tuſcan *freeze* of Palladio.

FREEZES, *ſymbolical*, are thoſe adorned with the attributes of religion; as the Corinthian of the temple behind the capitol at Rome, whereon are repreſented the inſtruments and apparatus of ſacrifice.

FREEZE *of the capitol*. See HYPOTRACHELION.

FREEZE, in *Commerce*, a kind of cloth, or ſtuff. See FRIZE.

FREEZING, *congelation*, in *Phyſiology*, the fixing of a fluid, or depriving it of its natural mobility, by the action of cold; or it is the act of converting a fluid ſubſtance into a firm, coherent, rigid one, called *ice*.

The Carteſians define *freezing* by the quietude or reſting of a fluid body, hardened by cold; which follows naturally enough from their notion of fluidity, where the parts are ſuppoſed to be in a continual motion.

In effect, one may pretty ſafely ſay, with ſome of thoſe philoſophers, that water *freezes*, becauſe, among other reaſons, its parts loſe their natural motion, and adhere cloſe to each other.

FREEZING, *the principal phenomena of*, are, 1. That water, and all fluids, oil alone excepted, dilate in *freezing*, i. e. take more ſpace, and are ſpecifically lighter than before.

That the bulk or dimenſions of water are increaſed by *freezing*, is matter of abundant experiment: and here it may be proper to obſerve the proceſs of nature in this alteration.

A glaſs veſſel, then, BD (*Tab.* II. *Pneum. fig.* 20.) full of water to G, being immerged in a veſſel of water, mixed with ſalt, RSTV, the water preſently riſes from E to F; which ſeems owing to the ſudden conſtriction of the veſſel haſtily plunged into ſo cold a medium. Soon after, from the point F it continually deſcends, condenſing, till it arrives at the point G; where, for ſome time, it ſeems to remain at reſt. But it ſoon recovers itſelf, and begins to expand, riſing from G to H; and from thence, ſoon after, by one violent leap, mounts to I. And here the water in B is immediately ſeen all thick and cloudy; and, in the very inſtant of this leap, is converted into ice. Add, that while the ice is growing harder, and ſome of the water near the neck of the veſſel B is *freezing*, the flux of water is continued above I, towards D, and at length runs out of the veſſel.

Mr. Boyle gives us ſeveral experiments of veſſels made of metals, exceeding thick and ſtrong; in which, when filled with water, cloſe ſtopped, and expoſed to the cold, the water, in *freezing*, coming to be expanded, and not finding either room, or vent, burſt the veſſels.

A ſtrong barrel of a gun, with water in it, cloſe ſtopped and *frozen*, was rent the whole length. Huygens, in order to try the force with which it would expand itſelf when confined, filled a cannon, the ſides of which were an inch thick, with water, and then cloſed the mouth and touch-hole, ſo that none could eſcape. The inſtrument thus filled was expoſed to a ſtrong *freezing* air. In leſs than twelve hours the water within was *frozen*, and began to dilate itſelf with ſuch force, that it actually burſt the piece in two different places. Mathematicians have calculated the force of the ice upon this occaſion; and they ſay, that ſuch a force would raiſe a weight of 27,720 pounds; and a ſmall braſs veſſel, five inches deep, and two in diameter, filled with water, &c. lift up its lid, which was preſſed with a weight of fifty-ſix pounds.

From hence, therefore, we need not be ſurpriſed at the effects of ice in deſtroying the ſubſtance of vegetables and trees, and even ſplitting rocks, when the froſt is carried to exceſs.

2. That they loſe not only of their ſpecific, but alſo of their abſolute gravity, by *freezing*; ſo that, when thawed again, they are found conſiderably lighter than they were before.

3. That *frozen* water is not quite ſo tranſparent as when liquid; and that bodies do not perſpire ſo freely through it.

4. That water, when *frozen*, evaporates almoſt as much as when fluid.

5. That water does not *freeze* in vacuo; but neceſſarily requires the preſence and contiguity of the air.

6. That water which has been boiled, *freezes* more readily than that which has not been boiled; and that a ſlight diſturbance of the fluid diſpoſes it to *freeze* more ſpeedily. Theſe two facts have lately been aſcertained by the experiments of Dr. Black of Edinburgh. The cauſe why boiling water accelerates its *freezing*, he ſuppoſes to be this; that water which has been boiled has loſt the air naturally contained in it, and which, on being expoſed to the atmoſphere, it begins to attract and abſorb. During this proceſs of abſorption, which probably continues for a conſiderable time, a motion is neceſſarily produced among its particles, which, though imperceptible, may be ſufficient to accelerate its congelation. In unboiled water this diſturbing cauſe does not exiſt. This account is confirmed by a fact mentioned by Fahrenheit, who diſcovered, that water, when preſerved at reſt, may be cooled ſome degrees below the *freezing* point without *freezing*. Having put water, purged of its air, into ſmall glaſs globes, and ſealed them up, he was ſurpriſed to find that the water, expoſed to a froſty air, remained much longer unfrozen than he expected. Upon opening ſome of the globes, and admitting the air, a ſudden congelation took place, and a ſimilar production of ice was occaſioned in the other globes, by ſhaking them. From this diſcovery, we are able to underſtand why they boil the water in India, in order to obtain ice; becauſe the utmoſt intenſity of cold they can obtain is not greater than 31° or 30° of Fahrenheit; but common water may eaſily be cooled to this degree, provided it be undiſturbed, without *freezing*; whereas this cannot happen to boiled water. Phil. Tranſ. vol. lxv. part i. art. 13.

7. That the water, being covered over with a ſurface of oil of olives, does not *freeze* ſo readily as without it; and that nut-oil abſolutely preſerves it under a ſtrong froſt, when olive-oil would not.

8. That rectified ſpirit of wine, nut-oil, and oil of turpentine, ſeldom *freeze*.

9. That the ſurface of the water, in *freezing*, appears all wrinkled; the rugæ, or wrinkles, being ſometimes in parallel lines, and ſometimes like rays, proceeding from a centre to the circumference.

FREEZING, *the theories of*, or the methods of accounting for theſe phenomena, are very numerous. The great principles different authors have gone upon, are either, that ſome foreign matter is introduced within the pores of the fluid, by whoſe means it is fixed, its bulk increaſed, &c.

Or, that ſome matter naturally contained in the fluid, is now expelled; by the abſence whereof the body becomes fixed, &c.

Or,

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Or, that there is ſome alteration produced in the texture or form, either of the particles of the fluid itſelf, or of ſomething contained within it.

To ſome one of theſe principles all the ſyſtems of *freezing* are reducible.

The Carteſians, who aſcribe all to the quietude of the parts of the fluid, before in motion, account for *freezing* from the receſs of the ethereal matter out of the pores of the water. The activity of that ether, or ſubtle matter, they hold to be that which gave the particles of the fluid their motion; conſequently, upon the abſence of this matter, the fluidity muſt ceaſe.

Though others of the ſame ſect aſcribe *freezing* to a diminution of the uſual force and efficacy of the ethereal matter, occaſioned by an alteration in the temperature of the air, whereby it is incapacitated for agitating the parts of the fluid as uſual.

The Gaſſendiſts, and other Corpuſcularians, with more probability, aſcribe the *freezing* of water to the ingreſs of a multitude of cold or frigorific particles, which, entering the liquor in ſwarms, and diſperſing themſelves every way through it, croud into the minuteſt parts of the water, and hinder the wonted agitation of its parts, wedging it up, as it were, into the hard and conſiſtent body of ice. And hence its increaſe of dimenſions, coldneſs, &c.

This intromiſſion of a foreign frigorific matter they ſuppoſe eſſential to CONGELATION, as that which characterizes and diſtinguiſhes it from COAGULATION; the latter being effected indifferently by a hot or cold mixture, but the former only by a cold one.

Of what kind theſe frigorific particles are, or how they produce their effect, is matter of debate, and has given occaſion to various ſyſtems.

Hobbes will have them to be common air, which, intruding into the water in congelation, entangles itſelf with the particles of the fluid, prevents their motion, and produces thoſe numerous bubbles obſerved in ice; thus expanding its bulk, and rendering it ſpecifically lighter: but this opinion is overturned by Mr. Boyle, who ſhews, that water will freeze in veſſels hermetically ſealed, and into which the air can have no ingreſs; and yet the bubbles will be as numerous herein, as in that frozen in the open air. Add, that oil is condenſed in *freezing*; conſequently, the air cannot there be the cauſe.

Others, of whom there is the greateſt number, will have the *freezing* matter to be a ſalt; arguing, that an exceſs of cold will render water torpid, but can never congeal it, without ſalt. They are ſaline particles, ſay they, and thoſe diſſolved and mixed in a due proportion, that are the chief cauſe of *freezing*, congelation bearing a near relation to CRYSTALLIZATION.

This ſalt they ſuppoſe of the nitrous kind, and to be be furniſhed by the air, which is generally allowed to abound in nitre. See AIR, and NITRE.

How the particles of nitre may prevent the fluidity of water, is pretty eaſily accounted for: theſe particles are ſuppoſed to be ſo many rigid, pointed ſpicula, which are eaſily driven into the ſtamina, or globules, of the water, and thus becoming variouſly mingled and entangled therewith, by degrees enfeeble and deſtroy the motion thereof. The reaſon this effect only ariſes in ſevere winter weather is, that it is then only that the retarding action of the nitrous ſpicula is more than equal to the power, or principle, whereby the fluid is otherwiſe kept in motion, or diſpoſed for motion.

This opinion is ſupported by the known experiment of artificial *freezing*. See FREEZING *mixture*. Let a quantity of common ſalt, or ſalt-petre, be mixed with ſnow, or ice pulverized, and the mixture diſſolved by the fire; upon immerging a tube full of water in the ſolution, the water, or at leaſt that part of it next the mixture, preſently freezes, even in warm air. Whence it is imagined, that the ſpicula of the ſalt, by the gravity of the mixture, and of the incumbent air, are driven through the pores of the glaſs, and mixed with the water; for that it is the ſalt has the effect, is ſuppoſed evident; inaſmuch as we know, aſſuredly, that the particles of water cannot find their way through the pores of glaſs. In theſe artificial *freezings*, whatever part the mixture is applied in, there is preſently produced a ſkin, or lamina, of ice, whether at top, or bottom, or on the ſides; becauſe there is always a ſtock of ſaline corpuſcles ſufficient to overpower the corpuſcles of fire; but natural congelations are confined to the top of the water, where the ſalt moſt abounds.

Againſt this ſyſtem the author of the Nouvelle Conjecture pour expliquer la Nature de la Glace, objects, that it does not appear, that nitre always enters the compoſition of ice; but that if it did, it would come ſhort of accounting for ſome of the principal effects. For how, for inſtance, ſhould the particles of nitre, by entering the pores of water, and fixing the parts, oblige the water to dilate, and render it ſpecifically lighter? Naturally they ſhould augment its weight. This difficulty, with ſome others, evince the neceſſity of a new theory. That author, therefore, advances the following one, which ſeems to ſolve the phenomena in a more eaſy and ſimple manner; as not depending on the precarious admiſſion, or extruſion, of any heterogeneous matter.

Water, then, *freezes* in the winter only, becauſe its parts, being then more cloſely joined together, mutually embarraſs one another, and loſe all the motion they had; and the cauſe of this cloſer union of the water, is the air; or, more expreſly, an alteration in the ſpring and force of the air.

That there is an infinite number of particles of groſs air interſperſed among the globules of water, is abundantly evident from experiment; and that each particle of air has the virtue of a ſpring, is confeſſed: now this author argues, that the ſmall ſprings of groſs air, mixed with the water, have more force in cold winter weather, and unbend themſelves more, than at other times: hence thoſe ſprings, thus unbending themſelves on one ſide, and the external air continuing to preſs the ſurface of the water on the other, the particles of water, thus conſtringed and locked up together, muſt loſe their motion and fluidity, and form a hard conſiſtent body; till a relaxation of the ſpring of the air, from an increaſe of heat, reduces the particles to their old dimenſions, and leaves room for the globules to flow again.

But this ſyſtem has its foible: even the principle on which it ſtands, may be demonſtrated to be falſe. The ſpring, or elaſticity of the air, is not increaſed by cold, but diminiſhed. Air expands itſelf by heat, and condenſes by cold; and it is demonſtrated, in pneumatics, that the elaſtic force of expanded air, is to that of the ſame air condenſed, as its bulk, when rarefied, to its bulk condenſed.

It is ſcarce worth mentioning, that ſome authors have advanced, to account for the increaſe of bulk and diminution of ſpecific gravity of frozen water, that the aqueous particles in their natural ſtate were nearly cubes, and ſo filled that ſpace without the interpoſition of many pores; but that, by congelation, they are changed from cubes to ſpheres; whence a neceſſity of much empty ſpace between them. Cubic particles are certainly much leſs proper to conſtitute a fluid, than ſpherical ones; and ſpherical particles leſs diſpoſed to form a fixt, than cubic ones. Thus much the nature of fluidity and firmneſs eaſily ſuggeſts. For a conſiſtent theory of *freezing*, we muſt recur either to the frigorific matter of the Corpuſcularians, conſidered under the light and advantages of the Newtonian philoſophy; or to the ethereal matter of the Carteſians, under the improvements of Monſ. Gauteron, in the Memoires de l'Academie Royale des Sciences, an. 1709.

Each of which we ſhall here ſubjoin; and leave the reader to make his choice. For the firſt: a number of cold ſaline corpuſcles, being introduced into the interſtices between the globules of water, may be ſo near each other, as to be within the ſphere of one another's attraction; the conſequence of which muſt be, that they will cohere into one ſolid or firm body; till heat afterwards, ſeparating them, and putting them into various motions, breaks this union, and ſeparates the particles ſo far from one another, that they get out of the diſtance of the attracting force, and into the verge of the repelling force; and then the water reaſſumes its fluid form.

For that cold and *freezing* do ariſe from ſome ſubſtance of a ſaline nature, floating in the air, ſeems probable, hence, that all ſalts, and more eminently ſome particular ones, when mixed with ſnow, or ice, do prodigiouſly increaſe the force and effects of cold: add, that all ſaline bodies do produce a ſtiffneſs and rigidity in the parts of thoſe bodies into which they enter.

Microſcopical obſervations upon ſalts manifeſt, that the figures of ſome ſalts, before they ſhoot into maſſes, are thin, double, wedge-like particles, which have abundance of ſurface with reſpect to their ſolidity (the reaſon why they ſwim in water, when once raiſed in it, though ſpecifically heavier); theſe ſmall points of the ſalt getting into the pores of the water, whereby, alſo, they are in ſome meaſure ſuſpended in the winter-time (when the heat of the ſun is not ſtrong enough to diſſolve the ſalts into a fluid, to break their points, or to keep them in perpetual motion), being leſs diſturbed, and more at liberty to approach one another; and, by ſhooting into cryſtals of the form above mentioned, do, by their extremities, inſinuate themſelves into the minuteſt pores of the water, and, by that means, *freeze* it into a ſolid form.

Farther, there are many little volumes, or particles, of air, included at ſeveral diſtances, both in the pores of the watery particles, and in the interſtices left by the ſpheri-

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cal figures. By the inſinuation of the ſaline cryſtals, the volumes of air are driven out of the watery particles, and many of them uniting, form larger volumes, which thereby have a greater force to expand themſelves, than when diſperſed; and ſo both enlarge the dimenſions, and leſſen the ſpecific gravity of the water, thus congealed into ice.

Hence, alſo, we may conceive how water, impregnated with ſalts, ſulphurs, or earths, which are not eaſily diſſolvable, may form itſelf into metals, minerals, bitumens, and other foſſils; the parts of theſe mixtures becoming a cement to the particles of water; or, getting into their pores, change them into theſe different ſubſtances.

For the ſecond: as an æthereal matter, or medium, is generally allowed the cauſe of the motion of fluids; and as the air itſelf has all its motion from the ſame principle; it follows, that all fluids muſt remain in a ſtate of reſt, or fixity, when this matter loſes of its neceſſary force: of conſequence, the air, being leſs warmed in the winter-time, from the obliquity of the rays of the ſun, is denſer, and more fixed, in winter, than any other ſeaſon of the year.

But, farther, from divers experiments we have learned, that the air contains a ſalt, ſuppoſed to be of the nature of nitre: this granted, and the denſity of the air allowed, it follows, that the molecules of this nitre muſt likewiſe be brought nearer together, and thickened, by the condenſation of the air; as, on the contrary, a rarefaction of the air, and an augmentation of its fluidity, muſt divide and ſeparate them.

If, now, the ſame thing happen to all liquors that have imbibed or diſſolved any ſalt; if the warmth of the liquid keep the ſalt exactly divided; and if the coolneſs of a cellar, or of ice, give occaſion to the molecules of the diſſolved ſalt to approach, run into each other, and ſhoot into cryſtals; why ſhould the air, which is allowed a fluid, be exempt from the general law of fluids?

It is true, the nitre, or the air, being groſſer in cold weather than hot, muſt have leſs velocity; but ſtill the product of its augmented maſs, into the velocity remaining, will give it a greater momentum, or quantity of motion; nor is any thing farther required to make this ſalt act with greater force againſt the parts of fluids; and, probably, this is the cauſe of the great evaporation in froſty weather.

This aerial nitre muſt promote the concretion of liquids; for it is not the air, nor yet the nitre it contains, that gives the motion to fluids; it is the ethereal medium. From a diminution of the force of that, therefore, ariſes a diminution of the motion of the reſt.

Now the ethereal matter being weak enough of itſelf, in the winter-time, muſt loſe ſtill more of its force by its action againſt air condenſed, and loaded with large molecules of ſalt: it muſt, therefore, loſe of its force in cold weather, and become leſs diſpoſed to maintain the motion of fluids. In a word, the air, during froſt, may be eſteemed like the ice impregnated with ſalt, wherewith we ice our liquors in ſummer time. Thoſe liquors, in all probability, *freeze*, from a diminution of the motion of the ethereal medium, by its acting againſt the ice and ſalt together; and the air, for all its ſcorching heat, is not able to prevent its concretion.

FREEZING *mixture*, a preparation for the artificial congelation of water, and other liquors.

All kinds of ſalts, whether alcaliſate or acid; and even all ſpirits, as thoſe of wines, &c. as alſo ſugar, and ſaccharum Saturni, mixed with ſnow, are capable of *freezing* moſt fluids; and the ſame effect is produced, in a very great degree, by a mixtion of oil of vitriol, or ſpirit of nitre, with ſnow. Thus Mr. Boyle.

M. Homberg obſerves the ſame of equal quantities of corroſive ſublimate, and ſal ammoniac, with four times the quantity of diſtilled vinegar.

Boerhaave gives us a method of producing artificial froſt, without either ſnow or ice: we muſt have for this purpoſe, at any ſeaſon of the year, the coldeſt water that can be procured; this is to be mixed with a proper quantity of any ſalt (ſal ammoniac will anſwer the intention beſt), at the rate of about three ounces to a quart of water. Another quart of water muſt be prepared in the ſame manner with the firſt; the ſalt, by being diſſolved in each, will make the water much colder than it was before. They are then to be mixed together, and this will make them colder ſtill. Two quarts more of water prepared and mixed in the ſame manner are to be mixed with theſe, which will increaſe the cold to a much higher degree in all. The whole of this operation is to be carried on in a cold cellar; and a glaſs of common water is then to be placed in the veſſel of liquor thus artificially cooled, and it will be turned into ice in the ſpace of twelve hours.

There is a method of making artificial ice by means of ſnow, without any kind of ſalt: for this purpoſe fill a ſmall pewter diſh with water, and upon that place a common pewter plate filled, but not heaped, with ſnow. Bring this ſimple apparatus near the fire, and ſtir the ſnow in the plate: the ſnow will diſſolve, and the ice will be formed on the back of the plate, which was ſet in the diſh of water.

Nothing is more commonly known than the method of congealing liquors into ice by an artificial froſt, even in the warmeſt ſeaſon; but it does not ſeem to be yet known what are the ſalts moſt efficacious of all on this occaſion, or, in other words, what ſalt is capable of producing the greateſt degree of artificial cold, or in what manner it may be beſt uſed, and what proportion it ought to bear with the powdered ice or ſnow that is uſed on the occaſion. The common proceſſes are known, but few have enquired ſo curiouſly into the whole as ſo nice a ſubject ſeems to deſerve.

Mr. Reaumur at length took the whole into conſideration, and examined the various degrees of cold by a nice thermometer, which being placed in the liquor to be frozen, ſhewed very exactly the degree of cold by the deſcent of the ſpirit.

Salt-petre uſually paſſes for a ſalt that may be very ſerviceable in theſe artificial congelations; but the experiments of this gentleman prove, that this is an erroneous opinion. The moſt perfectly refined ſalt-petre employed in the operation ſunk the ſpirit in the thermometer but three degrees and a half below the fixed point.

Of the ſalt petre he uſed, the unrefined makes the ſpirit ſink conſiderably lower; the cauſe of which is, that the rough ſalt petre contains a large quantity of common, or ſea ſalt; and this being able to cauſe a greater degree of cold than the ſalt it is mixed with, exerts itſelf with it, and carries it to a greater degree of coldneſs: whereas in the refining ſalt-petre, this ſea ſalt is thrown out, and conſequently the nitre becoming purer, acts only on its own principle, and cauſes a leſs degree of cold, ſuch as is its appropriated one.

Two parts of common ſalt being mixed with three parts of powdered ice in very hot weather, the ſpirit in the thermometer immediately deſcended fifteen degrees, which is half a degree lower than it would have deſcended in the ſevereſt cold of the year 1709. Mr. Reaumur after this experimented the ſalts all round, and tried with great regularity and exactneſs, what was the degree of cold occaſioned by each in a given doſe. Among the neutral ſalts, none produced a greater degree of cold than the common ſea ſalt. Among the alkalies, ſal armoniac, though generally eſteemed ſo very powerful a one on theſe occaſions, ſunk the thermometer only to thirteen degrees. Pot-aſhes ſunk it juſt as low as well refined ſalt-petre. Thus by trials of the ſeveral ſalts, the proper degree of cold producible from each is eaſily aſcertained, and tables may be made of the numbers. After which, in the deſcribing any degree of cold in a particular ſeaſon, it will be a much better way of expreſſing it, to ſay, it was equal to that produced by ſuch or ſuch a ſalt, than to name it by the degrees of a thermometer.

For the common uſes of the table, the ice required is not expected to be very hard, or ſuch as is produced by long continuance of violent cold: it is rather deſired to be like ſnow. Salt-petre, which is no very powerful *freezer*, is therefore more fit for the purpoſe than a more potent ſalt. It is not required that the congelations ſhould be very ſuddenly made; but its retaining its form as long as may be when made, is a thing of great importance to the dealer in theſe things; nor is the price of the ſalts which are to be uſed for this purpoſe, a matter of indifference.

If it be deſired to have ices very hard and firm, and very ſuddenly prepared, then ſea ſalt is of all others moſt to be choſen for the operation. The ices thus made will be very hard, but they will keep only a very little time without running. Pot-aſhes afford an ice of about the hardneſs that is uſually required. This forms indeed very ſlowly, but then it will preſerve itſelf a long time. And there is another ſubſtance which performs the buſineſs very nearly in the ſame manner with the pot-aſhes, and that on the ſame principle. This is a very cheap and ſimple one, being no other than common wood aſhes; but for this purpoſe the wood, which is burnt, ought to be freſh.

The ſtrong acid ſpirits of the neutral ſalts act much more powerfully in theſe congelations than the ſalts themſelves, or indeed than any ſimple ſalt can do. Thus ſpirit of nitre mixed with twice its quantity of powdered ice, immediately ſinks the ſpirit in the thermometer to nineteen degrees; that is, it produced a cold of four degrees greater than that obtained by means of ſea

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ſea ſalt, the moſt powerful of all the ſalts in making artificial cold. A much greater degree of cold may be given to this mixture by piling it round with more ice mixed with ſea ſalt. This gives a redoubled cold, and on the trial the thermometer was found to ſink to twenty-four degrees; that is, a degree of cold was thus artificially produced, which was to the greateſt known natural cold, that of the ſevere winter in 1709, as twelve to ſeven, or thereabouts. If this whole matter be covered with a freſh mixture of ſpirit of nitre and ice, a yet greater degree of cold is produced, and ſo on; the cold being by this method of freſh additions to be increaſed almoſt without bounds: but every addition, it is obſerved, gives a ſmaller increaſe than the former.

It is very remarkable in the acid ſpirits, that though ſea ſalt is ſo much more powerful than nitre in ſubſtance in creating cold, yet the ſpirit of nitre is much ſtronger than that of ſea ſalt; and another not leſs wonderful phenomenon is, that ſpirit of wine, a liquor which is little other than a liquid fire, has as powerful an effect in cogelations, or very nearly ſo, as the ſpirit of nitre itſelf. What but experiment could have brought people to imagine, that theſe two ſo very different liquors could have this property as it were in common?

The mixture of any other matter with powdered ice does not create a new cold by any other means than that of melting the ice it is mixed with. The moment of that melting is therefore the point of time in which the cold is ſtrongeſt of all, as after that the warmth of the external air cannot but be continually taking off from the new engendered cold. It is plain from hence, that the quicker this melting is performed, the harder the ice muſt be, or the greater the degree of cold. It were much to be wiſhed therefore, that the melting could be inſtantaneous, as in that caſe the particles of ice would all act at one and the ſame time on the matter to be congealed: and in order to this, it is neceſſary that every particle of ice ſhould have a particle of ſalt ready to act upon it. This requires that the ice and the ſalt ſhould be both powdered to a certain fineneſs. Hence may be deduced a rule, which though not quite ſo preciſe, yet may be ſufficiently ſo for the determining the proper proportion of the ſalt to be mixed with any determinate quantity of ice. We well know from experiment, how large a quanity of water is neceſſary to melt a certain quantity of ſalt of any kind, and repeated experiments might bring the knowledge of the other ſolution to nearly as great a certainty. It would be well to try the whole carefully with ſea ſalt: and when the proportions of this were known, it would be no difficult matter from theſe to deduce the proper quantities of other ſalts, according to their known differences, in regard to the quantities of water neceſſary to diſſolve them.

The ſeveral liquid ſubſtances which create a cold, in the ſame manner as the dry ſalts on being mixed with ice, are much more ſpeedy in their action than the ſalts; becauſe they immediately and much more intimately come into contact with the particles of the ice, than the ſalts can. Of this nature are ſpirit of nitre, ſpirit of wine, &c. to produce the expected degree of cold, it is always neceſſary that the ice and the added matter, whatever it be, ſhould both run together and intimately uniting form one clear fluid; it is hence that no new cold is produced with oil, which though it melts the ice, yet cannot mix itſelf into a homogene liquor with it, but muſt always remain floating on the ſurface of the water, produced by the melting of the ice. Mem. Acad. Scienc. Par. 1734.

Of late there has been a more effectual method of congealing fluids than any yet recited. It has been diſcovered, that fluids ſtanding in a current of air, grow by this means much colder than before. Fahrenheit had long ſince informed us, that a pond, which ſtands quite calm, often acquires a degree of cold much beyond what is ſufficient for *freezing*, and yet no congelation enſued: but if a ſlight breath of air happens in ſuch a caſe to bruſh over the ſurface of the water, it ſtiffens the whole in an inſtant. However, a phenomenon attends this experiment, which has not yet been explained; for the water, before its congelation, and in its liquid ſtate, ſinks the thermometer very low, which ſhews its exceſſive degree of coldneſs; but as ſoon as it begins to congeal, by means of the air, or any other agitation, the thermometer riſes to the ordinary *freezing* point. It has been diſcovered alſo, that all ſubſtances grow colder by the EVAPORATION of the fluids which they contain, or with which they are mixed. If both theſe methods, therefore, are practiſed upon the ſame body at the ſame time, they will increaſe the cold to almoſt any degree of intenſeneſs we deſire. The moſt extraordinary inſtance of artificial *freezing* that has yet been recorded, is that of the Ruſſian experiments at Peterſburgh, in which quickſilver was congealed.

In December 1759, they had at Peterſburgh the coldeſt weather, and the moſt intenſe froſt, that ever was known, ſo that De Liſle's thermometer ſtood at 205 degrees: at that time profeſſor Braun repeated Fahrenheit's experiments, in order to produce artificial cold, by means of ſpirit of nitre combined with pounded ice or ſnow. Aqua fortis, found by the thermometer to be 204 degrees cold, was poured upon pounded ice, both the ice and aqua fortis being of the ſame temperature with the air; upon the firſt pouring, the mercury fell 20 degrees; the ſpirit was poured off and on again ſeveral times, but the mercury in the thermometer fell no lower than 234 degrees, ſo that no more than 30 degrees of cold could by theſe means be produced; but as Fahrenheit, Reaumur, and Muſchenbroek, who had repeated the ſame experiment, could never produce cold greater than 40° below 0 in Fahrenheit's thermometer, which correſponds with 210 in De Liſle's, uſed by profeſſor Braun, he ſatisfied himſelf with having added 20° to the cold formerly known.

However, he determined to vary his experiments; and being under a neceſſity of uſing ſnow inſtead of ice, which he afterwards found to be much preferable to it, at a time when the ſnow and aqua fortis were of the ſame degree of cold with the air, viz. 203°, he immerſed the thermometer in ſnow contained in a glaſs; and pouring a few drops of the aqua fortis on that part of the ſnow in which the thermometer was immerſed, he obſerved the mercury to ſubſide to 260; repeating the experiment in the ſame manner, and pouring on ſome more aqua fortis, the mercury immediately fell to 380. And, then, immerſing the thermometer, before it had loſt any of this acquired cold, in another glaſs filled with ſnow, the mercury ſubſided to 470°. Upon taking out the thermometer, the mercury was immoveable, and continued ſo in the open air for twelve minutes, and did not recover its fluidity and begin to riſe for ſome minutes after it was carried into a warm room, where the temperature of the air was 125°. He repeated the ſame experiment, firſt with the ſame, and then with another thermometer, with the ſame ſucceſs. Profeſſor Braun's thermometers had a ſpherical bulb, and their ſcale was divided into 1200 parts, of which 600 were above 0, which denotes the heat of boiling water, and 600 below that heat. He alſo uſed another thermometer, the ſcale of which went no lower than 360° below 0, denoting the heat of boiling water. The mercury ſoon deſcended in this thermometer, ſo that the whole was contained in the bulb; and the immobility of the mercury led him to conjecture, that it might be frozen or become a ſolid body. But as he had not broken his glaſſes, he could at that time only form a conjecture. At another time, when the cold was abated, and the thermometer ſtood at 199°, he repeated the experiment with a little variation: he firſt put the bulb of the thermometer into a glaſs of ſnow, gently preſſed down, before he poured on the aqua fortis; he then, in another glaſs, poured the aqua fortis upon the ſnow, before he immerſed the thermometer in it; and he alſo put the ſnow to the aqua fortis, before he put his thermometer in it: but in theſe ſeveral ways he found the event exactly the ſame; the mercury was immoveable; and breaking the bulb of the thermometer, he found the mercury ſolid, but not wholly ſo, as the middle part of the ſphere was not yet fixed. Mr. Æpinus repeated the ſame experiment, and the mercury in his thermometer fell, with extreme rapidity, almoſt to the 500th degree; and in breaking the glaſs from below, he found the quickſilver contained in it abſolutely frozen. The quickſilver, thus rendered ſolid, bore hammering and extenſion, like other metals; its hardneſs was like that of lead, though ſomewhat ſofter; and, upon ſtriking, it ſounded like lead. When the mercury was extended by theſe ſtrokes, it was eaſily cut with a penknife, and in its congealed ſtate looked like the moſt poliſhed ſilver; but in about twelve minutes, after being expoſed to the air, which was 197°, it recovered its former fluidity. In this laſt experiment of Mr. Braun, the mercury deſcended to 530°, and on the next day, the cold having increaſed to 212°, it deſcended to 650. In his following experiments, he invariably found, that the mercury ſunk lower, when the whole of it was congealed, than if any part of it remained fluid. It then generally deſcended to 680 and 700, but the bulbs were never, in any of his experiments, without cracks: moreover, the mercury, on other occaſions, deſcended to 800, and even to 1500; but, in this laſt experiment, the bulb was quite broke, ſo that the globe of mercury, thoroughly frozen, fell out, and by its fall, of about three feet, the ball of mercury became a little compreſſed. In another experiment, when the mercury deſcended to 1260°,

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1260°, the congealed ball was ſtruck ſeveral times with an ax, and became flat like an Engliſh half-crown; but receiving ſome cracks by the blows, it diſſolved in about twenty minutes.

Mr. Braun found, that, *cæteris paribus*, the more intenſe the natural cold was, the more eaſily and expeditiouſly did theſe experiments ſucceed; though with the nitrous acid poured on ſnow, mercury may be congealed at any time, when the heat of the atmoſphere is not greater than 175° by De Liſle's thermometer: and though the degree of cold neceſſary to conſolidate mercury cannot be preciſely aſcertained, yet Mr. Braun eſtimates it to be about 469 degrees in his thermometer. In the proceſs of his obſervations, Mr. Braun found that double aqua fortis was more effectual than ſpirit of nitre; but with the ſimple ſpirit of nitre, which ſeldom brings the mercury lower than 300°, mercury may be frozen in the following manner: let ſix glaſſes be filled with ſnow as uſual, and the thermometer be put in one of them, and the ſpirit of nitre be poured upon it; when the mercury would fall no lower in this, remove the thermometer to the ſecond, and ſo on to the third and fourth, in which fourth immerſion the mercury was congealed. Mr. Æpinus gives the following direction for uſing the fuming ſpirit of nitre: take the ſpirit of nitre, cooled as much as poſſible, and with it fill half a wine glaſs, throwing in as much ſnow at the ſame time, and ſtirring it till it becomes of the conſiſtence of pap; and you thus obtain, almoſt in an inſtant, the neceſſary degree of cold for the congelation of quickſilver. In the experiments above recited, diſtilled quickſilver was generally uſed; and in ſome the quickſilver was revivified from ſublimation.

It is remarked by Mr. Braun, that by the mixture of ſnow and ſpirit of nitre, which froze the mercury, he never was able to bring thermometers, filled with the moſt highly rectified ſpirit of wine, lower than 300°: ſo that the cold which will freeze mercury, will not freeze ſpirit of wine; and therefore ſpirit thermometers are the moſt fit to determine the degree of coldneſs in frigorific mixtures, till we are able to conſtruct ſolid metallic thermometers with ſufficient accuracy. Mr. Braun tried the effects of different fluids in his frigorific mixtures: he always found that Glauber's ſpirit of nitre and double aqua fortis were the moſt powerful; and from a number of experiments made when the temperature of the air was between 159 and 153 by his thermometer, he concludes, that ſpirit of ſalt pounded upon ſnow, increaſed the natural cold 30°; ſpirit of ſal ammoniac, 10; oil of vitriol, 35; Glauber's ſpirit of nitre, 58; aqua fortis, 40; ſimple ſpirit of nitre, 30; dulcified ſpirit of vitriol, 20; Hoffman's anodyne liquor, 32; ſpirit of hartſhorn, 10; ſpirit of ſulphur, 10; ſpirit of wine rectified, 20; camphorated ſpirit, 15; French brandy, 12; and ſeveral kinds of wine increaſed the natural cold to 6, 7, or 8 degrees. It appears alſo, from Mr. Braun's experiments, that both the boiling and *freezing* of mercury have this in common; that, when it begins to boil, it riſes with rapidity, and deſcends rapidly when it begins to freeze: ſo that if the mean term of the congelation of mercury be fixed at 650 below 0, and the term of its boiling at 414 above 0, its greateſt contraction to its greateſt dilatation will be 1064 degrees of Mr. Braun's thermometer, and 1237 of Fahrenheit's, as 212 is the point of boiling water, and 32 the *freezing* point in Fahrenheit's, which correſponds with 150 under the term of boiling water in Mr. Braun's. Hence every one will ſee the great alteration of ſpecific gravity in frozen and boiling mercury, as, between one and the other, the tenth part of the volume is leſſened. Phil. Tranſ. vol. li. part ii. for 1760. art. 64. p. 672. Ibid. vol. lii. part i. art. 31. p. 156. See alſo an account of ſome ſucceſsful experiments for *freezing* quickſilver at Albany fort, Hudſon's bay, in 1775, by Mr. Hutchins, Phil. Tranſ. vol. lxvi. part i. art. 10. p. 174. See MERCURY and THERMOMETER.

FREEZING *rain*, or *raining ice*, a very uncommon kind of ſhower, which fell, in the weſt of England, in December, anno 1672. See Phil. Tranſ. N° 90.

This rain, as ſoon as it touched any thing above ground, as a bough, or the like, immediately ſettled into ice; and, by multiplying and enlarging the icicles, it broke all down with its weight. The rain that fell on the ſnow, immediately *froze* into ice, without ſinking in the ſnow at all.

It made an incredible deſtruction of trees, beyond any thing in all hiſtory. "Had it concluded with ſome guſt "of wind," ſays a gentleman on the ſpot, "it might "have been of terrible conſequence."

"The ſprig of an aſh-tree, of juſt three quarters of a "pound, being weighed, the ice thereon weighed ſix-"teen pounds. Some were frighted with the noiſe in "the air; till they diſcerned it was the clatter of icy "boughs daſhed againſt each other." Dr. Beale obſerves, that there was no conſiderable froſt obſerved on the ground during the whole; whence he concludes, that a froſt may be very fierce, and dangerous, on the tops of ſome hills; while, in other places, it keeps at two, three, or four, feet diſtance above the ground, rivers, lakes, &c. and may wander about, very furiouſly, in ſome places, and be remiſs in others, not far off. This froſt was followed by glowing heats, and a wonderful forwardneſs of vegetation.

FREEZING *of wines*. See *Condenſing of* WINES.

FREEZING, in *Commerce* and *Manufactures*. See FRIZING.

FREEZING, in *Sea Language*, is a ſort of ornamental painting on the upper part of a ſhip's quarter, ſtern, or bow. It generally conſiſts of armour, inſtruments of war, marine emblems, &c.

FREEZELAND, FRIEZELAND, or FRIZELAND, *horſe*, in *War*, the ſame with CHEVAL *de friſe*.

FREGAROLA, in *Zoology*, a name given by many to a ſmall river-fiſh, well known in England by the name of the MINOW.

FREGGIA, in *Zoology*, the name of a long anguilliform fiſh, of the tænia kind, more commonly called CAVAGIRO.

FREGIT *clauſum*. See CLAUSUM.

FREIGHT. See FRAIGHT.

FREISER, a name uſed by ſome for the STRAWBERRY *plant*.

FRENCH, FRANÇOIS, abſolutely uſed, ſignifies the language of the people of France.

The *French*, as it now ſtands, is no original, or mother-language, but a medley of ſeveral: there is ſcarce any language but it has borrowed words, or perhaps phraſes, from.

The languages that prevail moſt, and that are, as it were, the baſis thereof, are, 1. The Celtic; whether that were a particular language itſelf, or whether it were only a dialect of the Gothic, as ſpoke in the Weſt and North. 2. The Latin, which the Romans carried with them into the Gauls, when they made the conqueſt thereof. And, 3. The Teutonic, or that dialect of the Teutonic ſpoke by the Franks, when they paſſed the Rhine, and eſtabliſhed themſelves in Gaul.

Of theſe three languages, in the ſpace of about thirteen hundred years, was the preſent *French* formed, ſuch as it is now found. Its progreſs was very ſlow; and both the Italian and Spaniſh were regular languages long before the *French*.

Paſquier obſerves, it was under Philip de Valois, that the *French* tongue firſt began to be poliſhed; and that, in the regiſter of the chamber of accounts of that time, there is a purity ſeen almoſt equal to that of the preſent age. However, the *French* was ſtill a very imperfect language till the reign of Francis I. the cuſtom of ſpeaking Latin at the bar, and of writing the public acts and inſtruments of the courts of juſtice in that language, had made them overlook the *French*, their own language. Add, that the preceding ages had been remarkable for their ignorance, which was owing, in good meaſure, to the long and calamitous wars which France had been engaged in; whence, the *French* nobleſſe deemed it a kind of merit, not to know any thing; and the generals regarded little, whether or no they wrote and talked politely, provided they could but fight well.

But Francis I. who was the reſtorer of learning, and the father of the learned, changed the face of things; and, after his time, Henry Stevens printed his book, De la Precellence du Langage François.

The change was become very conſpicuous at the end of the ſixteenth century; and under Henry IV. Amyot, Coeffeteau, and Malherbe, contributed towards bringing it to its perfection; which the cardinal De Richelieu completed, by the eſtabliſhment of the *French* academy; an aſſembly, wherein the moſt diſtinguiſhed perſons of the church, the ſword, and the gown, have been members.

Nor did the long reign of Louis XIV. contribute a little to the improvement of the language: the perſonal qualities of that prince, and his taſte for the polite arts, and that of the princes of the blood, rendered his court the politeſt in Europe. Wit and magnificence ſeemed to vie; and his generals might have diſputed with the Greeks, Romans, &c. the glory of writing well, if they could not that of fighting.

From court, the elegance and purity of the language ſoon ſpread itſelf into the provinces; and now there is ſcarce any body there who does not write and ſpeak good *French*.

One of the characters of the *French* language is, to be natural and eaſy. The words are ranged in it much in the ſame order as the ideas in our minds; in which it differs exceedingly from the Greek and Latin, where the inverſion of the natural order of words is reputed a beauty. Indeed the Hebrew ſurpaſſes even the *French*,

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in this point; but then it comes ſhort of it in copiouſneſs and variety.

It muſt be added, however, that as to the analogy of grammar, and the ſimplicity wherewith the moods of verbs are formed, the Engliſh has the advantage, not only over the French, but over all the known languages in the world; but then the turns, the expreſſions, and the idioms, of the Engliſh, are ſometimes ſo quaint, and extraordinary, that it loſes a good deal of the advantage which its grammatical ſimplicity gives it over the reſt.

The *French* has but few compound words; wherein it differs widely from the Greek, High Dutch, and Engliſh. This the *French* authors own a great diſadvantage in their language; the Greek and Dutch deriving a great part of their force and energy from the compoſition of words, and frequently expreſſing that in one ſounding word, which the *French* cannot expreſs but by a periphraſis. The diminutives in the *French* are as few as the compounds; the greateſt part of thoſe remaining in uſe having loſt their diminutive ſignification; but what diſtinguiſh the *French* moſt are its juſtneſs, purity, accuracy, and flexibility.

French is the moſt univerſal and extenſive language in Europe. The policy of ſtates and courts has rendered it neceſſary for the miniſters of princes, and their officers, &c. and the taſte of arts and ſciences has had the ſame effect, with regard to the learned.

In Germany, and elſewhere, the princeſſes and perſons of diſtinction value themſelves on underſtanding *French*; and in ſeveral courts of Europe, *French* is almoſt as much known as the language of the country; though the court of Vienna is an exception from this rule. *French* is there very little uſed; the emperor Leopold could not bear to hear it ſpoke in his court; the Latin and Italian are there cultivated inſtead of it. This extenſiveneſs of the *French* language is no modern advantage; William the Conqueror gave laws to England in the *French* language; and the ancient cuſtoms of moſt of the provinces of the Netherlands are wrote in the ſame.

Laſtly, the *French* is the ſame language every where; not only in all the provinces of France, but in all places where it is ſpoken, out of France.

For a critical acquaintance with what regards the *French* tongue, ſee the Remarques of M. Vaugelas; and the Obſervations M. Corneille has made on thoſe remarks; the Remarques of F. Bouhours; and the Doubts of a Bas-Breton gentleman, by the ſame father; the Converſations of Ariſte and Eugene; the Obſervations of M. Menage, and his Etymologies, with thoſe of M. Huet; F. Buffier's French Grammar; and that of the abbé Regnier. Add, the two diſcourſes of the abbé de Dangeau; one on the vowels, and the other on the conſonants, and many later works.

FRENCH *Bole*. See BOLE.

FRENCH *Bread*. See BREAD.

FRENCH *Character, Coins, Companies, Crown*. See the ſubſtantives.

FRENCH *graſs*, a name given by our farmers to a plant raiſed for the food of cattle, and more properly called SAINT-*foin*. It had its name *French graſs*, from its coming originally to us from France, and from its uſe in ſerving both freſh and dried for the food of cattle; the common clover is called graſs alſo by the farmers, though neither this nor the other are properly graſſes. Some of our farmers alſo call it everlaſting graſs, from its long continuance, a ſtrong crop often yielding a plentiful annual produce for forty years without any renewing.

FRENCH *Man*. See FRANCIGENA, and ENGLECERY.

FRENCH *Meaſures, Money, Order, Padſaddle, Pox, Silks, Weights*. See the ſubſtantives.

FRENCH *Wines, duty on*. See DUTY.

FRENK. See FRANK.

FRENUM, or FRÆNUM. See FRÆNUM.

FRENZY, and FRENETIC. See PHRENZY, and PHRENETIC.

FRESCO, in the *Arts*, a kind of painting performed on freſh plaſter, or on a wall laid with mortar not yet dry; and with water-colours.

This ſort of painting has a great advantage; by its incorporating with the mortar, and drying along with it, it is rendered extremely durable; and never fails or falls, but along with it. The Italians, from whom we borrow the term, call it *freſco*; becauſe it is frequently uſed for walls, alcoves, and other buildings, in the *open air*. Vitruvius, lib. vii. cap. 4. calls it *udo tectorio*.

Painting in *freſco* is very ancient, having been practiſed in the earlieſt ages of Greece and Rome. It is chiefly performed on walls and vaults, newly plaſtered with lime and ſand; but the plaſter is only to be laid, in proportion as the painting goes on; no more being to be done at once, than the painter can diſpatch in a day, while it dries.

Before he begins to paint, a cartoon or deſign is uſually made on paper, to be calked, and transferred to the wall, about half an hour after the plaſter is applied.

The ancients painted on ſtucco; and we may remark in Vitruvius what infinite care they took in making the incruſtation or plaſtering of their buildings to render them beautiful and laſting; though the modern painters find a plaſter made of lime and ſand preferable to it; both as it does not dry ſo haſtily, and as being a little browniſh, it is fitter to lay colours on, than a ground ſo white as ſtucco.

In this kind of painting, all the compound and artificial colours, and almoſt all the minerals, are ſet aſide, and ſcarce any thing is uſed but earths; which are capable of preſerving their colour, defending it from the burning of the lime, and reſiſting its ſalt, which Vitruvius calls its bitterneſs.

For the work to come out in all its beauty, the colours muſt be laid on quick, while the plaſter is yet moiſt; nor ſhould they ever be retouched, dry, with colours mixed up with the white of an egg, or ſize, or gum, as ſome workmen do; becauſe ſuch colours grow blackiſh; nor do any preſerve themſelves, but only ſuch as were laid on haſtily at firſt.

The colours uſed, are white made of lime ſlacked long before, and white marble duſt; oker, both red and yellow; verditer; lapis lazuli; ſmalt; black chalk, &c. All which are only ground, and worked up with water; and moſt of them grow brighter and brighter, as the *freſco* dries.

The bruſhes and pencils for this work ought to be long and ſoft, otherwiſe they will rake and raiſe the painting. The colours ſhould be full, and flowing from the bruſh; and the deſign perfect; for, in this work, you cannot alter or add upon any colour.

FRESH *diſſeiſin*, in *Law*, (*friſca diſſeiſina*, from the French *fraiz*; i. e. *recens*, & diſſeiſer, viz. *poſſeſſione ejicere*) ſignifies that *diſſeiſin* which a man might formerly ſeek to defeat of himſelf, and by his own power, without reſorting to the king or the law; as where it was not above fifteen days old, or ſome other ſhort continuance. Briton, cap. 5. Of this Bracton writes at large, concluding it to be arbitrary. Lib. iv. cap. 5.

FRESH *fine*, is that which was levied within a year paſt. Weſtm. 2. cap. 45. See FINE.

FRESH *force, friſca fortia*, in *Law*, denotes a force done within forty days.

If a man be diſſeiſed of lands or tenements, within any city or borough; or deforced from them after the death of his anceſtors, to whom he is heir; or after the death of his tenant for life, or in tail; he may, within forty days after his title accrued, have his remedy by an aſſize, or bill of *freſh force*.

FRESH *the hawſe*, on board a *Ship*. See HAWSE.

FRESH *Shot*, in the *Sea-phraſe*, ſignifies the falling down of any great river, into the ſea; by means whereof the ſea hath *freſh* water a good way from the mouth of the river. As this is more or leſs, they call it a *great*, or *ſmall freſh ſhot*.

FRESH *Spell*, in the *Sea-language*, a freſh gang, to relieve the rowers in the long boat.

FRESH *Suit, recens inſecutio*, in *Law*, is ſuch a preſent and active proſecution of an offender, where a robbery is committed, as never ceaſes, from the time of the offence committed, or diſcovered, till he be apprehended.

The benefit of ſuch purſuit of a felon is, that the party purſuing ſhall have his goods reſtored to him; whereas otherwiſe they are the king's.

Though the party robbed doth not apprehend the thief immediately, but ſome time after the robbery, provided he uſed his utmoſt endeavours to take him; or though he happens to be apprehended by ſome other perſon, yet it ſhall be adjudged *freſh purſuit*.

Freſh ſuit is either within the view, or without. Manwood ſays, that upon *freſh ſuit* within the view, treſpaſſers in the foreſt may be attached by the officers purſuing them, though without the limits of the foreſt. *Freſh ſuit* may continue for ſeven years. See HUE *and Cry*.

FRESH *Water*, is that not tinctured or impregnated with ſalt, or ſaline particles, enough to be diſcoverable by the ſenſe.

Such generally is that of ſprings, rains, wells, lakes, &c. Dr. Liſter is of opinion, that the natural and original ſtate of water is to be ſalt: the *freſhneſs* he ſuppoſes to be accidental, and to be owing to the vapours of plants, and the breath of animals therein; and to the exhalations raiſed by the ſun.

Others will have all water originally *freſh*, and take its ſaltneſs to be accidental; to account for which, a great number of hypotheſes have been framed.

The ſaltneſs of water is a foreign, and in moſt caſes a hurtful quality. It renders it not only nauſeous to the

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taſte, but greatly prejudicial to the body; and it is generally agreed, that thoſe waters, *cæteris paribus*, are beſt, not only for drinking, but alſo for œconomical uſes, as waſhing, boiling, and brewing, which are the freeſt from ſaltneſs.

Hence, various methods have been contrived for examining the *freſhneſs* of waters, and for dulcifying or making ſalt water *freſh*.

Mr. Boyle gives us a method of examining the *freſhneſs* of water, by means of a precipitate, which caſts down any ſaline particles before floating therein.

Into one thouſand grains of diſtilled water he puts one grain of ſalt; and into the ſolution lets fall a few drops of a ſtrong well filtrated ſolution of a well refined ſilver, diſſolved in clear aqua fortis; upon which there immediately appears a whitiſh cloud, which, though but ſlowly, deſcends to the bottom, and there ſettles in a white precipitate, in which is the ſaline matter of the fluid.

This method, if it were required, would examine water to a greater nicety, than that here ſpecified. It has diſcovered ſalt in water where there was but one grain of ſalt in two thouſand, nay in three thouſand times the weight of water.

The experiment was tried before the Royal Society, in 1692, by Sir Hans Sloane; where it was likewiſe found that a drop or two, even of ſpirit of ſalt, mixed with common water, would be diſcovered by the ſame method. Phil. Tranſ. abr. vol. ii. p. 298.

Dr. Hook, in the ſame year, read a lecture before the Royal Society, on a method of his own, for diſcovering the ſmalleſt quantity of ſalt contained in water, on a principle of hydroſtatics. The operation was performed by means of a large poiſe of glaſs, of the ſhape of a bolt-head; the ball thereof was three inches in diameter, and the neck $\frac{1}{24}$ of an inch. This being ſo poiſed, with red lead put in it, as to make it very little heavier than *freſh* water; and then ſuſpended by the ſmall ſtem, which was graduated, to the end of a nice beam of a balance; and the degree or diviſion of the neck, contiguous to the ſurface of the water, noted; upon infuſing a quantity of ſalt, only equal to the two thouſandth part of the weight of the water, the neck of the poiſe ſunk near half an inch lower in the water. Phil. Tranſ. abr. vol. ii. p. 304.

The dulcifying, or making of ſalt water *freſh*, is a ſecret, that has been long ſought with great attention. For an account of the principal attempts that have been made with this view, ſee *Sea*-WATER.

FRESH *Wind* ſignifies ſtrong, but not violent; hence when the gale increaſes, it is ſaid to freſhen.

FRESHES, in *Sea-language*, denotes the impetuoſity of an ebb-tide, increaſed by heavy rains, and flowing out into the ſea, often diſcolouring it to a conſiderable diſtance, and forming a line that ſeparates the two colours, and which may be diſtinctly perceived for a great length along the coaſt.

FRET, or FRETT, in *Architecture*, a kind of knot, or ornament, conſiſting of two liſts, or fillets, variouſly interlaced, or woven, and running at parallel diſtances, equal to their breadth. See *Tab. Archit. fig.* 34.

A neceſſary condition of theſe *frets* is, that every return and interſection be at right angles. This is ſo indiſpenſable, that they have no beauty without it, but become perfectly Gothic.

Sometimes the *fret* conſiſts but of a ſingle fillet, which, if well managed, may be made to fill its ſpace exceedingly well.

The ancients made great uſe of theſe *frets:* the places they were chiefly applied on were even, flat members, or parts of building; as the faces of the corona, and eaves of cornices; under the roofs, foſſits, &c. on the plinths of baſes, &c.

The appellation was occaſioned hence, that the French word *frette* literally ſignified the timber-work of a roof, which conſiſts chiefly of beams, rafters, &c. laid acroſs each other, and, as it were, *fretted*.

FRET, in *Muſic*, is uſed for the ſtops uſed on ſome inſtruments, eſpecially baſs viols and lutes: it conſiſts of ſtrings tied round the neck of the inſtrument, at certain diſtances, within which ſuch and ſuch notes are to be found. Theſe ſtrings or *frets* are ſometimes, yet ſeldom, put on the baſs violin for learners, and taken off again when they can find the notes without them. On lutes and viols they always remain.

FRET, or FRETTE, in *Heraldry*, is a bearing conſiſting of ſix bars, croſſed, and interlaced, *fretwiſe*; as in *Tab. Herald. fig.* 39.

Guillim derives the word from the French *rets*, *net*; but the reader will eaſily furniſh himſelf with a better etymology from the word *fret*, in architecture.

He bears diamond a *fret* topaz; the coat armour formerly of the lord Maltravers, and now quartered by the duke of Norfolk. When it conſiſts of more than ſix pieces, the number muſt be ſpecified.

Some call this the *true lovers knot*; others *Harrington's knot*, becauſe it is their arms; and *nodo firmo*, the motto. Gibbon is for calling it *heraldorum nodus amatorius*.

FRETTS, in *Mineralogy*, a term uſed by our miners to expreſs the worn ſide of the banks of the rivers in mine-countries, where they ſearch for the SHOAD ſtones, or grewts, waſhed down from the hills, in order from thence to trace out the running of the ſhoad up to the mine. Phil. Tranſact. N° 69.

FRETTY, or FRETTE, in *Heraldry*, is where there are divers bars laid acroſs each other.

Fretty is of ſix, eight, or more pieces. Azure, *fretty* of eight pieces, or, the coat of the lord Willoughby.

Columbiere obſerves, that *fretty*, abſolutely uſed, without any addition, is ſuppoſed to be of ſix pieces; that is, ſo many bars, or pieces, croſſing each other, which, therefore, need not be expreſſed; but if there be more, as much muſt be mentioned. And yet Guillim has azure, *fretty* of ſix, argent; the coat of the ancient lords Elthingham, of Suſſex.

FRETUM, *ſtraight*, or *ſtreight*, in *Geography*. See STRAIGHT.

FRET-*work*, an enrichment of *frets*, or a place adorned with ſomething in manner thereof. See FRET.

Fret-work is ſometimes uſed, among us, to fill up and enrich flat, empty ſpaces; but it is principally practiſed in roofs, which are *fretted* over with plaſter-work.

The Italians, alſo, apply it to the mantlings of chimneys with great figures: a cheap piece of magnificence, and as durable almoſt within doors, as harder matters in the weather.

FRIABLE is applied to bodies, to denote them tender and brittle, eaſily crumbled or reduced to powder between the fingers; their force of coheſion being ſuch as eaſily expoſes them to ſuch ſolution. Such are pumice, and all calcined ſtones, burnt alum, &c.

Friability is ſuppoſed to ariſe hence, that the body conſiſts wholly of dry parts, irregularly combined, and which are readily ſeparated, as having nothing unctuous or glutinous to bind them together.

FRIAR, or FRIER, by the Latins called *frater*, the Italians *fra*, and the French *frere*, that is, *brother*, is a term common to the monks of all orders; founded on this, that there is a kind of fraternity, or brotherhood, preſumed between the ſeveral religious perſons of the ſame convent or monaſtery.

The kinds of *friars* are very numerous: AUGUSTINE *friars*; DOMINICAN, or black, or preaching, *friars*; FRANCISCAN, or grey, or begging, *friars*; and CARMELITES, or white *friars*.

FRIAR, in a more peculiar ſenſe, is reſtrained to ſuch monks as are not prieſts; for thoſe in orders are uſually dignified with the appellation of FATHER.

FRIARS, or FRIERS *obſervant*, *fratres obſervantes*, were a branch of the Franciſcans; thus called, becauſe not combined together in any cloyſter, convent, or corporation, as the conventuals are, but only agreed among themſelves to *obſerve* the rules of their order, and that more ſtrictly than the conventuals did, from whom they ſeparated themſelves out of a ſingularity of zeal, living in certain places of their own chuſing.

FRIAR'*s cowl*, in *Botany*. See WAKE *Robin*.

FRIARY *of the holy Trinity*. See TRINITY.

FRIBURGH, FRIDBURGH, or FRITHEBORG, among our Anglo-Saxon anceſtors, denoted the ſame as FRANK-pledge did after the time of the Conqueſt.

Præterea eſt quædam ſumma & maxima ſecuritas, per quam omnes ſtatu firmiſſimo ſuſtinentur, viz. ut unuſquiſque ſtabilitat ſe ſub fidejuſſionis ſecuritate, quam Angli vocant freoborghes: *ſoli tamen Eboracenſes dicunt eandem* tienmannatale, *quod ſonat Latine decem hominum numerum.* LL. Edw. II. ap. Lamb.

Every man in this kingdom was anciently aſſociated in ſome decennary, or company of ten families, who were pledged, or bound, for each other, to keep the peace, and obſerve the law. See TITHING. If any offence was done by one, the other nine were to anſwer it; that is, if the criminal fled from juſtice, they had thirty days allowed to apprehend him: if he was not taken in that time, he who was the *friburgh*, i. e. the principal pledge of the ten, ſhould take two of his own number, and the chief pledges of three neighbouring *friburghs*, with two others out of each of the ſaid *friburghs*, who were to purge themſelves, and their *friburgh*, of the forfeiture and flight of the criminal. If they could not do this, the principal pledge, with the other eight, were to make ſatisfaction.

Great men were not combined in any ordinary decenna, or dozen, as being deemed a ſufficient aſſurance for themſelves and their menial ſervants.

FRI-

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FRICASSEE, a diſh, or meſs, haſtily dreſſed in a frying-pan, and ſeaſoned with butter, oil, or the like.

The word is French, formed of the Latin *frixatura*, *frying*. Others will have *fricaſſée* formed in imitation of the noiſe made by butter, or other fat, when melted in the pan.

We ſay a *fricaſſée* of pullets, of rabbits, of tench, of tripe, of frogs, of eggs, of peas, &c.

FRICIUM, of *frico*, *I rub*, in *Pharmacy*, a name given to ſuch medicines as are intended to be rubbed into the ſeveral parts of the body. The ancients had three kinds of *fricia*, the dry, the ſoft, and the liquid; the firſt was uſed in the way of fumigation, the ſecond was bound on the part with cloths, and the laſt was uſed by way of embrocation.

FRICTION, the act of rubbing or grating the ſurface of one body againſt that of another, called alſo *attrition*.

The phenomena ariſing upon the *friction* of divers bodies, under different circumſtances, are very numerous and conſiderable.

Mr. Hawkſbee gives us a number of experiments of this kind; particularly of the attrition, or *friction* of glaſs, under various circumſtances, the reſult of which was, that it yielded light, and became electrical.

All bodies by *friction* are brought to conceive heat; many of them to emit light; particularly a cat's back, ſugar, beaten ſulphur, mercury, ſea-water, gold, copper, &c. but, above all, diamonds, which, when briſkly rubbed againſt glaſs, gold, or the like, yield a light equal to that of a live coal when blowed by the bellows. See ELECTRICS and ELECTRICITY.

FRICTION, in *Mechanics*, denotes the reſiſtance a moving body meets with from the ſurface on which it moves.

Friction ariſes from the roughneſs or aſperity of the ſurface of the body moved on, and that of the body moving: for ſuch ſurfaces conſiſting alternately of eminences and cavities, either the eminences of the one muſt be raiſed over thoſe of the other, or they muſt be both broke and worn off; but neither can happen without motion, nor can motion be produced without a force impreſſed. Hence, the force applied to move the body is either wholly, or partly, ſpent on this effect; and conſequently there ariſes a reſiſtance, or *friction*, which will be greater, *cæteris paribus*, as the eminences are the greater, and the ſubſtance the harder: and as the body, by continual *friction*, becomes more and more poliſhed, the *friction* diminiſhes.

Hence it follows, that the ſurfaces of the parts of machines that touch each other ſhould be as ſmooth and poliſhed as poſſible. However, it is found by experience, that the flat ſurfaces of metals, or other bodies, may be ſo far poliſhed as to increaſe *friction*; becauſe the attraction of COHESION becomes ſenſible, as we bring the ſurfaces of bodies nearer and nearer to contact. But, as no body can be ſo much poliſhed, as quite to take away all inequality; witneſs thoſe numerous ridges diſcovered by the microſcope on the ſmootheſt ſurfaces; hence ariſes the neceſſity of anointing the parts that touch with oil, or ſome other fatty matter.

FRICTION, *laws of*. 1. As the weight of a body moving on another is increaſed, ſo is the *friction*.

This we ſee experimentally in a balance, which, when only charged with a ſmall weight, eaſily turns; but, with a greater, a greater force is required.

Hence, if the line of direction of a moving body be oblique to the ſurface moved on, the *friction* is the greater; this having the ſame effect as an increaſe of weight.

And hence, again, as a perpendicular ſtroke or impreſſion is to an oblique one; as the whole ſine, to the ſine of the angle of incidence; and the ſine of a greater angle is greater, and that of a leſſer leſs; the *friction* is the greater, as the line of direction approaches nearer to a perpendicular.

This is eaſily obſervable, and eſpecially in the teeth of wheels, which are frequently broke on this very account. The *friction*, therefore, is taken away, if the line of direction of the moving body be parallel to the ſurface.

2. The *friction* is leſs in a body that rolls, than it would be were the ſame body to ſlide, as is eaſily demonſtrated. For ſuppoſe a dented ruler, AB, *Tab. Mechanics*, *fig.* 12. and ſuppoſe a wheel DE to move along with it, with its teeth perpendicular to the circumference; if now the body were to ſlide, the tooth F, when it touched the ruler, would deſcribe a right line on the ſurface thereof, and, as the tooth of the ruler H reſiſts the ſame, it could not proceed without removing or breaking either the tooth H, or that F. And the ſame will hold in the ſliding of any rough ſurface upon another, where all the *friction* will take place that can any way ariſe from the roughneſs of the ſurface. But if the wheel ED roll along the ruler, then the tooth H will no longer reſiſt its motion, only as it is to be hoiſted out of the cavity F over the eminence of the tooth H; and the ſame holds in the rubbing of any rough body over the ſurface of another.

Hence, in machines, leſt the *friction* ſhould employ a great part of the power, care is to be taken, that no part of the machine ſlide along another, if it can be avoided; but rather that they roll, or turn upon each other. With this view it may be proper to lay the axes of cylinders, not, as is uſually done, in a groove, or concave matrix, but between little wheels, ABCD. *fig.* 13. moveable on their reſpective axes: for, by this contrivance, the *friction* is transferred from the circumference of thoſe wheels to their pivots; and the *friction* may be ſtill diminiſhed farther, by making the axles of thoſe wheels reſt upon other *friction*-wheels that turn round with them. This was long ago recommended by P. Caſabus; and experience confirms, that we ſave much power by it. Hence alſo it is, that a pulley moveable on its axis reſiſts leſs than if it were fixed. And the ſame may be obſerved of the wheels of coaches, and other carriages.

From theſe principles, with a little farther help from the higher geometry, Olaus Roemer determined the figure of the teeth of wheels, that ſhould make the leaſt reſiſtance poſſible, and which ſhould be epicycloidal. And the ſame was afterwards demonſtrated by De la Hire; though, which is much to be lamented, the thing is not yet taken into practice.

Hence, in ſawing-mills, the ſides of the wooden rectangle the ſaws are fitted into, ſhould be furniſhed with rotulæ, or little wheels, which would greatly leſſen the *friction*; and the like in other caſes.

FRICTION, *calculation of the quantity of*. The *friction* is a point of the utmoſt importance in machines; and by all means to be conſidered, in calculating the force thereof: yet it is generally overlooked in ſuch calculations: but this is principally, becauſe its preciſe value is not known. It is not yet reduced to certain and infallible rules: ſince it depends upon the ſtructure of bodies, the form of their prominent parts and cavities, and upon their rigidity, their elaſticity, their coherence, and other circumſtances. The common method is, barely to compute the advantage, which a moving power has from the machine; either on account of its diſtance from a fixed point; or of the direction in which it acts. And in all the demonſtrations it is ſuppoſed, that the ſurfaces of bodies are perfectly ſmooth and poliſhed. Indeed the engineers expect, that in the practice they ſhould loſe part of the advantage of their force, by the *friction*: but how much, it is ſuppoſed, nothing but the practice can determine. M. Amontons, indeed, has made an attempt to ſettle, by experiment, a foundation for the preciſe calculation of the quantity of *friction*; and Mr. Parent has confirmed it, from reaſoning and geometry: but their theory, however warranted, is not generally and fully received.

M. Amontons's principle is, that the *friction* of two bodies depends on the weight, or force, wherewith they bear on each other; and only increaſes as the bodies are more ſtrongly preſſed, or applied, againſt each other, or are charged with a greater weight; and that it is a vulgar error, that the quantity of *friction* has any dependence on the bigneſs of the ſurfaces rubbed againſt each other; or that the *friction* increaſes as the ſurfaces do. Thus if a piece of wood four inches wide and one inch thick be ground, and thereby made exactly fit to the ſurface of another fixed piece of the ſame wood, it will acquire the ſame weight to draw it along on the ſame, whether it be laid on its broad or narrow ſide: for, though on the broad ſide there be four times the number of touching particles *(cæteris paribus)*, yet each particle is preſſed with but $\frac{1}{4}$ of the weight bearing on thoſe of the narrow ſide; and ſince four times the number multiplied by $\frac{1}{4}$ of the weight is equal to $\frac{1}{4}$ of the number multiplied by four times the weight, it is plain that the effect, that is, the reſiſtance, is equal in both caſes, and therefore, requires the ſame force to overcome it.

Upon the firſt propoſal of this paradox, M. de la Hire had recourſe to experiments; which ſucceeded much in favour of the new ſyſtem. He laid ſeveral pieces of rough wood on a rough table; their ſizes were unequal; but he laid weights on them, ſo as to render them all equally heavy: and he found, that the ſame preciſe force, or weight, applied to them by a little pulley was required to put each in motion, notwithſtanding all the inequality of the ſurfaces. The experiment ſucceeded in the ſame manner in pieces of marble, laid on a marble table. Upon this M. de la Hire betook himſelf to the rationale of the thing; and has given us a phyſical ſolution of the effect. And M. Amontons has ſettled a calculus of the value of

friction;

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friction; and the loſs ſuſtained thereby in machines, on the foundation of the new principle.

In wood, iron, lead, and braſs, which are the principal materials uſed in machines, he finds the reſiſtance, cauſed by *friction*, to be nearly the ſame, when thoſe materials are anointed with oil, or other fatty matter; (but this fact has been diſputed by Muſchenbroek, and experiments urged in proof of the contrary): and this reſiſtance, independent of the quantity of ſurface, he makes to be nearly equal to a third part of the force wherewith the bodies are preſſed againſt each other. Others have obſerved, that, if the ſurfaces be hard and well poliſhed, the *friction* will be leſs than a third part of the weight; but if the parts be ſoft or rugged, it will be much greater. Let a very ſmooth cylinder of wood AB, *Tab.* III. *Mechanics*, *fig.* 44. be laid on two well-poliſhed and oiled or greaſed ſupporters C and D, and be charged with the weight of two pounds in the two equal balls G, H; it will require an additional weight x (equal to about a third part of the two pounds) to give motion to, or overcome the *friction* of the ſaid cylinder. But this additional weight, as it cauſes a greater preſſure of the cylinder, will increaſe the *friction*, and require the addition of another weight y, equal to a third part of its own; for the ſame reaſon the weignt y will require another z a third part of two pounds and ſo on *ad infinitum*. Therefore, if the *friction* is preciſely equal to a third of the weight, the firſt weight with all the additional ones viz. 2, $\frac{2}{3}$, $\frac{2}{9}$, $\frac{2}{27}$ &c. will be a ſeries of numbers in geometrical progreſſion decreaſing: and the ſum of all theſe terms, omitting the firſt, i. e. the ſum of the infinite number of additional weights $x+y+z$ &c. is equal to one pound: ſo that if the weight of the cylinder be inconſiderable, the way to overcome the *friction* will be to double the power G or H at once.

But if the cylinder moved on the two ſmall gudgeons E and F, or on a ſmall axis, the *friction* would be abated in the ſame proportion as the diameter of theſe gudgeons is leſs than the diameter of the cylinder, becauſe in this caſe the parts on which the cylinder moves and rubs will have leſs velocity than the power which moves it in the ſame proportion. See WHEEL-*Carriages*.

The above recited hypotheſis of M. Amontons has been adopted and confirmed by M. Camus, Deſaguliers and others. In order to eſtimate the quantity of *friction* in any engine, begin at the power and conſider the velocity and the weight at the firſt rubbing part, and determine the quantity of *friction* by the foregoing principles; then proceed to the next rubbing part, finding the *friction* there, &c. Mr. Emerſon, in his Principles of Mechanics, deduces from experiments the following remarks relating to the quantity of *friction*: when a cubic piece of ſoft wood of eight pounds weight, moves upon a ſmooth plane of ſoft wood, at the rate of three feet per ſecond, its *friction* is about one third of the weight; but if it be rough, the *friction* is little leſs than half the weight: on the ſame ſuppoſition, when both the pieces of wood are very ſmooth, the *friction* is about one fourth of the weight: the *friction* of ſoft wood on hard, or of hard wood upon ſoft is one fifth or one half of the weight; of hard wood upon hard wood one ſeventh or one eighth; of poliſhed ſteel moving on ſteel or pewter one fourth; moving on copper or lead, one fifth of the weight. He obſerves in general, that metals of the ſame ſort have more *friction* than thoſe of different ſorts; that lead makes much reſiſtance; that iron or ſteel running in braſs makes the leaſt *friction* of any; and that metals oiled make the *friction* leſs than when poliſhed, and twice as little as when unpoliſhed. Deſaguliers obſerves that, in Monſ. Camus's experiments on ſmall models of ſledges in actual motion, there are more caſes wherein the *friction* is leſs than where it is more than one third of the weight. See a table, exhibiting the *friction* between various ſubſtances, formed from his experiments in Deſ. Exp. Phil. vol. i. p. 193, &c.

Beſide the preſſion, the magnitude whereof determines that of the *friction*, there is another circumſtance to be conſidered; viz. the velocity. The *friction* is the greater, and the more difficult to ſurmount, as the parts are rubbed againſt each other with the greater ſwiftneſs; ſo that this velocity muſt be compared with that of the power neceſſary to move the machine, and overcome the *friction*. If the velocity of the power be double that of the parts rubbed, it acquires, by that means, an advantage that makes it double; or, which amounts to the ſame, it diminiſhes the contrary force of *friction* by one half; and reduces it to a ſixth part of the weight, or preſſion. But this velocity M. Amontons only conſiders as a circumſtance that augments or diminiſhes the effect of the preſſion, i. e. the difficulty of the motion: ſo that the *friction* ſtill follows the proportion of the weight. Only, we are hereby directed to diſpoſe the parts of machines that rub againſt each other, in ſuch manner, as that they may have the leaſt velocity poſſible: and thus the diameter of the axis of a wheel ſhould be as ſmall as poſſible, with regard to that of the wheel; in that the leſſer the axis, the ſlower will be the motion of the ſurfaces rubbing againſt each other; ſince the velocity of a circular motion always goes diminiſhing from the circumference to the centre: and, for the ſame reaſon, the teeth of dented wheels ſhould be as ſmall and thin as poſſible; for a tooth catching on a notch, &c. rubs one of its ſides againſt a ſurface equal to its own; and is to diſengage itſelf, in a certain time, by paſſing over a ſpace equal to the ſurface; conſequently, the leſſer the ſurface, the leſs ſpace it has to move; the ſmallneſs of the ſurface diminiſhing the reſiſtance of the *friction*; not as it is a leſs ſurface that rubs, but as there is a leſs ſpace to move. The following general propoſition may be deduced from the preceding remarks viz. That the reſiſtances ariſing from *friction* are to one another in a ratio compounded of the preſſures of the rubbing parts, and the times or velocities of their motions.

But, notwithſtanding all the confirmations and illuſtrations of this theory of *friction*, the public, or even the academy itſelf where it was propoſed, could not be brought fully to acquieſce in it. Muſchenbroek and the abbé Nollet have concluded from experiments that the *friction* of bodies depends on the quantity of their ſurface as well as their weight. Introd. ad Phil. Nat. vol. i. c. 9. and Lect. Phyſ. Exp. tom. i. p. 241. There is ſcarce any ſubject of experiment, with regard to which different perſons have formed ſuch various concluſions, ſo that the nature and laws of *friction* are not yet ſufficiently clear and deciſive. It is granted, that the preſſion has a great effect, and is, in many caſes, the only thing to be conſidered in *frictions*: but it will be hard to perſuade us abſolutely to exclude the conſideration of the ſurface. In effect, the contrary ſeems capable of a metaphyſical demonſtration.

If two bodies, with plain ſurfaces, ſuppoſed infinitely hard, and poliſhed, be moved along each other, the *friction* will be none or infinitely ſmall; but if, in lieu of ſuch ſuppoſition, which has no place in nature, we ſuppoſe two bodies, with rough uneven ſurfaces, the difficulty of moving one of them on the other muſt either ariſe from this; that the firſt is to be raiſed, in order to diſengage the parts catched or locked in the ſecond; or that the parts muſt be broken, and worn off; or both. In the firſt caſe, the difficulty of raiſing one of the bodies makes that of the motion; and of conſequence the *friction* ariſes wholly from the weight, or preſſion; and the ſurface has nothing to do in it.

In the ſecond caſe, the magnitude of the ſurface would be all; were it poſſible this ſecond caſe could be abſolutely abſtracted from the firſt; i. e. could the parts of one body be rubbed and worn againſt thoſe of the other, without raiſing one of them; it being viſible, that a greater number of parts to be broken would make a greater reſiſtance than a leſs: but as in practice we never rub, or grind, without raiſing the body, the reſiſtance ariſing from the greatneſs of the ſurface in the ſecond caſe, is always combined with that from the preſſion; whereas, in the former caſe, that ariſing from the preſſion may be alone, and uncompounded.

Add, that what is worn off a body, is ordinarily very little, with regard to the great number of times the body muſt have been raiſed during the *friction*, and all the little heights added together, which the body muſt have been raiſed to.

Hence, as the reſiſtance from preſſion may be ſingle; and as the ſame always accompanies that ariſing from the magnitude of the ſurfaces, and is uſually much the more conſiderable of the two, when it does accompany it; for theſe reaſons, in moſt of the experiments that are made, it is the only one perceived, and the only one that needs to be conſidered.

But then, as it is poſſible, in certain caſes, for the preſſion to be very ſlender, and the number of parts to be rubbed, very great, it muſt be owned, there are caſes wherein the *friction* follows, very ſenſibly, the proportion of the ſurfaces.

Dr. Deſaguliers has treated fully of the *friction* of engines, carriages, &c. See his Courſe of Experim. Philoſ. vol. i. p. 133 to 138. and p. 182 to 254. ſee alſo p. 458 to 460.

FRICTION *of the parts of fluids*. See RESISTANCE, and RETARDATION *of fluids*.

FRICTION *of ropes*. See CORDAGE and ROPES.

FRICTION *of wheel-carriages*. See WHEEL-*Carriages*.

FRICTION, in *Medicine*, and *Surgery*, denotes the act of rubbing a diſeaſed part with oils, unguents, or other matters; in order to eaſe, relieve, and cure it.

Frictions are much uſed of late in venereal caſes. They prefer the applying of mercury externally by way of *friction*, to that of giving it internally, to raiſe a ſalivation.

There

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There are alſo *frictions* with the fleſh-bruſh, a linen cloth, or the hand only: for the effect of which laſt, ſee STROAKING.

Frictions of any kind are a ſort of exerciſe which contributes greatly to health; as they excite and ſtir up the natural warmth, divert defluxions, promote perſpiration, open the pores of the ſkin, and carry off ſtagnant humours.

The fleſh-bruſh, Dr. Cheyne obſerves, is an exerciſe extremely uſeful for promoting a full and free perſpiration and circulation. Every body knows the effect of currying horſes; that it makes them ſleek, gay, lively, and active; ſo as even to be judged equivalent to half the feeding.

This it can no otherwiſe effect, but by aſſiſting nature to throw off the recrements of the juices, which ſtop the free circulation, and, by conſtant *friction*, irritation, and ſtimulation, to bring the blood and ſpirits to the parts moſt diſtant from the ſeat of heat and motion; and ſo plump up the ſuperficial muſcles. And the ſame effect it would have in other creatures, and man himſelf, if managed in the ſame manner, and with the ſame care and regularity.

Perſons, therefore, of weak nerves, and ſedentary lives, would do well to ſupply the want of other exerciſe with ſpending half an hour, morning and night, in currying and rubbing their whole body, eſpecially their limbs, with a fleſh-bruſh. But this means of health is moſt advantageouſly uſed when the *primæ viæ* are moſt empty.

FRICTION, or rather FRIXION, in *Chemiſtry*, is the ſame with what in cookery we call *frying*; viz. the coction of certain matters in a pan, with the addition of ſome unctuous thing, as oil, fat, &c.

The *frixion* of medicines is performed over a ſlow, moderate fire; and that of foods over a quick one.

FRIDAY, the ſixth day of the WEEK ſo called from Friga, a goddeſs worſhipped by the Saxons on this day. It is a faſt-day in the church of England, in memory of our Saviour's crucifixion, unleſs Chriſtmaſs-day happens to fall on *friday*, which is always a feſtival.

FRIDAY, *Good*: See PASSION-*Week*.

FRIDSTOLL, or FRITHSTOW, of the Saxon *frid*, peace, and *ſtol*, ſeat, in our *ancient Writers*, ſignifies a ſeat, chair, or place of peace, where criminals might find ſafety and protection.

In the charter of immunities confirmed to the church of St. Peter in York, ann. 5 H. VII. it is explained by *Cathedra quietudinis & pacis*.

Of theſe there were many in England; but the moſt famous was at Beverley, which had this inſcription, *Hæc ſedes lapidea* Freedſtoll *dicitur, i. e.* Pacis Cathedra *ad quam reus fugiendo perveniens, omnimodam habet ſecuritatem*. Camden.

FRIENDLESS *Man*, was the old Saxon name for him whom we call an outlaw.

The reaſon is, becauſe he was, upon his excluſion from the king's peace and protection, denied all help of friends, after certain days. *Nam foris fecit amicos*.

FRIENDS *Alien*. See ALIEN.

FRIESLANDERS, in *Eccleſiaſtical Hiſtory*, a ſect of moderate ANABAPTISTS, deriving their name from *Frieſland*, the country which they inhabit. See WATERLANDIANS.

FRIEZE, FRIZE, or FREEZE. See FREEZE.

FRIGATE, in *Sea Affairs*, a ſhip of war, uſually of two decks, light built, deſigned for ſwift ſailing. When it hath but one deck, and conſequently is of a ſmaller ſize, they call her a light *frigate*.

Frigates mount from twenty to thirty-eight guns, and are eſteemed excellent cruizers. The name was formerly known only in the Mediterranean, and applied to a long kind of veſſel, navigated in that ſea with ſails and oars. The Engliſh were the firſt who appeared on the ocean with theſe ſhips, and equipped them for war as well as for commerce.

FRIGATE-*built* denotes the diſpoſition of the decks of ſuch merchant ſhips as have a deſcent of four or five ſteps from the quarter deck and fore-caſtle into the waiſt, in contradiſtinction to thoſe whoſe decks are on a continued line for the whole length of the ſhip, which are called galley-built. See *Fluſh*-DECK.

FRIGATOON, a Venetian veſſel, commonly uſed in the Adriatic, built with a ſquare ſtern, and without any foremaſt, having only a main-maſt, mizen-maſt, and bow-ſprit.

FRIGERATORY, among *Builders*, denotes a place intended to keep things cool in ſummer.

FRIGHT. This paſſion has been known not only to cauſe, but to cure diſeaſes. Mr. Boyle mentions agues, gout, and ſciatica, cured by this means. See Works abr. p. 82, &c.

It is a commonly known cure for the hiccough, to put the patient in a ſudden *fright*.

FRIGID, FRIGIDUS, *cold*, is variouſly uſed. A *frigid* ſtyle, is a low, jejune manner of diction; wanting force, warmth of imagination, figures of ſpeech, &c.

FRIGID *Zone*, or *Frozen Zone*, in *Geography*. See ZONE.

FRIGIDITY is alſo uſed in the ſame ſenſe with IMPOTENCE.

FRIGORIFIC, of *frigus*, *cold*, and *facio*, *I make*, in *Phyſics*, ſomething that occaſions cold.

Some philoſophers, particularly Gaſſendus, and other corpuſcularians, denying cold to be a mere privation, or abſence of heat, contend that there are actual *frigorific* corpuſcles, or particles as well as fiery ones: whence proceed COLD and HEAT. But later philoſophers allow of no other *frigorific* particles beſide thoſe nitrous ſalts, which float in the air in cold weather, and occaſion FREEZING.

FRILL, in *Falconry*, when a hawk trembles or ſhivers, they ſay ſhe *frills*. Dict. Ruſt.

FRINGE-*tree*. See SNOW-*drop-tree*.

FRINGILLA, in the *Linnæan Syſtem of Zoology*, the name of a large genus of birds of the general order of the paſſeres. The diſtinguiſhing characters of this genus are theſe: the tongue is whole and even, the beak is of a conic, ſtraight, ſharp-pointed figure, and one mandible receives the other into the ſinus of its baſis. Of this genus are the CHAF-FINCH, GOLD-*finch*, SPARROW, LINNET, &c.

FRINGILLAGO, in *Zoology*, a name by which ſome have called the whole genus of the titmouſe; but others have reſtrained it only to one ſpecies of them, which is the common larger kind, called by us the ox-eye. This is much larger than any of the others, weighing near an ounce, whereas they ſeldom exceed three drams. Its head and throat are black, the cheeks white, the back green, the belly of a yelloviſh green, divided in the middle by a bed of black, which extends to the vent: the rump is of a blueiſh grey. The quill feathers are duſky, edged partly with blue, partly with white; the coverts blue, the greater tipt with white. The exterior ſides of the outmoſt feathers of the tail are white, of the others blueiſh; their interior ſides duſky, the legs of a lead colour; the toes are divided to the origin; and the back toe of the whole genus of titmouſe is large and ſtrong. This bird builds in hollow trees, and lays ten eggs, though it ſometimes viſits the gardens and does great miſchief to the fruit. It has three chearful notes which it begins to utter in the month of February. Pennant. Ray's Ornithol. p. 174.

FRINGILLAGO *Americana cærulea*, in *Zoology*, a name given by Mr. Ray to the American titmouſe, otherwiſe known by its Braſilian name *guiracenoia*.

FRINGILLARIUS *Accipiter*, in *Zoology*, the name of a ſpecies of hawk, called by ſome *niſus*, and in Engliſh the *ſparrow*-HAWK.

FRIPPERY, a French term, ſometimes uſed in our language; properly importing the trade, or traffick, of old ſecond-hand cloaths and goods.

The word is alſo uſed for the place where ſuch ſort of commeree is carried on, and even for the commodities themſelves. The company of *Frippiers*, or *Fripperers*, at Paris, form a regular corporation, of an ancient ſtanding; and make a conſiderable figure among the companies of that city.

FRIST, a term among *Merchants* for ſelling goods upon credit.

FRIT, or FRITT, in the *Glaſs Manufacture*, is the matter, or ingredients, whereof glaſs is to be made; when they have been calcined, or baked in a furnace.

A ſalt drawn from the aſhes of the plant kali, or from fern, or other plants mixed with ſand, or flint, and baked together, makes an opake maſs, called by glaſsmen *frit*; probably from the Italian *frittare*, to fry, or becauſe the *frit*, when melted, runs into lumps, like fritters, called by the Italians *fritelli*.

Frit, by the antients, was called *hammonitrum*, or *ammonitrum*, of ἄμμος, ſand, and νίτρον, nitre: under which name it is deſcribed by Pliny thus: fine ſand from the Volturnian ſea, mixed with three times the quantity of nitre, and melted, makes a maſs called *ammonitrum*; which, being rebaked, makes pure glaſs. Hiſt. Nat. lib. xxxvi. cap. 26.

Frit, Neri obſerves, is only the calx of the materials which make glaſs; which though they might be melted, and glaſs be made, without thus calcining them, yet it would take up much more time. This calcining, or making, of *frit*, ſerves to mix and incorporate the materials together, and to evaporate all the ſuperfluous humidity. The *frit*, once made, is readily fuſed, and turned into glaſs.

There are three kinds of *frits*; the firſt, *cryſtal frit*, or that for cryſtal metal; made with ſalt of pulverine and ſand.

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The ſecond, and ordinary *frit*, is made of the bare aſhes of pulverine, or barillia, without extracting the ſalt from them. This makes the ordinary white, or cryſtal metal.

The third is *frit* for green glaſſes, made of common aſhes, without any preparation. This laſt *frit* will require ten or twelve hours baking.

The materials in each are to be finely powdered, waſhed and ſearced; then equally mixed, and frequently ſtirred together in the melting pot. For the reſt, ſee GLASS, and CRYSTAL.

FRITBURGH. See FRIBURGH.

FRITH; ſee FRYTH.

FRITHGILD, was anciently the ſame with what we now call a *guild*, or a *fraternity*, or *company*. See GILD.

FRITILLARIA *craſſa*, ſee SWALLOW-*wort*.

FRITILLARY, *fritillaria*, the *checquered tulip*, and *crown imperial*, in *Botany*; a genus of the *hexandria monogynia* claſs; its characters are theſe: the flower hath no empalement, but is bell-ſhaped and hath ſix oblong petals; in the hollow at the baſe of each petal is ſituated a *nectarium*: and the flower hath ſix *ſtamina* ſtanding near the ſtyle. In the centre is ſituated an oblong three-corneted germen, which afterward becomes an oblong capſule with three lobes, having three cells, which are filled with flat ſeeds ranged in a double order. There are nine ſpecies. There are vaſt varieties in the colours of the flower, when the plants are carefully propagated from ſeeds. They are by ſome propagated by roots, but the method by ſeeds is greatly preferable, as it prodnces much the greater number of roots, as well as the better flowers.

The ſeeds for this ſhould be ſaved from the fineſt flowers, and ſown on ſome light freſh earth in flat ſhallow pans, or boxes with holes at the bottom, kept open by tile-ſhreds to let out the moiſture. The ſeeds muſt be ſown pretty thick, and covered with a quarter of an inch of earth: this is to be done in the beginning of Auguſt. The pans or boxes are then to be ſet in a place where they may have the morning's ſun, till about eleven o'clock, and if the ſeaſon proves dry, they muſt be watered, and always carefully kept clear of weeds.

Toward the latter end of September the boxes muſt be removed into a warmer ſituation, and placed under ſhelter of a hedge or under a ſouth wall, and they are here to remain till the middle of March, by which time the plants will be come up an inch high. They are now to be removed into a ſhady ſituation, and are to remain there the whole ſummer. About the beginning of Auguſt, a bed of freſh earth is to be prepared, on which the earth of the pans and boxes containing the roots of the plants is to be ſtrewed, after their leaves are all dead: this is to be covered one fourth of an inch thick with fine freſh earth evenly ſifted on, and in this ſtate they are to remain till they flower, which is generally the third year from the ſowing. When they are in flower, the fineſt kinds ſhould be marked with ſticks, and their roots planted out into ſeparate beds.

As ſoon as the leaves are decayed they ſhould be carefully weeded, and thin off-ſets taken up and tranſplanted. Miller.

For an account of the other ſpecies of this genus, ſee CROWN *imperial*.

FRIXION. See FRICTION.

FRIZE, or FRIEZE, in *Architecture*, a part of the entablature of columns, more uſually written and pronounced FREEZE.

FRIZE, or FREEZE, in *Commerce*, a kind of woollen cloth, or ſtuff, for winter wear, being *frized*, or knapt, on one ſide; whence, in all probability, it derives its name.

Of *frizes*, ſome are croſſed, others not croſſed: the former are chiefly of Engliſh manufacture, the latter of Iriſh.

FRIZING *of cloth*, a term in the *Woollen Manufactory*, applied to the forming of the knap of a cloth, or ſtuff, into a number of little hard burrs, or prominences, covering almoſt the whole ground thereof.

Some cloths are only *frized* on the back-ſide, as black cloths; others on the right ſide, as coloured and mixed cloths, rateens, bays, frizes, &c.

Frizing may be performed two ways; one with the hand, i. e. by means of two workmen, who conduct a kind of plank, that ſerves as a *frizing* inſtrument.

The other way is by a mill, worked either by water, or a horſe; or, ſometimes, by men. This latter is eſteemed the better way of *frizing*, becauſe the motion being uniform and regular, the little knobs of the *frizing* are formed more equably and regularly.

The ſtructure of this uſeful machine is as follows:

The three principal parts are, the *frizer*, or criſper; the *frizing*-table; and the drawer, or beam. The two firſt are two equal planks, or boards, each about ten feet long, and fifteen inches broad; differing only in this, that the *frizing*-table is lined or covered with a kind of coarſe woollen ſtuff, of a rough, ſturdy knap, and that the *frizer* is incruſtated with a kind of cement, compoſed of glue, gum Arabic, and yellow ſand, with a little aqua vitæ, or urine. The beam or drawer, thus called, becauſe it draws the ſtuff from between the *frizer* and *frizing*-table, is a wooden roller, beſet all over with little, fine, ſhort points or ends of wire, like thoſe of cards uſed in carding of wool.

The diſpoſition and uſe of the machine is thus: the table ſtands immoveable, and bears or ſuſtains the cloth to be *frized*, which is laid with that ſide uppermoſt on which the knap is to be raiſed. Over the table is placed the *frizer*, at ſuch diſtance from it as to give room for the ſtuff to be paſſed between them; ſo that the *frizer*, having a very ſlow, ſemi-circular motion, meeting the long hairs or knap of the cloth, twiſts and rolls them into little knobs or burrs, while, at the ſame time, the drawer, which is continually turning, draws away the ſtuff from under the *frizer*, and winds it over its own points.

All that the workman has to do while the machine is going, is to ſtretch the ſtuff on the table as faſt as the drawer takes it off, and, from time to time, to take off the ſtuff from the points of the drawer.

It has already been obſerved, that the *frizing*-table is lined with ſtuff of a ſhort, ſtiff, ſtubby knap; the uſe whereof is, to detain the cloth between the table and *frizer*, long enough for the grain to be formed, that the drawer may not take it away too readily; which otherwiſe muſt be the caſe, inaſmuch as it is not held by any thing at the other end.

It were needleſs to ſay any thing particular of the manner of *frizing* ſtuffs with the hand, it being the aim of the workmen to imitate, as near as they can, with their wooden inſtrument, the ſlow, equable, and circular motion of this machine. It needs only be added, that their *frizer* is but about two feet long, and one broad; and that, to form the knap more eaſily, they moiſten the ſurface of the ſtuff lightly with water, mingled with whites of eggs, or honey.

FRIZONE, in *Zoology*, a name by which many call the COCCOTHRAUSTES or groſs-beak, called alſo in Engliſh the hawfinch.

FROBENIUS's *æthérial ſpirit*. See ÆTHER and SPIRIT.

FROG, *rana*, in *Zoology*, a genus of reptiles in the claſs of amphibious animals: the characters of it are, that the body is naked, without a tail, and furniſhed with four legs.

The feet of the *frog* are webbed, for the better ſwimming, and it has very ſtrong muſcles in the hinder part of its body to aſſiſt it in leaping. The lungs of the *frog* are different from thoſe of all other animals; they are only a ſort of membranaceous bladders, with ſeveral tubercles, by means of which they reſemble the fruit of the firs, or pines: theſe, when once inflated, do not immediately become flaccid, as in other animals, but remain in that ſtate as long as the creature pleaſes. The creature can remain a long time under water, and has been kept ſo for ſeveral days, by tying it down, and received no hurt from it. It is a very long-lived animal; and even if its belly be opened, and the inteſtines and all the viſcera taken out, it will continue its leaping, and all its other motions, as if nothing had happened to it, for a conſiderable time; but if the nerve of one of the hinder legs be cut, it inſtantly loſes all power of uſing that limb. Ray's Synop. Quad. p. 247.

FROGS, *the generation of*, was very nicely inquired into by the ſagacious Lewenhoek. He found, by repeated obſervations, that the male in copulation only ſits upon the female, not being joined to her, nor having any apparent penis. At the time that the female *frog* drops her ſpawn, the male alſo throws out his ſemen, which is to be placed under the eggs, as the ſemen of fiſhes that want the penis is caſt under the eggs or ſpawn of their females, that the animalcules in it may impregnate the eggs. The animalcule in the male-ſeed has its way to make into a certain point of the egg of the female, or elſe that egg is unfruitful; and this is the reaſon why the animalcules in the male ſemen are ſo prodigiouſly more numerous than the eggs of the female, becauſe vaſt multitudes of them muſt neceſſarily be loſt. The teſticles and vaſa deferentia of *frogs* are very evident to any one uſed to anatomical inquiries, on opening the creature; and theſe contain vaſt numbers of very vigorous animalcules at the time when the creature is to produce its young, which is in April, but at other times they are not ſo numerous or lively.

The *frog* differs from all creatures in the manner of its generation. It no way reſembles any of the quadrupeds in this particular; and though in ſome ſort it approaches to the nature of fiſh, yet it differs from them alſo in many things. The egg of the *frog* is a ſmall black ſpot, enve-

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enveloped in a mucilaginous ſubſtance; in this egg is contained the embrio *frog*, which, on the breaking of the egg in hatching, comes forth in the form of a tadpole. This young animal is for ſome time nouriſhed by the gelatinous matter which envelopes the eggs, but it does not conſume the whole of it; for the particles of water making way by degrees into it, divide its parts, and it ſoon becomes expanded, frees itſelf from the living animals, and floats on the ſurface of the water, or at a ſmall depth in it, in form of a thin cloud: this, though it now no longer ſerves for food to the young creature, is however of ſome ſervice to it, ſerving it as an aſylum, or place of reſt and ſafety, when tired with ſwimming.

The egg of the *frog*, therefore, is, in ſome degree, analogous to that of an inſect of the winged kind, which is to go through a metamorphoſis before it arrives at its perfect ſtate; for it hatches into the tadpole, as the egg of a butterfly into a caterpillar, and arrives at that its ultimate ſtate, after a determinate time ſpent in the other. In this it differs from the generation of fiſhes, the eggs of whoſe ſpawn hatch into perfect fiſhes, which go through no change; and it differs from all in the gelatinous ſubſtance which envelopes the egg, and ſerves as the firſt food to the fœtus.

The eggs are indeed, when nicely examined, found to be incloſed in a double liquor, a more pellucid and thin one within the gelatinous one, which ſerves as the general covering to the whole ſeries of eggs; and it is this thin one which it principally feeds on when firſt hatched, and which ſerves to the ſame purpoſes as the white of an egg in the fowl-kind. Ray, ut ſupra.

This creature bears the experiments of the air-pump better than moſt other animals. It will breathe ſome time after the extraction of the air, but at length the viſible motion of the throat will ceaſe, and the body ſwell a little. After three hours lying in this condition, when no farther ſign of life appears, if the animal be placed in the open air, a few hours will recover it to its former life and vigour. The ſame animal put into a receiver exhauſted of the air, but nearly filled with water, will live many hours under the water, and ſeem to reſpire, but in five or ſix hours it will die. The larger and luſtier *frogs* live longer than the young ones in the receiver. Phil. Tranſ. N° 62.

The FROG affords the curious in microſcopic obſervations a very beautiful view of the circulation of the blood; but the method of examining it to advantage was never hit upon till the contrivance of the late ingenious Dr. Stuart for that purpoſe. This he did by the ſolar microſcope in the following manner. The looking-glaſs, tube, and convex lens, are the ſame in this, as in the common ſolar microſcope; but inſtead of the little pocket microſcope of Wilſon, he uſed the belly-part of the common large reflecting one, fixed horizontally on a pedeſtal, juſt at an equal height with the tube. This ſtands on a little ſhelf made to ſupport it; and to its ſnout, which lies on a level with the tube, the magnifiers are ſcrewed: the object being extended and faſtened with ſtrings and pins on a frame contrived for that purpoſe, is applied between the tube and the magnifier, whereby the ſun's rays, reflected from the looking-glaſs, through the tube, upon the object, paſs on through the magnifier, and exhibit upon the ſcreen an image of the object moſt prodigiouſly enlarged. Baker's Microſ. p. 132.

To view a *frog* with this apparatus, the ſkin of the belly is to be opened from near the anus to the throat, and then giving it a little ſnip ſide-ways both at the top and bottom, and ſticking a fiſh-hook into each corner of the ſkin, it was eaſily extended before the microſcope, and ſhewed on the ſcreen the moſt beautiful view imaginable of the veins and arteries of the ſkin, with the blood circulating through them. In the arteries thus viewed, the blood is ſeen to ſtop, and recede a little at every pulſation by the dilatation, and ruſh forcibly on again by the contraction of the heart; while in the veins it ever kept the ſame equable and uniform current, with a ſurpriſing rapidity; and when the ſcreen was removed farther back, and the object by that means more enlarged, the alternate expanſion and contraction of the ſides of the arteries were very viſible. After this, the abdomen of the *frog* being opened, and the muſcles of it being extended before the microſcope in the ſame manner as the ſkin was, the ſtructure of theſe muſcles is beautifully ſeen, being all made up of bundles of tranſparent ſtrings of fibres, all lying parallel to one another, and joined by a common membrane.

Theſe ſtrings or fibres appeared alſo through their whole length made up of roundiſh veſicles, and reſembled ruſhes divided longitudinally; but there is no certainty of any circulation being ſeen in theſe.

When this has been ſufficiently examined, a part of the creature's guts being pulled out and extended with the meſentery, there is ſeen the fineſt of all views of the circulation of the blood. Words are not able to deſcribe this wonderful ſcene. The blood is ſeen paſſing through numberleſs veſſels at one and the ſame inſtant, in ſome one way, and in others directly the contrary. Several of the veſſels are thus magnified to more than an inch in diameter, and the globules of the blood rolling through them, appear near as large as pepper-corns; while in many of the minuteſt veſſels only ſingle globules were able to find their paſſage, and that too by changing their ſhape into an oblong ſpheroid. The pulſation and acceleration of the blood in the arteries are thus alſo very beautifully ſeen. As the animal under examination grows languid and near expiring, the blood in the arteries will often ſtop on a ſudden, and ſeem as if it were coagulating, and will then run back for ſome time; after which it will again recover its natural courſe with a great deal of rapidity. A due conſideration of theſe particulars may poſſibly account for the intermiſſions, ſtarts, and irregularities, in the pulſe of perſons near death. Baker's Microſcope, p. 136.

FROG, among *Farriers*, the ſame with fruſh. See FRUSH.

FROG's *bit*, in *Botany*. See HYDROCHARIS.

FROG, *bull*. See BULL-*frog*.

FROG-*fiſh*, in *Ichthyology*, an Engliſh name for the RANA-PISCATRIX, or LOPHIUS. See SEA-*Devil*.

FROG-*fiſh of Surinam*, is produced by the transformation of a *frog* into a fiſh. The *frog*, in its firſt ſtate, is ſpotted with brown, yellow, and green, but paler on the belly; the hinder feet are webbed like thoſe of a gooſe, but the fore-feet are without webs: the firſt change this *frog* undergoes is by the growing out of a tail; after which it gradually acquires the ſhape of a fiſh, the two fore-feet decreaſing and periſhing by degrees, and then the hinder legs; and, at length, the *frog* is changed into a perfect fiſh. The Indians and Europeans of Surinam call theſe fiſhes jakies; they are cartilaginous, and of a ſubſtance like our *muſtela*, and very delicate food. A bone or cartilage runs down the back, with ſmall bones all over the body, which is divided into equal parts; they are adorned with beautiful ſcales, are firſt of a darkiſh colour, and afterwards grey. See an account of the ſeveral transformations of this *frog*, illuſtrated with drawings, and of the transformation of fiſhes into *frogs*, in Phil. Tranſ. vol. li. p. 2. art. 60. p. 653, &c.

FRONDES, among *Botaniſts*. See LEAF.

FRONT, the forehead, or that part of the face above the eyebrows.

The word is formed of the Latin *frons*; and that from the Greek φρονειν, *to think, perceive*; of φρην, *mens, the mind, thought*. Martinius, to make out this etymology, obſerves, that from the forehead of a perſon we perceive what he is, what he is capable of, and what he thinks of. Du Laurens chuſes to derive it from *ferre*, becauſe it bears the marks of what we have in our head.

FRONT is alſo uſed where ſeveral perſons, or things, are ranged ſide by ſide, and ſhew their *front*, or fore-parts.

FRONT, in *Architecture*, denotes the principal face, or ſide of a building; or that preſented to their chief aſpect, or view.

FRONT, in *Fortification*. See FACE and TENAILLE.

FRONT *of a regiment*, in *Military Language*, denotes the foremoſt rank of a battalion, ſquadron, or any other body of men.

To *front* every way, is when the men are faced to all ſides. See FILE-*leaders*.

FRONT *of a camp* is the line that determines its extent, and in which are placed the colours and ſtandards of the troops that occupy the CAMP.

FRONT, in *Perſpective*, a projection or repreſentation of the face, or fore-part of an object, or of that part directly oppoſite to the eye; called alſo, and more uſually, ORTHOGRAPHY.

FRONT, *line of the*. See LINE.

FRONT *ſcale*. See SCALE.

FRONTAL, in *Architecture*, a little fronton or pediment, ſometimes placed over a ſmall door or window.

FRONTAL, FRONTLET, or *Brow-band*, is alſo uſed in ſpeaking of the Jewiſh ceremonies.

This *frontal* conſiſts of four ſeveral pieces of vellum, on each whereof is written ſome text of ſcripture: they are all laid on a piece of a black calf's leather, with thongs to tie it by. The Jews apply the leather with the vellum on their foreheads, in the ſynagogue, and tie it round the head with the thongs.

FRONTALE *os*, in *Anatomy*. See *Os* FRONTIS.

FRONTALE, or FRONTAL, in *Medicine*, an external form of remedy, applied on the forehead and temples, with a bandage, for the cure of the head-ach, megrim, vapours, defluxions on the eyes, &c.

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Frontals are compoſed of roſes, elder flowers, betony, marjoram, lavender, camphire, &c. wrapped in a linen cloth, and applied over the forehead and temples.

There are alſo *frontals* in manner of liniments, made of unguentum populeum and extract of opium, or of paſtes, powders, ſeeds, &c.

In *frontals* applied to eaſe the violence of the head-ach, in the heights of fevers, they frequently mix the kernels of cherries.

FRONTALES, in *Anatomy*, two muſcles, one on each ſide the forehead, commonly ſuppoſed to ſpring from the ſkull, but not known to ariſe from the occipital muſcles; or rather, it appears that the *frontales* and occipitales, are only one continued digaſtric muſcle, on each ſide, moving the ſcalp and ſkin of the forehead and eyebrows. See *Tab. Anat. (Myol.) fig.* 1. N° 1.

The *frontales* begin to be thus denominated after they have begun to paſs the coronal ſuture, with fibres paſſing obliquely to the eyebrows, where they terminate, and in the lower part of the ſkin of the forehead.

They have each two appendages: the ſuperior, or external, is commonly fixed to the bone of the noſe; the lower is fixed to the os frontis, and is, by Volcherus Coiter, made a diſtinct muſcle, and called CORRUGATOR, from its uſe in drawing the eyebrows to each other, and wrinkling the forehead.

FRONTATED, a term uſed by *Botaniſts*, to expreſs that the petalum, or leaf of a flower, grows broader and broader; and at laſt, perhaps, terminates in a right line; in oppoſition to *cuſpidated*, which expreſſes, that the leaves terminate in a point.

FRONTEVAUX, *order of.* See FONTEVRAUD.

FRONTIER, the border, confine, or extreme, of a kingdom, or province; which the enemies find in front when they would enter the ſame. Thus we ſay, a *frontier* town, *frontier* province, &c. *Frontiers* were anciently called *marches*.

The word is derived from the French *frontiere*, and that of the Latin *frontaria*; as being a kind of front oppoſed to the enemy. Skinner derives *frontier* from *front*; inaſmuch as the *frontier* is the exterior, and moſt advanced part of a ſtate; as the front is that of the face of a man.

FRONTIS *os*, in *Anatomy*, the bone of the forehead. See *Tab. Anat. (Oſteol.) fig.* 1. *lit. a.* See Os *Frontis*.

FRONTIGNIAC *wine* is ſo called, from a town of Languedoc in France, ſituated ſixteen miles ſouth-weſt of Montpelier, remarkable for producing it.

FRONTISPIECE, in *Architecture*, the portrait, or principal face, of a fine BUILDING.

The word is formed of the Latin *frontiſpicium*, q. d. *frontis hominis inſpectio*.

The *frontiſpiece* of the Louvre is the fineſt piece of architecture in France.

Hence, alſo, by a figure, we ſay, the *frontiſpiece* of a book, meaning an ornament, with an engraven title on the firſt page.

FRONTLET. See FRONTAL.

FRONTLET, *Aim*, in *Gunnery*, is a piece of a plank three inches thick, a foot long, and ſeven or eight inches high, with a round cavity underneath, to fit the outſide of the gun, and having a ſmall ſlit to ſee the object through it. It is placed upon the vent field of the gun, when it is pointed in a BATTERY.

FRONTON, in *Architecture*, an ornament, among us more uſually called PEDIMENT.

FROST, an exceſſive cold ſtate of the weather, whereby the motion and fluidity of liquors is ſuſpended; or, it is that ſtate of the air, &c. whereby fluids are converted into ICE. See COLD and FREEZING.

Metals contract in *froſt*. Monſ. Azout found, by experience, that an iron tube, twelve feet long, loſt two lines of its length, upon being expoſed to the air in a *froſty* night; but this we ſuppoſe wholly the effect of the cold. *Froſt* does not contract fluids, as was formerly imagined; on the contrary, it ſwells or dilates them, by nearly a tenth of their bulk. See ICE.

Scheffer aſſures us, that in Sweden the *froſt* pierces into the earth two cubits, or Swediſh ells, and turns what moiſture is found therein into a whitiſh ſubſtance, like ice: he adds, the ſtanding waters freeze to a greater depth, even to three ells, or more; but thoſe that have a current, leſs; and rapid waters, and bubbling ſprings, never freeze, even there.

Olearius aſſures us, that in the city of Moſcow he obſerved the earth to be cleft by the *froſt* many yards in length, and a foot broad. Scheffer mentions ſudden cracks or rifts in the ice of the lakes of Sweden, nine or ten feet deep, and many leagues long; and adds, that the rupture is made with a noiſe not leſs terrible than if many guns were diſcharged together. By ſuch means the fiſhes are furniſhed with air; ſo that they are rarely found dead.

In the great *froſt* in 1683, oaks, aſhes, walnut-trees, &c. Mr. Bobart tells us, were miſerably ſplit and cleft, ſo that one might ſee through them; and this, frequently, with terrible noiſes, like the exploſion of fire-arms; the clefts were not only in the bodies, but continued to the larger boughs, roots, &c. See an inquiry into the circumſtances and cauſes hereof in the Philoſoph. Tranſact. N° 165.

The natural hiſtories of *froſts* furniſh very extraordinary effects thereof. The trees are frequently ſcorched, and burnt up, as with the moſt exceſſive heat; of which there are divers inſtances in ſo warm a climate as that of Provence.

The cloſe of the year 1708, and the beginning of 1709, were remarkable, throughout the greateſt part of Europe, for a ſevere *froſt*. Dr. Derham ſays, it was the greateſt in degree, if not the moſt univerſal, in the memory of man: it extended throughout England, France, Germany, Denmark, Italy, &c. but it was ſcarce felt in Scotland or Ireland. All the orange-trees, and olives, in Italy, Provence, &c. and all the walnut-trees throughout France, with an infinity of other trees, periſhed by this *froſt*. They had a kind of gangrene that grew on them; which Monſ. Gauteron takes to have been the effect of a corroſive ſalt corrupting and deſtroying their texture. He adds, there is ſo much reſemblance between the gangrene befalling plants through *froſt*, and that which the parts of animals are liable to, that they muſt have ſome analogous cauſe. Corroſive humours burn the parts of animals; and the aerial nitre condenſed has the ſame effect on the parts of plants. *Penetrabile* frigus *aduret*. Memoires de l'Academie Royale des Sciences, an. 1709.

In England, the greateſt ſufferers in the animal kingdom, Dr. Derham obſerves, were birds and inſects; particularly larks, and robin-red-breaſts; much the greateſt part of which periſhed. But the vegetables were far the greater ſufferers; few of the tender ſorts eſcaped; bays, hollies, roſemary, cypreſs, alaterni, phillyreas, arbuti, lauruſtines, and even furze; with moſt of the fruteſcent herbs, as lavenders, abrotanums, rue, thyme, &c. Mr. Bobart informs us, were generally deſtroyed. The ſame writer adds, that the ſap of the finer wall fruit was ſo congealed and diſordered, that it ſtagnated in the limbs and branches, and produced diſorders like to chilblanes in human bodies, which, in many parts of trees, would turn to mortifications; and that the very buds of the finer trees, both the leaf-buds, and bloſſom-buds, were quite killed, and dried into a farinaceous matter.

Dr. Derham relates it, as a common obſervation, that vegetables ſuffered more in this winter from the ſun, than the *froſt*; in that the ſun-ſhine melting the ſnow, and opening the ground, left them more expoſed to the rigours of the enſuing night; and at a meeting of the Royal Society, it was obſerved, that the calamities which befel trees, aroſe, not purely from their being frozen, but, principally, from the winds ſhaking and rocking them, when they were ſo; which rent and parted their fibres. Phil. Tranſ. N° 324.

In very cold countries meat may be preſerved by the *froſt* ſix or ſeven months, and prove tolerable good eating. See Captain Middleton's Obſervations made in Hudſon's Bay, in the Phil. Tranſ. N° 465. ſect. 2.

In that climate the *froſt* ſeems never out of the ground, it having been found hard frozen in the two ſummer months.

Brandy and ſpirits of wine, ſet out in the open air, freeze to ſolid ice in three or four hours. Lakes and ſtanding waters, not above ten or twelve feet deep, are frozen to the ground in winter, and all the fiſh therein periſh.

But in rivers, where the current of the tide is ſtrong, the ice does not reach ſo deep, and the fiſh are preſerved.

Springs have never yet been found free from FREEZING, though lying ever ſo deep; ſo that the water uſed is melted ſnow and ice. Id. ibid.

The great power of *froſt* on vegetables is a thing ſufficiently known; but the differences between the *froſts* of a ſevere winter, and thoſe which happen in the ſpring mornings, in their effects on plants and trees, were never perfectly explained, till by Meſſ. Du Hamel, and De Buffon, in the Memoirs of the Paris Academy.

The accurate knowlege of vegetables, which is ſo material a part of agriculture, as to deſerve the attention of all who wiſh well to their country, is however a thing only to be arrived at in length of time, and by a great number of experiments, ſuch as no one man's life can give him opportunities of making; and even thoſe which have been made ſeemingly with the greateſt care and caution in one place, and have ſerved for the eſtabliſhment of rules with one author, have been found to ſucceed very differently, and to give very different ideas in another place, and to another perſon.

The *froſts* of ſevere winters are much more terrible than thoſe of the ſpring, as they bring on a privation of all the

products

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products of the tenderer part of the vegetable world; but then they are not frequent, ſuch winters happening but once perhaps in an age, and the *froſts* of the ſpring are in reality greater injuries to us than theſe, as they do us great injuries, though not ſo terrible as the others, and theſe are every year repeated.

In regard to trees the great difference is this, that the *froſts* of ſevere winters affect even their wood, their trunks and large branches; whereas thoſe of the ſpring have only power to hurt the buds.

The winter *froſts* happening at a time when moſt of the trees in our woods and gardens have neither leaves, flowers, nor fruits upon them, and have their buds ſo hard as to be proof againſt ſlight injuries of weather, eſpecially if the preceding ſummer has not been too wet; in this ſtate, if there are no unlucky circumſtances attending, the generality of trees bear moderate winters very well; but hard *froſts*, which happen late in the winter, cauſe very great injuries even to thoſe trees which they do not utterly deſtroy. Theſe are, 1. Long cracks following the direction of the fibres. 2. Parcels of dead wood incloſed round with wood yet in a living ſtate. And, 3. That diſtemperature which the foreſters call the double blea, which is a perfect circle of blea, or ſoft white wood, which, when the tree is afterwards felled, is found covered by a circle of hard and ſolid wood. The BLEA is in its natural ſtate an outer circle of white and imperfect wood encompaſſing the hard and more perfect wood of the tree, and ſurrounded by the bark, and is eaſily diſtinguiſhed in moſt ſpecies from the hard wood or heart of the tree by its different colour, and want of hardneſs.

The number of obſervations which Mr. Reaumur made of the blea in trees of different parts of France, all ſhewed him the falſe blea under the ſame number of annual circles of the after-growth of the tree; and theſe being counted, proved juſt as many as the number of years ſince 1709; whence he very juſtly concluded, that all the falſe blea he found throughout the kingdom, was the effect of the ſeverity of this one hard winter. And it is very evident, that this falſe blea is that part of the tree, which in the year 1709 was the true and natural blea, and which the ſeverity of the *froſts* of that winter prevented from ever becoming ſound and ſolid wood, but left it to become more weak and defective for a ſucceſſion of years; during which the ſeveral annual circles of ſupervening blea all became ſound and perfect wood in their natural courſe.

It appears very plain, that the blea muſt be that part of the wood which ſuffers moſt, becauſe it is the outer wood of all, and itſelf makes a covering for the inner part; and add to this, that it is of itſelf of a much leſs compact texture, and contains more juices for the *froſt* to act upon.

Another accident attending trees from very ſevere *froſts* is, that they are ſometimes ſplit by them according to the direction of their fibres, and this often with a very loud crack.

It is not uncommon in large foreſts to meet with trees that have been thus ſplit, and which having outlived the winter that occaſioned it, are found to have a long rib marking the place where the crack was, and forming a ſort of cicatrix or ſcar over the wound. This cicatrix or rib is however only ſuperficial; and wherever it is, the crack is ſtill found remaining under it in the tree; for though the bark and blea can in this manner conſolidate and form a covering for a wound, the fibres of the ſolid wood, when once broken or ſeparated, never cloſe again.

It is the general opinion of the workmen, that all theſe cracks in timber are the effects of *froſts*; and it is very eaſy to conceive, that it may be natural for *froſts* to effect it, as it is well known that all frozen liquors take up more room, than they did while in a fluid ſtate. See FREEZING. It is not certain, however, that all the cracks in timber are from this cauſe, many of them may have been occaſioned merely by a redundance of ſap.

The opinions of authors about the expoſitions of trees to the different quarters, have been very different, and moſt of them grounded on no rational foundation. Many are of opinion thal the effects of *froſt* are moſt violently felt on thoſe trees which are expoſed to the north; and others think, the ſouth, or the weſt, the moſt ſtrongly affected by them. There is no doubt, but the north expoſure is ſubject to the greateſt cold. It does not, however, follow from this, that the injury muſt be always greateſt on the trees expoſed to the north in *froſts*; on the contrary, there are abundant proofs among the preceding obſervations, that it is on the ſouth ſide that trees are generally more injured by *froſt*; and it is plain from repeated experiments, that there are particular accidents, under which a more moderate *froſt* may do more injury to vegetables, than the moſt ſevere one which happens to them under more favourable circumſtances.

It is plain from the accounts of the injuries trees received by the *froſts* in 1709, that the greateſt of all were owing to repeated falſe thaws, ſucceeded by repeated new *froſts*. But the *froſts* of the ſpring ſeaſon furniſh abundantly more numerous examples of this truth; and ſome experiments made by Mr. de Buffon, at large in his own words, prove inconteſtibly, that it is not the ſevereſt cold, or moſt fixed *froſt*, that does the greateſt injury to vegetables.

This is an obſervation directly oppoſite to the common opinion, yet is not the leſs true, nor is it any way diſcordant to reaſon. We find by a number of experiments, that humidity is the thing that makes *froſt* fatal to vegetables, and therefore every thing that can occaſion humidity in them, expoſes them to theſe injuries, and every thing that can prevent or take off an over proportion of humidity in them, every thing that can dry them, though with ever ſo increaſed a cold, muſt prevent or preſerve them from thoſe injuries. Numerous experiments and obſervations tend to prove this. It is well known that vegetables always feel the *froſt* very deſperately in low places where there are fogs. The plants which ſtand by a river ſide, are frequently found deſtroyed by the ſpring and autumnal *froſts*, while thoſe of the ſame ſpecies, which ſtand in a drier place, ſuffer little, or perhaps not at all by them; and the low and wet parts of foreſts are well known to produce worſe wood than the high and drier; and the coppice wood in wet and low parts of common woods, though it puſh out more vigorouſly at firſt than that of other places, yet never comes to ſo good a growth; for the *froſt* of the ſpring killing theſe early top-ſhoots, obliges the lower part of the trees to throw out lateral branches; and the ſame thing happens in a greater or leſſer degree to the coppice-wood that grows under cover of larger trees in great foreſts; for here the vapours not being carried off, either by the ſun or wind, ſtagnate and freeze, and in the ſame manner deſtroy the young ſhoots, as the fogs of marſhy places. It is a general obſervation alſo, that the *froſt* is never hurtful to the late ſhoots of the vine, or to the flower-buds of trees, except when it follows heavy dews, or a long rainy ſeaſon, and then it never fails to do great miſchief, though it be ever ſo ſlight.

The *froſt* is always obſerved to be more miſchievous in its conſequences on newly cultivated ground, than in other places; and this is becauſe the vapours which continually ariſe from the earth, find an eaſier paſſage from thoſe places, than from others. Trees alſo which have been newly cut, ſuffer more than others by the ſpring *froſts*, which is owing to their ſhooting out more vigorouſly.

Froſts alſo do more damage on light and ſandy grounds, than on the tougher and firmer ſoils, ſuppoſing both equally dry; and this ſeems partly owing to their being more early in their productions, and partly to their lax texture, ſuffering a greater quantity of vapours to tranſpire.

It alſo has been frequently obſerved, that the ſide-ſhoots of trees are more ſubject to periſh by the ſpring *froſts*, than thoſe from the top; and Mr. Buffon, who examined into this with great accuracy, always found the effects of the ſpring *froſts* much greater near the ground than elſewhere. The ſhoots within a foot of the ground quickly periſhed by them; thoſe which ſtood at two or three feet high, bore them much better; and thoſe at four feet and upwards frequently remained wholly unhurt, while the lower ones were wholly deſtroyed.

Theſe are a ſeries of obſervations, which have proved beyond all doubt, that it is not the hard *froſts* which ſo much hurt plants, as thoſe *froſts*, though leſs ſevere, which happen when they are full of moiſture; and this clearly explains the account of all the great damages done by the ſevere *froſts* being on the ſouth ſide of the trees which are affected by them, though that ſide has been plainly all the while leſs cold than the north. Great damage is alſo done to the weſtern ſides of trees and plantations, when after a rain with a weſt wind, the wind turns about to the north at ſun-ſet, as is frequently the caſe in ſpring, or when an eaſt-wind blows upon a thick fog before ſun-riſing. Mem. Acad. Scien. Par. 1737.

FROST, *hoar*, or *white* FROST, *Pruina*, is the DEW *frozen*, or congealed, early in cold mornings; chiefly in autumn. *Hoar-froſt*, Mr. Regis obſerves, conſiſts of an aſſemblage of little parcels of ice cryſtals; which are of various figures, according to the different diſpoſition of the vapours, when met, and condenſed, by the cold.

Dew is, in all appearance, the matter of *hoar-froſt*; though many of the Carteſians will have it formed of a cloud; and either congealed in the cloud, and ſo let fall; or ready to be congealed as ſoon as it arrives at the earth.

FROST-*ſplit*, a phraſe uſed by our farmers to expreſs ſuch trees as have large cracks in their trunks and branches,

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rendering them unfit for the uſes they would otherwiſe have ſold for, and by that means greatly debaſing their value. It has been pretended by ſome, that theſe rents and cracks in trees were owing to other cauſes; but we have had innumerable inſtances, and thoſe well recorded, of the immediate effect of hard *froſts* on the ſtrongeſt trees, ſpoiling them in this manner; and it appears very rational to ſuppoſe all theſe injuries do really come by the ſame means, and are properly called by this term. Vide ſupra, and the Phil. Tranſ. N° 165.

FROTH, a white, light ſubſtance, formed on the ſurface of fluids, by vehement agitation.

Froth conſiſts wholly of little ſpherules, or globules; and, accordingly, may be defined, an aſſemblage of aqueo-aereal bubbles.

FROTH, in the *Manege*, is a moiſt white matter that oozes from a horſe's mouth, otherwiſe called foam. A horſe that by champing on his bridle, throws out a great deal of *froth*, is judged to be a horſe of mettle and health, and to have a cold freſh mouth.

FROTH-*ſpit*, or *cuckow-ſpit*, a name given to a ſort of white *froth* or ſpume very common in the ſpring, and firſt months of the ſummer, on the leaves of certain plants, particularly on thoſe of the common white field lychnis, or catch-fly, thence called by ſome *ſpatling-poppy*. All writers on vegetables have taken notice of this *froth*, though few have underſtood the cauſe or origin of it, till of late. Many imagined it an exhalation from the earth; ſome have eſteemed it, as its name expreſſes, the ſaliva of the cuckow; others, the extravaſated juices of the plant, and ſome a hardened dew. But all theſe are erroneous opinions, and the account of it is that it owes its origin to a ſmall inſect, called by ſome the flea-graſs-hopper, which applies its anus cloſe to the leaf, and diſcharges upon it a ſmall drop of a white viſcous fluid, containing ſome air in it, and, therefore, ſoon elevated into a bubble. Before this is well formed, it depoſits ſuch another drop, and ſo on, till it is every way overwhelmed with a quantity of theſe bubbles, which form this *froth*. See CICADULA.

FROUNCE, in the *Manege*, a diſeaſe in horſes, when ſmall warts or pimples ariſe in the midſt of the palate, which are very ſoft and ſore, and ſometimes breed in the lips and tongue.

This diſorder is occaſioned many ways; ſometimes by eating wet hay, whereon rats or other vermin have piſſed; by drawing frozen duſt into their mouths among the graſs, &c.

As to the method of treatment, it conſiſts in letting them blood in the two largeſt veins under the tongue, and waſhing the ſores with vinegar and ſalt, or with ale and ſalt, till they bleed.

FROUNCE, in *Falconry*, a diſeaſe incident to hawks, ariſing from moiſt and cold humours falling down to the palate and root of the tongue; by which means they loſe their appetite, and cannot cloſe their clap. Waſhing with alum-water, lemon-juice, &c. is held good for it.

FROWER, an edged tool uſed in cleaving wood into laths.

FROWEY, a term uſed by workmen for timber, which is evenly tempered, and works freely without tearing.

FROZEN, or FRIGID *zone*. See ZONE.

FROZEN *ocean*. See OCEAN.

FROZEN *waters*. See WATERS.

FRUCTIFEROUS properly denotes any thing that produces fruit; but in a more large and figurative ſenſe, is uſed by lord Bacon, and others, for ſuch experiments in natural philoſophy, as prove advantageous to the experimenter in point of gain or profit.

FRUCTIFICATION *of plants*. *Fructification* is defined by Linnæus to be the temporary part of a vegetable appropriated to generation, terminating the old vegetable, and beginning the new. It conſiſts of the following ſeven parts; viz. the CALYX, COROLLA, STAMEN, PISTILLUM, PERICARPIUM, SEMEN or SEED, and RECEPTACULUM.

The organs of *fructification* in plants are the *pointal*, generally contained in the middle of flowers; and the *threads*, which ſurround it, furniſhed at their extremities with little *heads*; theſe the botaniſts term, the firſt the *piſtillum*, the ſecond the *ſtamina*, and the third, or heads of the ſtamina, the *antheræ*, or *apices*. See FLOWER.

The apices contain the *farina fœcundans*, a fine ſubtile matter analogous to the *ſemen maſculinum* in animals; the ſtamina ſerve only for their ſupport, and to convey nutrition to them; and the *piſtillum* is the part deſtined to receive this *farina*, and convey it to the ſeeds.

It is upon theſe principles that the excellent Linnæus has founded his ſyſtem of the vegetable world, and formed his claſſes. This author's work has been received by the learned world in all nations with the reſpect it merits; but has been too generally cenſured among the ſlighter proficients in botanical reſearches, as abſtruſe, difficult, and unintelligible. The viewing theſe things in a new light, and the neceſſity of making new words to convey new ideas, have indeed given this great attempt ſomething of the face of an abſtruſe piece; but premiſing a few general hints, it may not be difficult to vindicate the author from the heavy charges which have been laid againſt him, and give the Engliſh reader a clear and perfect view of his work.

From the ſtructure and uſe of the *piſtillum*, *ſtamina*, and *apices*, it is eaſy to conceive that the former muſt be accounted the *female*, and the two latter the *male parts* of flowers. This is the great baſis of his ſyſtem. To expreſs the different combinations of theſe in the different claſſes of plants, by formal deſcriptions to each, had been tedious, and an exceſſive burden to the memory: to avoid this, he has excellently contrived the compriſing that deſcription, or general character, in one word. It is eaſy to conceive there could be no word already in uſe, that could expreſs what had never before been thought of; he was therefore neceſſitated to invent new ones for this purpoſe. He has ventured therefore to form twenty-four ſuch, for his claſſes, which are of that number, and has taken them from that language which all the learned have ever uſed on the ſame occaſion, the Greek; and this with the leaſt oſtentation or ſhew of learning imaginable: in ſhort, to underſtand all theſe, there is no need of knowing more Greek than that ἀνὴρ ſignifies a *man*, or any thing male; and γυνὴ, a *woman*, or *female*; that δύναμις is *power* or *efficacy*; ἀδελφὸς, a *brother*; and thence ἀδελφιὰ, *brotherhoods* or *communities*; that σὺν is *together*; γένεσις, *generation*, or *origin*; and οἶκος, a *houſe*, or *habitation*; that πολὺς ſignifies *many*; γάμος, *marriage*; and κρυπτὸς, *hidden*, or *concealed*; and that the numbers one, two, three, four, five, ſix, ſeven, eight, nine, ten, twelve, and twenty, or their derivatives, once, twice, &c. are expreſſed by the Greek words μόνος, δὶς, τρὶς, τετρὰ, πέντε, ἕξ, ἑπτὰ, ὀκτὼ, ἐννέα, δεκὰς, δωδεκα, εἰκοσι: there needs, I ſay, no more knowlege of Greek than this, to underſtand perfectly the meaning of all the terms this author, to avoid tedious deſcriptions, has uſed as the characters of his claſſes. To begin with certainty and regularity:

He firſt divides the whole vegetable world into ſuch ſpecies as have their flowers viſible and obvious to the eyes, and ſuch as have them inviſible, or at the utmoſt ſcarce diſcernible.

Thoſe which have them viſible he then divides again into ſuch as have the *ſtamina*, *apices*, and *piſtillum*, that is, the male and female parts of *fructification* in the ſame flower: Theſe he, for that reaſon, calls *hermaphrodite* flowers.

And ſuch as have the male and female parts of *fructification*, that is the *apices* and *piſtillum*, either in different flowers upon the ſame ſtalk, or upon different plants of the ſame ſpecies: theſe he calls the diſtinct male and female flowers.

Thoſe which have the different organs of *fructification* lodged in the ſame flower, he again divides into ſuch as have the ſtamina in no part growing together, or cohering to one another; and ſuch as have them either growing together or cohering together mutually in ſome part, either with one another, or with the *piſtillum*.

Thoſe which have them in no part cohering either with the *piſtillum* or with one another, he again ſubdivides into ſuch as obſerve no exact or accurate proportion of length one among another; and ſuch as have ever two of the ſtamina ſhorter than the reſt.

From theſe general diviſions he deſcends to his particular claſſes, of which he eſtabliſhes twenty-four. See the ſeveral claſſes and orders in the Linnæan ſyſtem illuſtrated by figures in *Tables* I. II. III. IV. V. VI. and VII. *of Botany*.

The firſt thirteen are of the plants which have *hermaphrodite* flowers, with the organs of *fructification* disjunct, no where cohering with one another, and obſerving no exact proportion in length.

The firſt is the *monandria*, containing two orders: the word is derived from the Greek μόνος and ἀνὴρ, one male part, and ſignifies a flower that has only one ſuch. This claſs accordingly comprehends thoſe plants which have an *hermaphrodite* flower, and in it only one ſingle *ſtamen*: of this claſs are the *blitum*, *canna*, &c.

The ſecond is the *diandria*, containing three orders; the word, derived from the ſame ἀνὴρ and δὶς, *twice*, and ſignifying a flower that has two male parts, comprehends all thoſe plants which have *hermaphrodite* flowers with two *ſtamina* in each: of this claſs are the *monarda*, *anthoxanthum*, *piper*, &c.

The third is the *triandria*, containing three orders; the word, derived from the ſame ἀνὴρ and τρὶς, *thrice*, ſignifies a flower that has three male parts in it, and comprehends thoſe plants which have *hermaphrodite* flowers with three *ſtamina* in each: of this claſs are the *crocus*, *avenna*, *mollugo*, &c.

The fourth is the *tetrandria*, containing four orders; the word,

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word, derived from the ſame ἀνὴρ and τετρὰς, *four times*, ſignifies a flower that has four male parts, and accordingly comprehends thoſe plants which have *hermaphrodite* flowers, with four *ſtamina* in each: of this claſs are the *dipſacus*, *hammamelis*, *potamogeton*, &c.

The fifth is the *pentandria*, containing ſix orders: the word, derived from the ſame ἀνὴρ and πέντε, *five*, ſignifies a flower with five male parts; and accordingly this claſs comprehends thoſe plants which have *hermaphrodite* flowers with five *ſtamina* in each: of this claſs are the *nerium*, *anethum*, *turnera*, *parnaſſia*, *craſſula*, *myoſurus*, *&c.*

The ſixth is the *hexandria*, containing five orders: the word, derived from the ſame ἀνὴρ and ἕξ, ſignifies a flower that has ſix male parts, and accordingly comprehends thoſe plants which have *hermaphrodite* flowers with ſix *ſtamina* in each; theſe *ſtamina*, the author obſerves, are either all equal in length, or alternately one ſhorter than another; the latter belong to the fifteenth claſs: of this claſs are the *amaryllis*, *oryza*, *rumex*, *petiveria*, *aliſma*, *&c.*

The ſeventh is the *heptandria*, containing four orders: the word, derived from the ſame ἀνὴρ and ἑπτὰ, *ſeven*, ſignifies a flower with ſeven male parts, and comprehends thoſe plants which have *hermaphrodite* flowers with ſeven *ſtamina* in the ſame flower with the *piſtillum*: of this claſs are the *æſculus*, *ſaururus*, *&c.*

The eighth is the *octandria*, containing four orders: the word, derived from the ſame ἀνὴρ and ὀκτὼ, *eight*, ſignifies a flower with eight male parts, and comprehends thoſe plants which have *hermaphrodite* flowers with eight *ſtamina* in the ſame flower with the *piſtillum*: of this claſs are the *œnothera*, *galenia*, *polygonum*, *adoxa*, *&c.*

The ninth claſs is the *enneandria*, containing three orders: the word, derived from the ſame ἀνὴρ and ἐννέα, *nine*, ſignifies a flower that has nine male parts, and comprehends thoſe plants which have *hermaphrodite* flowers with nine *ſtamina* in each: of this claſs are the *caſſyta*, *rheum*, *butomus*, *&c.*

The tenth claſs is the *decandria*, containing five orders: the word, derived from the ſame ἀνὴρ and δεκὰς, *ten*, ſignifies a flower which has ten male parts, and comprehends all thoſe plants which have *hermaphrodite* flowers with ten *ſtamina* in each: of this claſs are the *kalmia*, *ſaxifraga*, *ſtellaria*, *oxalis*, *phytolacca*, *&c.*

The eleventh is the *dodecandria*, containing five orders: the word, derived from the ſame ἀνὴρ and δώδεκα, *twelve*, ſignifies a flower which has twelve male parts in it, and comprehends thoſe plants which have *hermaphrodite* flowers with from twelve to nineteen *ſtamina* in the *hermaphrodite* flower: of this claſs are the *aſarum*, *agrimonia*, *euphorbia*, *ſempervivum*, *&c.*

The twelfth is the *icoſandria*, containing five orders: the word, derived from the ſame ἀνὴρ and εἴκοσι, *twenty*, ſignifies ſtrictly a flower with twenty male parts in it; the author, however, does not underſtand it in that ſtrict ſenſe, but uſing it as we frequently do words expreſſing large quantities, as indefinite and in an indeterminate ſenſe, defines it to mean only a larger number of *ſtamina* than are expreſſed under any other of the diſtinctions; and comprehends under it, in this claſs, all thoſe plants which have *hermaphrodite* flowers and commonly twenty *ſtamina*, often more, in each; thoſe *ſtamina* alſo growing to the inner ſide of the cup of the flower, not to the receptacle of the future ſeeds: of this claſs is the *punica*, *cratægus*, *ſorbus*, *pyrus*, *rubus*, *&c.*

The thirteenth is the *polyandria*, containing ſeven orders: the word, derived from the ſame ἀνὴρ and πολὺς, *many*, ſignifies, in an exact ſenſe, no other than what he makes the *icoſandria*, the title of the laſt claſs, expreſs: theſe are, perhaps, the only two words in which his expreſſion is deficient, the name he has given the claſſes not at all importing their particular difference from one another: this, however, he has very accurately done in the character which follows them; and comprehends under this claſs thoſe plants which have *hermaphrodite* flowers with from twenty to a hundred *ſtamina* in each, but which grow in this to the receptacle of the future ſeed, not as in the other claſs to the inner ſide of the cup of the flower: of this claſs are the *ſarracenia*, *pæonia*, *aconitum*, *aquilegia*, *ſtratiotes*, *ranunculus*, *&c.*

Theſe are the claſſes this accurate diſtinguiſher has eſtabliſhed among the *hermaphrodite* flowers, whoſe *ſtamina* have no regular proportion of length, in regard to one another. To theſe he next ſubjoins two claſſes of ſuch of them as have ever two of their *ſtamina* ſhorter than the reſt.

The firſt of theſe (the fourteenth claſs of the general order) is of the *didynamia*, containing two orders: the word, derived from δὶς and δύναμις, *power*, or *efficacy*, ſignifies with him ſuch flowers as have two of their male parts of more efficacy than the reſt; and in this claſs he accordingly comprehends all thoſe plants which have *hermaphrodite* flowers with four *ſtamina*, two of which are cloſe together, longer, and of greater efficacy in the great work of fecundating the ſeeds, than the reſt: of this claſs are the *melittis*, *melianthus*, *&c.*

The ſecond of theſe (the fifteenth claſs in the general order) is of the *tetradynamia*, containing two orders: the word, derived from τετρὰς and δύναμις, ſignifies a flower with four of its male parts of more efficacy than the reſt; and in this claſs he comprehends the plants with *hermaphrodite* flowers, having ſix *ſtamina*, four of which are longer than the reſt, the two oppoſite ſhort: of this claſs are the *lunaria*, *cheiranthus*, *&c.*

From theſe he proceeds to thoſe *hermaphrodite* flowers whoſe *ſtamina* cohere, either mutually along one another, in different manners, or with the *piſtillum* of the flower: theſe coalitions of the *ſtamina* he calls brotherhoods, or communities; and according to the different ſtate of theſe, and their conjunction with the *piſtillum*, he eſtabliſhes five claſſes of them.

The firſt of theſe (the ſixteenth in the general order) is the *monadelphia*, containing five orders: the word, derived from μόνος, *ſingle*, and ἀδελφιὰ, *brotherhoods*, or *communities*, ſignifies with him a flower, whoſe *ſtamina*, by means of the filaments running in among one another, are all formed into one body; and under this claſs he comprehends thoſe plants with *hermaphrodite* flowers, whoſe *ſtamina*, or male parts, are all bound together in one body: of this claſs are the *hermannia*, *geranium*, *pentapetes*, *alcea*, *&c.*

The ſecond of theſe (the ſeventeenth claſs in the general order) is the *diadelphia*, containing four orders: the word, derived from δὶς and ἀδελφιὰ, ſignifies with him a flower whoſe *ſtamina* are, by the conjunction of their filaments, formed into two bodies; and under this claſs he comprehends thoſe plants which have *hermaphrodite* flowers, the *ſtamina* of which are ſo cluſtered together into two bodies: of this are the *fumaria*, *polygala*, *lathyrus*, *&c.*

The third of theſe (the eighteenth in the general order) is the *polyadelphia*, containing three orders: the word, derived from πολὺς and ἀδελφιὰ, ſignifies with him a flower whoſe male parts are cluſtered into three or more ſeparate bodies; and in this he comprehends thoſe plants with *hermaphrodite* flowers, whoſe *ſtamina*, by the conjunction of their filaments, are formed into three or more cluſters: of this claſs are the *theobroma*, *citrus*, *hypericum*, *&c.*

The fourth of theſe claſſes (the nineteenth in the general order) is the *ſyngeneſia*, containing ſix orders: the word, derived from σὺν, *together*, and γένεσις, *generation*, *origin*, or *formation*, ſignifies with him ſuch flowers as have their male parts naturally formed into a ſingle regular congeries; and accordingly he comprehends under this claſs ſuch plants as have *hermaphrodite* flowers, the *ſtamina* of which, by the junction of their *apices*, are formed into a ſingle, regular, cylindric body: of this claſs are the *leontodon*, *xeranthemum*, *helianthus*, *calendula*, *echinops*, *lobelia*, *&c.*

The fifth of theſe claſſes (the twentieth in the general order) is the *gynandria*, containing eight orders: the word, derived from γυνὴ, *a woman*, or *female*, and ἀνὴρ, *male*, ſignifies with this author a conjunction of the male and female parts of a flower at their origin; and he accordingly comprehends under this claſs thoſe plants which have *hermaphrodite* flowers, the *ſtamina*, or male parts of which grow to the *piſtillum*, or female part of the flower, and not to the receptacle of the ſeeds: of this claſs are the *orchis*, *ſiſyrinchium*, *paſſiflora*, *ariſtolochia*, *arum*, *&c.*

Next after theſe he ranges thoſe plants which have flowers not *hermaphrodite*, but regularly and diſtinctly male and female, as the ſexes in animals are diſpoſed; and after theſe ſuch plants as have flowers irregularly of one, or the other, or ſomething of both ſexes.

Of theſe he eſtabliſhes only three claſſes.

The firſt of theſe (the twenty-firſt claſs in the general order) is the *monoecia*, containing eleven orders: the word, derived from μόνος, and οἶκος, *a habitation*, ſignifies with this author ſuch plants as have their diſtinct flowers on the ſame individual; and he comprehends accordingly under it thoſe plants which have the male and female flowers diſtinct in themſelves, but placed on the ſame plant, or the different ſtalks from the ſame root: of this claſs are the *zanichella*, *tripſacum*, *urtica*, *parthenium*, *juglans*, *pinus*, *momordica*, *andrachne*, *&c.*

The ſecond of theſe (the twenty-ſecond claſs in the general order) is the *dioecia*, containing fourteen orders: the word, derived from the ſame οἶκος and δὶς, ſignifies with him plants which have their male and female flowers not on the ſame individual; and accordingly comprehends under it ſuch plants as have diſtinct male and female flowers, on different plants of the ſame ſpecies, either of which, the male and female plants, as they are

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hence called, might have arisen from the same seed: of this class are the *salix*, *empetrum*, *viscum*, *humulus*, *tamus*, *populus*, *mercurialis*, *kiggelaria*, *menispermum*, *cliffortia*, *juniperus*, *ruscus*, *clutia*, &c.

The third of these (the twenty-third in the general method) is the *polygamia*, containing three orders: the word, derived from πολὺς, *many*, and γάμος, *marriage*, signifies with this author plants which have a diversity of combinations, and many ways of *fructification*, in the same species; and accordingly he comprehends under this class those plants which have, in the same species, some flowers male, others female, each distinct and perfect in its kind; and others mixed or *hermaphrodite*, with the male and female organs of *fructification* both in each: of this class are the *veratrum*, *fraxinus*, *ficus*, &c.

After all these he places those plants whose flowers are either absolutely invisible, or scarce discernible by the eye: of these he makes only one, his twenty-fourth and last class, the *cryptogamia*: the word, derived from κρυπτὸς, *hidden*, or *concealed*, and γάμος, or *marriage*, signifies a set of plants, in which the *fructification* is concealed; and under this last class he comprehends those plants which either flower, as is generally supposed, within the fruit, or have the organs of their *fructification* so mingled as to escape our observation: of this class are the *ferns*, *mosses*, *flags*, and *mushrooms*; e. gr. *polypodium*, *bryum*, *fucus*, and *agaricus*.

These are the classes into which this author has regularly and accurately reduced the whole vegetable world; the characters of which are so expressive, and the parts they are founded upon so fixed and invariable in their nature and office, that there seems no reason hereafter to perplex the world with any new system.

As the classes are here all taken from the number, site, and disposition of the male parts of the flower, so the orders which make their subdistinctions are, by this author, deduced from the differences of the female parts or *pistillum*; and as that is single, double, triple, and so on, they are on the same principles named *monogynia*, *digynia*, *trigynia*, &c.

It were to be wished indeed, that the characters of the different genera of these classes were as perfect and accurate as the classes themselves: this, however, was more than the work of one man; the author has fixed the general distinction, and led the way, and it is easy now for a much less genius to follow him.

FRUCTISTÆ, in *Botany*. See BOTANY.

FRUGIVOROUS *Birds*, are such as feed on fruits; either wholly or in part.

The *frugivorous*, according to Mr. Willughby, are a species of terrestrial birds, some of which have crooked bills, and claws, yet are of gentler nature, and not rapacious. Such are the parrot kind; which, though sometimes carnivorous, yet feed likewise on fruit.

FRUIT, in its general sense, includes whatever the earth produces for the nourishment and support of animals; as herbs, grain, pulse, hay, corn, flax, and every thing expressed by the Latins under the name *fruges*.

In the civil law, they distinguish three kinds of *fruits*.

FRUITS, *natural*, which the earth produces spontaneously, and without any culture; as those of trees.

FRUITS *of industry*, which, though natural, require some culture to perfect them. And

FRUITS, *civil*, which are only *fruits* in the eye of law; as rents, salaries, wages, &c.

In the canon law, *fruits* include every thing whereof the revenue of a benefice consists; as glebe-land, tythes, rents, offerings, mills, &c.

FRUIT, in *Natural History*, denotes the last production of a tree, or plant, for the propagation, or multiplication, of its kind; in which sense *fruit* includes all kinds of seeds, with their furniture, &c.

FRUIT, in *Botany*, is properly that part of a plant wherein the seed is contained; called by the Latins *fructus*, and by the Greeks, καρπὸς.

The *fruit* in the Linnæan system is one of the parts of fructification, and is distinguished into three parts, viz. the PERICARPIUM, SEED, and receptacle, or RECEPTACULUM *seminum*.

FRUITS are sometimes dry; and sometimes soft and fleshy.

FRUIT also implies an assemblage of seeds in a head; as in a ranunculus, &c. and, in the general, all kinds of seeds, or grains, whether naked, or inclosed in a cover, capsule, or pod; and whether bony, fleshy, skinny, membranous, or the like. The *fruit* is the product, or result, of the flower; or that for whose production, nutrition, &c. the flower is intended. The structure and parts of different *fruits* are somewhat different; but, in all the species, the essential parts of the *fruit* appear to be only continuations, or expansions, of those observed in the other parts of the tree.

Dr. Beal suggests some very good reasons for a direct communication between the remotest part of the tree, and the *fruit*; so that the same fibres, or stamina, which constitute the root, trunk, and boughs, are extended into the *fruit* itself.

Thus, cutting open an apple transversly, it will be found to consist of four parts; viz. 1. a skin, or *cortex*, which is only a production of the skin, or outer bark, of the tree. 2. A *parenchyma*, or pulp; which is an expansion, and intumescence of the inner bark of the tree. 3. Fibres, or ramifications, of the woody part of the tree, dispersed throughout the *parenchyma*.

Of these last, authors generally reckon fifteen principal branches; ten whereof penetrate the parenchyma, and incline to the basis of the flower; the other five ascend more perpendicularly from the pedicle, or stalk, and meet with the former at the base of the flower; to these branches are fastened the capsulæ, or coats, of the kernels.

These branches, being at first extended through the parenchyma, to the flower, furnish the necessary matter for the vegetation thereof; but, the *fruit* increasing, intercepts the aliment; and thus the flower is starved, and falls off.

4. The core, which is the produce of the pith, or medulla, of the plant, indurated and strengthened by twigs of the wood and fibres, inosculated therewith: it serves to furnish a cell, or lodge, for the kernels; filtrates the juice of the parenchyma; and conveys it, thus prepared, to the kernel.

In a pear we distinguish five parts; viz. the skin, parenchyma, ramification, stone, and acetarium.

The three first parts are common to the apple. The stone, observed chiefly in choak pears, is a congeries of hard corpuscles, dispersed throughout the whole parenchyma; but in the greatest plenty, and closest together, about the centre, or acetarium: it is formed of the harder, or calculous parts, of the nutritious juice of the parenchyma, extravasated in masses. The acetarium is a substance of a tart, acid taste, of a globular figure, inclosed in an assemblage of several of the stony parts above mentioned.

In the plum, cherry, &c. there are four parts; viz. a coat, parenchyma, ramification, and stone or nucleus. The stone consists of two very different parts; the inner, called the kernel, is soft, tender, and light; being derived from the pith, or medulla, of the tree, by seminal branches, which penetrate the base of the stone; the external, or harder part, called the *shell*, is a concretion of the stony, or calculous parts of the nutritious juice, like the stone in pears; and, like that, it contains a soft, parenchymous matter within it.

The nut, analogous to which is the acorn, consists of a shell, cortex, and medulla. The shell consists of a coat, and parenchyma, derived from the bark, and wood, of the tree. The cortex consists of an inner, and outer part; the first is a duplicature of the inner tunic of the shell; the second is a mossy substance, derived from the same source as the parenchyma of the shell. But whether the medulla or pulp of the kernel arise from the pith of the tree, or the cortical part of the fruit, is not yet agreed.

Lastly, berries, as grapes, &c. besides the three general parts, viz. coat, parenchyma, and ramification, contain grains of a stony nature, which do the office of seeds.

As to the use of *fruits*, beside the pleasure and advantage they afford men, &c. they are of service in guarding, preserving, and feeding the seed inclosed; in filtrating the coarser, more earthy, and stony parts of the nutritious juice of the plant, and retaining them to themselves; and sending none to the seed but the poorest, most elaborated, and spirituous parts, for the support and growth of the tender, delicate embryo, or plantule, contained therein.

So that the *fruit* does the same office to the seed, that the leaves of the flower do to the *fruit*.

The use of *fruits* with us might, under proper regulations, be rendered much more extensive than it is. Many *fruits* which do hurt when eaten raw, would make wines equal in flavour to many of those now obtained at great prices from abroad; and lands which will not bear corn, yet would bear trees and shrubs producing such *fruits*; and the consequence of this method of culture would be, that much ground, at present lying waste, would be occupied, and great employment found for the numerous poor of some of our counties, where the quantities of waste land are proportionably so great, that there is not employment for the people of one half of the county.

Cherries properly managed make an excellent wine, and that in very large quantities; and plums also make a very agreeable kind, but that it has an austereness, which must be taken off by mixing a little sugar with it when in the glass, not before it is drawn off.

A coarse plum, somewhat larger than a damson, is the

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beſt kind for this wine. There is a ſort of plum that grows wild in ſome of our hedges. It will ſucceed on any ground, the pooreſt that can be imagined, and it produces a great abundance of *fruit*. The wine that is made from it is of a very conſiderable ſtrength, and affords a pleaſant brandy by diſtillation in conſiderable quantities. Our common garden currants afford a very agreeable wine; and our gooſeberries are not ſecond to any thing. All theſe produce *fruit* in great abundance; and the planting and taking care of them is very cheap, and the operation very eaſy. The common way of making theſe wines yields very good ones; but when the art of the experienced Vigneron is employed in it, the liquors will prove much better. Phil. Tranſ. N° 124.

Fruits are diſtinguiſhed, by gardeners, into *ſtone-fruit*, and *kernel-fruit*; *ſummer-fruit*, and *winter-fruit*; *wall-fruit*, and *dwarf-fruit*, &c.

M. Quintinie obſerves, that cold, heavy, moiſt lands, produce the faireſt and largeſt *fruit*; but the hotter, drier, and lighter, the more delicious and rich-taſted.

FRUITS, *colours from.* The red juices of *fruits*, as of currants, mulberries, elder-berries, morello, and black cherries, when inſpiſſated and dried, may be again diſſolved in water, to which they give nearly the ſame red colour as they do when freſh. Rectified ſpirit extracts the tinging particles, and acquires a brighter colour than the watery ſolution; becauſe much of the mucilage is left undiſſolved by the former. The red ſolutions, and the juices, are ſometimes made dull, and ſometimes more florid, by acids, and are generally rendered purpliſh by alkalies. The colours of theſe juices are generally periſhable. They reſiſt the power of fermentation, but quickly decay, when the juice is ſpread thinly on any ſubſtance, and dried in open air. The bright lively reds are ſooneſt changed; the dark, dull, red ſtain of the black cherry is conſiderably durable. The bright red *fruit* of the *opuntia*, or prickly pear, is an exception to the above rule; as it gives, according to Labat, a beautiful red dye. The ripe berries of BUCKTHORN ſtain paper of a green colour; from theſe is prepared the ſubſtance called SAP-*green*; which is a pigment ſufficiently durable, ſoluble in water, but not miſcible with oil. The berries, when green, yield a yellow, and, when over-ripe, a purple pigment. Woollen cloth, prepared with alum and tartar, receives, on being boiled with the berries, a periſhable yellow dye. Neumann's Chem. with Dr. Lewis's Notes, p. 433. See AVIGNON *Berry*, ANNOTTO, or ROUCOU, and TURNESOL.

FRUITS, *preſervation of.* See *Preſervation of* FLOWERS, and PRESERVATION *of Vegetables.*

Fruits intended for long keeping ſhould be gathered before they are fully ripe, and in a fair day towards noon.

For the early ripening of *fruit*, ſee FORCING and RIPENING.

FRUIT, *bread.* See BREAD.

FRUITS, with regard to commerce, are diſtinguiſhed into *recent* or *freſh*, and *dry*.

FRUITS, *recent*, are thoſe ſold juſt as they are gathered from the tree, without any farther preparation. As are moſt of the productions of our gardens and orchards, ſold by the fruiterers.

FRUITS, *dry*, are thoſe dried in the ſun, or by the fire, with other ingredients ſometimes added to them to make them keep; imported chiefly from beyond ſea, and ſold by the grocers.

Such are raiſins, currants, figs, capers, olives, cloves, nutmegs, pepper, and other ſpices; which ſee under their reſpective articles.

Under the denomination of *dry fruits* are alſo frequently included apples, pears, almonds, filberds, &c.

FRUITS, *polypyreneous.* See POLYPYRENEOUS.

FRUITS *current* for coins. See COIN.

FRUITS, *firſt.* See FIRST *fruit*, ANNATES, and PRIMITIÆ.

FRUIT-*flies*, a name given by gardeners, and others, to a ſort of ſmall black *flies*, found in vaſt numbers among *fruit*-trees, in the ſpring-ſeaſon, and ſuppoſed to do great injury to them.

Theſe are a ſpecies of ſmall black fly. Mr. Lewenhoek preſerved ſome of them for his microſcopical obſervations. He found that they did not live longer than a day or two, but that the females in this time uſually laid a great number of longiſh eggs. The gardeners who ſuppoſe that theſe flies wound the leaves of the trees, are miſtaken: it is true that they feed on their juices, but they have no weapons with which to extract this themſelves; they feed on ſuch as is naturally extravaſated, and when there is not enough of this for their purpoſe, they haunt thoſe places where the PUCERONS reſort, and feed on the juices which theſe little creatures extravaſate by means of the holes they bore in the leaves with their trunks. Theſe pucerons are a ſmall ſort of inſect very common on our *fruit*-trees, and other plants and trees; they are of a greeniſh colour, and are commonly called tree-lice. Philoſ. Tranſ. N° 262.

FRUIT-*ſtones*. The miſchiefs ariſing from the bad cuſtom of many people ſwallowing the ſtones of plums and other *fruit* are very great. The Philoſophical Tranſactions give us an account of a woman who ſuffered violent pains in her bowels for thirty years, returning once in a month or leſs. At length a ſtrong purge being given her, the occaſion of all theſe complaints was driven down from her bowels to the anus, where it gave a ſenſation of ſtoppage and diſtenſion, and produced a continual deſire of going to ſtool, but without voiding any thing. On the aſſiſtance of a careful hand in this caſe, there was taken out with a forceps an oblong ball of an oval figure, of about ten drams weight, and meaſuring five inches in circumference; this had cauſed all the violent fits of pain ſhe had been ſo many years afflicted with, and after the taking it out ſhe became perfectly well. The ball extracted looked like a ſtone, and felt very hard, but it ſwam in water; on cutting it through with a knife, there was found in the center of it a plum-ſtone, round which ſeveral coats of this tough and hard matter, reſembling a ſtone, had gathered. Another inſtance given in the ſame papers is of a man, who dying of an incurable colic, which had tormented him many years, and baffled the effects of medicines, was opened after death; and in his bowels was found the cauſe of his diſtemper, which was a ball of the like nature with that juſt mentioned, but ſomething larger, being ſix inches in circumference when meaſured, and weighing an ounce and half; in the center of this, as of the other, there was found the ſtone of a common plum, and the coats were of the ſame matter with thoſe of the former. Theſe and ſeveral other inſtances mentioned in the ſame place, ſufficiently ſhew the folly of that common opinion, that the ſtones of *fruits* are wholeſome.

For though by nature the guts are ſo defended by their proper mucus, that people very ſeldom ſuffer by things of this kind, yet if we conſider the various circumvolutions of the guts, their valves and cells, and at the ſame time conſider the hair of the ſkins of animals we feed on, the wool or down on herbs and *fruit*, and the fibres, veſſels, and nerves of plants, which are not altered by the ſtomach, it will appear a wonder that inſtances of this ſort of miſchief are not much more frequent. Cherry-ſtones, ſwallowed in great quantities, have occaſioned the death of many people, and there have been inſtances even of the ſeeds of ſtrawberries, and kernels of nuts, collected into a lump in the guts, and cauſing violent diſorders, which could never be cured till they were carried off. Philoſ. Tranſ. N° 282. p. 1282.

FRUIT-*trees* are diſtinguiſhed, like the *fruits* they bear, into wall *fruit*-trees, ſtandard *fruit*-trees, &c.

With regard to *fruit*-trees, Monſ. Quintinie obſerves,

1. That the cutting and trimming of young trees hinders them from quick bearing; though it contributes both to the beauty of the tree, and to the richneſs and flavour of the fruit.

2. That kernel *fruit*-trees come later to bear than ſtone *fruit*-trees; the term required by the firſt, before they arrive at a fit age for bearing, being, one with another, about four or five years; but, when they do begin, they bear in greater plenty than ſtone-*fruit*.

3. That ſtone-*fruits*, figs, and grapes, commonly bear conſiderably in three or four years; and bear full crops the fifth and ſixth years; and hold it for many years, if well ordered.

4. That *fruits*, in the ſame neighbourhood, will ripen a fortnight ſooner in ſome grounds, than in others of a different temperature.

5. That in the ſame country, hot or cold ſummers ſet conſiderably forwards, or put backwards, the ſame *fruit*.

6. That the *fruits* of wall-trees generally ripen before thoſe on ſtandards; and thoſe on ſtandards before thoſe on dwarfs.

7. That the *fruit* of all wall-trees, planted in the ſouth and eaſt quarters, commonly ripen about the ſame time; only thoſe in the ſouth rather earlier than thoſe in the eaſt; thoſe in the weſt are later by eight or ten days; and thoſe in the north by fifteen or twenty.

For the planting, pruning, engrafting, &c. of *fruit*-trees, ſee PLANTING, TRANSPLANTING, PRUNING, and ENGRAFTING. See alſo ORCHARD, GARDEN, and NURSERY.

Monſ. de Reſſons, in the Memoires de l'Academie Royale des Sciences, ann. 1716, gives us a method of grafting ſtone *fruit*-trees without loſing of time; ſo that a tree which bore bad *fruit* the preceding year, ſhall bear the choiceſt *fruit* the year following.

It frequently happens that perſons are deceived in their *fruit*-trees, eſpecially thoſe bought of the nurſery-men;

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and it is an unpleaſing thing, after having waited three years for *fruit*, to find it bad at laſt, and to be obliged to graft the tree again, and wait four years more for the ſecond hopes. In effect, in the common methods of grafting, they know nothing better than to cut off the head of a tree, and make it put forth new wood to graft in: this neceſſarily makes a long delay, which Monſ. Reſſons ſhews how to abridge.

Upon conſidering the union of the ſap in grafts, that author was led to think, that all the office the bark has in grafting, is to receive the ſcutcheon; ſo that if the bark be not quite hard, dry, and inflexible, and incapable of yielding without cracking or burſting, it ſhould ſeem indifferent, whether one grafted on new wood, or old, the ſap paſſing equally into both: which reaſoning had the good fortune to be verified by a number of experiments made with that view.

We are at liberty, then, to graft almoſt at any age, and in any wood. Accordingly, a peach-tree of a worſe kind or quality may be grafted from another of the beſt, in autumn, in the height of its *fruit* and ſap, without cutting off any branches; the graft ſoon cements to the tree by the union of the ſaps, without ſhooting at all: ſo that, cutting off the branches above the grafts the ſpring following, the ſame graft inſerted the preceding autumn will ſhoot vigorouſly; and, being on a wood of the ſame kind, the *fruit* thenceforth produced will be much the larger and finer. But this is not the great point; for the tree thus engrafted will not bear till the third year, and we want *fruit* the firſt.

In order to this it is to be obſerved, that there are three kinds of branches: wood-branches, growing immediately from the ſtem or ſtock of the tree; *fruit*-branches; and branches half of the wood, half of the *fruit* kind, being ſuch as, ariſing from the largeſt wood-branches, preſerve the character thereof, but which, in two years time, will produce *fruit*-branches. Now, this intermediate kind of branches ſhould be choſen for ſcutcheons or grafts. They are eaſily known by being bigger than the *fruit*-branches, and leſs than the wood-branches: they have each of them two, three, four, or even five leaves to each eye; and the eyes are farther diſtant from each other than thoſe of the *fruit*-branches, but cloſer than thoſe of the wood-branches. It muſt be added, that the eyes on ſuch branch are three; one intended for a wood-branch, being ſituate between the two leaves, and advancing farther than the other two, which are intended for *fruit*, and are placed without-ſide the leaves.

Theſe laſt are the preciſe ſubjects to be choſen for the purpoſe of grafting. Twelve of theſe ſcutcheons, more or leſs, according to the ſtrength of the tree to be grafted on, being duly applied, we may depend on a crop of good *fruit* the very next year, on the ſame tree which the laſt year produced the worſt.

There is, in the Philoſophical Tranſactions, a method of making *fruits* and flowers grow in winter inſtead of ſummer, without the common way of doing it by heat. This method is to take up the trees with their roots in the ſpring-ſeaſon, juſt as they begin to ſhoot out their buds; let them be placed upright in a cellar, and ſtand there till the end of September following; then fit veſſels to them, and place the roots in them, covering them in a proper manner with earth, and bring them up into a common ſtove; water them at times with a ſolution of the bigneſs of a walnut of crude ſal armoniac in a quart of rain-water, and they will make their natural progreſs as in ſummer, and in the months of February or March following the *fruit* will be full ripe, and as well taſted as if it had grown on them in the common way, and ripened at its natural ſeaſon. Phil. Tranſ. N° 282, p. 44.

The ſuperfluous ſhoots from theſe trees muſt be pruned off at ſuch times of the year, when the trees are full of juice, and furniſhed for a farther ſupply; and by this means there will be no marks of the wounds, they will cloſe up ſo perfectly. The manner of producing pyramidal trees by ingrafting, is not only applicable to *fruit*-trees, but has been tried on oaks, limes, and roſes, with the ſame ſucceſs. Vide infra.

Laurembergius tells us of a peculiar way of managing *fruit*-trees for ready ſervice and beauty, by means of which they will bear *fruit* the firſt year. The method is this: draw a branch of a *fruit*-tree through a pot of earth, and prick it full of holes with a knife, ſo far as it is to ſtand in the pot; let it be well watered for the firſt ſeven or eight days, to make it ſhoot out a great quantity of roots; in the March following cut off the branch from the tree, and let it depend wholly on itſelf for nouriſhment; break the pot away, and place the clump of earth with the young tree in it in the place where it is intended to ſtand. The author aſſures us it will partake ſo much of the nature of the ſtock, as to bear *fruit* the firſt year. Philoſ. Tranſ. N° 3.

An anonymous author has given us, in a treatiſe publiſhed at Hamburgh, under the title Amænitates Hortenſes Novæ, a new method of grafting trees, ſo as to have very beautiful pyramids of *fruit* on them, which will exceed both in quantity, beauty, and flavour, all that can be otherwiſe produced. This, he ſays, he had long experienced, and the method he gives of doing it is this: the trees are to be tranſplanted in autumn, and all the branches cut off; early in the following ſummer the young ſhoots are to be pulled off, and the buds are then to be ingrafted into them in an inverted direction; this, he ſays, adds not only to the beauty of the pyramid, but makes the branches alſo more fruitful. Theſe are to be cloſely connected to the trunk, and to be faſtened in with the common ligature; they are to be placed circularly round the tree, three buds in each circle, and theſe circles at ſix inches diſtance from one another. The old trees may be ingrafted in this manner, the ſucceſs having been found very good in thoſe of twenty years ſtanding; but the moſt eligible trees are thoſe which are young, vigorous, and full of juice, and have not more thickneſs than a finger or two. When theſe young trees are tranſplanted, they muſt be fenced round with pales, to defend them from the violence of the winds; and there muſt be no dung put to them till they are thoroughly rooted, for fear of rotting them before the fibres ſtrike. The buds ingrafted muſt be ſmall, that the wounds made in the bark to receive them, not being too large, may heal the ſooner; and if any of the buds do not ſucceed, which will be found in a fortnight, there muſt be others put in their place. The wound made to receive theſe buds, muſt be a ſt ait cut, parallel to the horizon, and the piece of bark taken out muſt be downward, that the rain may not get in at the wound. In the autumn of the ſame year, this will be a green and flouriſhing pyramid, and the next ſummer it will flower, and ripen its *fruit* in autumn. Act. Erud. ann. 1710.

The Peterſbourg academy furniſhes us with two very ſingular inſtances of *fruits* growing in an unnatural manner; the one of thoſe in the fig-tree, the other in the apple-tree. In both thoſe caſes, the *fruit*, inſtead of its common ſituation, was placed upon the trunk of the tree, with no branch or leaf near it, but only a ſhort pedicle for its ſupport. The inſtance of the fig-tree afforded three figs in a cluſter, the middle one of which withered, but the other two grew to their proper ſize, and were like the reſt of the figs on the ſame tree. The other inſtance of the apple-tree afforded only one ſingle *fruit*; but there was in it ſomething very ſtrange, or that appeared ſo, however, at firſt ſight; for the apples produced on the branches of the tree were of one kind, and this of another. The tree had been grafted, and all the *fruit* of the branches grew from the graft; this ſingle one, which ſtood upon the trunk of the tree below the graft, was of the ſpecies produced by the ſtock. This had doubtleſs been preceded by a flower, though unobſerved, and it could only be as it appeared, of the nature of the genuine *fruit* of the ſtock. All gardeners know, that the ſtock ſuffers no change from the graft; in both theſe caſes there was probably the rudiment of a branch where the ſingle *fruit* appeared, and every other part of it, except the bud of the *fruit* alone, had periſhed, while that arrived at its deſtined ſize and maturity. We have alſo an account in the Philoſophical Tranſactions, N° 385, of an apple-tree bearing a conſiderable quantity of *fruit* for many years together without bloſſoming.

FRUITERY, a place for the laying up and keeping of FRUIT. See GRANARY.

The *fruitery* ſhould be inacceſſible to any thing of moiſture, or even froſt.

FRUITFULNESS, the quality of bearing plenty of fruit, called alſo FERTILITY, and FECUNDITY.

FRUMENTACEOUS *plants* are thoſe which produce geniculated or knotted ſtalks, with reed-like leaves; and whoſe ſeed growing in ſpikes or *jubæ*, is uſeful to make pultege, or bread.

The word is formed from *frumentum*, a general name comprehending all ſorts of corn, or grain, for bread. Hence the Italians, who follow the Latins, uſe *grano* and *frumento* for the ſame.

Wheat, barley, rye, millet, &c. are *frumentaceous* plants. Some authors uſe *frumentaceous* in a narrower ſenſe, reſtraining it to plants which bear a conformity to wheat, either in reſpect of their fruits, leaves, ears, or the like. But this ſeems founded on a miſtaken notion of *frumentum*, as if it denoted only *wheat*, which is rather the ſenſe of the word *triticum*.

FRUMENTARII, in *Antiquity*, a kind of ſoldiers, or archers, under the Weſtern Empire.

St. Cyprian relates, in one of his letters, that ſome of theſe *frumentarii* were ſent to take him.

The firſt time we read of *frumentarii*, as officers, is in the

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the time of the emperor Adrian. Spartian, in his life of that prince, aſſures us, that he made uſe of them to inform himſelf of what paſſed.

Before this time, the name *frumentarius* was only given to the corn-merchants, or meaſurers of corn.

Theſe *frumentarii* did not make any particular corps, diſtinct from the other forces, but there was a certain number of them in each legion, as, among us, there is a certain number of grenadiers in each battalion. Accordingly, in ancient inſcriptions, we meet with *frumentarii* of this or that legion. It is ſuppoſed they were originally a number of young perſons, diſpoſed by Auguſtus throughout the provinces, particularly on all the grand roads, to advertiſe the emperor, with all expedition, of every thing that happened.

In order to this they had a kind of intendance of all the carriages, and on this account came to be employed for the conveyance of corn, *frumentum*, to the armies; whence their appellation.

Afterwards they were incorporated into the troops themſelves, where they ſtill retained their ancient name.

Their principal office was the giving intelligence, in which they agreed with thoſe called *curioſi*, with whom they were frequently joined. See CURIOSUS.

FRUMENTATION, *frumentatio*, among the *Romans*, a largeſs of corn beſtowed on the people. This practice of giving corn to the people, was a very ancient cuſtom among the Romans, and frequently uſed to ſooth the turbulent humour of the populace.

At firſt the number of thoſe to whom this largeſs was given, was indeterminate, till Auguſtus fixed it at two hundred thouſand.

FRUMENTUM *Saracenicum*, in *Botany*, a name by which ſome authors expreſs the fagopyrum, or *buck*-WHEAT.

FRUMENTUM *Indicum*, *Indian corn*, a name given by our American planters to MAIZE.

FRUMENTY, popularly FURMETY, a kind of pottage, the baſis whereof is wheat, boiled up with milk, ſugar, and ſometimes ſpice.

Pliny tells us, that in his time they mixed chalk among it. Galen deſcribes it as a very nutritious food made of corn, or pulſe, boiled with water, wine, and oil.

The Latins called it *alica*, which Feſtus derives *ab alendo*; as being very nouriſhing. But then it muſt be obſerved, they made it of any kind of corn.

Ours being reſtrained to wheat, we have given its denomination accordingly, from *frumentum*. An emulſion, wherein wheat was an ingredient, would be a kind of *frumenty*.

FRUMGYLD, in *our old Writers*, is the firſt payment made to the kindred of a perſon ſlain, towards the recompence of his murder.

FRUMSTOL, in *our old Writers*, the chief ſeat or manſion-houſe, which is called by ſome the *homeſtal*. Leg. Inæ, cap. 38.

FRUSO, in *Zoology*, a name given by ſome to the *coccothrauſtes criſtata Indica*, commonly called the *Virginia* NIGHTINGALE.

FRUSSURA, in *our old Writirs*, a breaking down; alſo a ploughing or breaking up. *Fruſſura domorum* is houſe-breaking; and *fruſſura terræ*, new broke land.

The word comes from the French *froiſſure*, *a bruiſe*; and that from the verb *froiſſer*, *to bruiſe* or *break*.

FRUSH, or FROG, in the *Manege*, is a ſort of tender horn which ariſes in the middle of the ſole, and at ſome diſtance from the toe of a horſe; it divides into two branches, running towards the heel, in the form of a fork.

FRUSTUM, in *Mathematics*, a piece cut off or ſeparated from a body.

FRUSTUM of a pyramid, or cone, is a part or piece thereof cut off, uſually by a plane parallel to the baſe.

All round and ſquare timber that grows tapering, may be conceived as the *fruſtum* of a cone, or pyramid: to find the quantity whereof, take the following theorem, which in the main is Mr. Oughtred's. Given, B (*Tab. Survey. fig.* 10.) the ſide of the greater baſe, *b* the leſſer baſe's ſide, A the height of the *fruſtum:* though, below, we ſuppoſe B and *b* to repreſent the areas of the two baſes. Whole height $a + A = H$.

Firſt, to find *a*, ſay, as $B - b : b :: A ; \frac{b\ A}{B-b}$ or $\frac{b\ A}{x}$.

Now $BH = 3$ times the whole pyramid, becauſe any priſm is three times a pyramid of the ſame baſe and height with it, by 7 and 10 Euclid, and $b\,a = 3$ times the upper pyramid.

Wherefore $\frac{BH - b\,a}{3}$ equal to the *fruſtum* of the pyramid required; which theorem in words is this:

Multiply the lower baſe by the whole height, and from the product ſubtract the upper baſe multiplied by the height of the top-piece wanting, and then one third of the remainder ſhall give the *fruſtum*.

And in the ſame way you may proceed for the *fruſtum* of a cone; only it will be more difficult to find the circular baſes. See CONE.

FRUSTUM *of a ſphere*. See SEGMENT.

We have a general theorem in Mr. Mac-Laurin's Treatiſe of Fluxions, concerning the *fruſtum* of a ſphere, cone, ſpheroid, or conoid, terminated by parallel planes, when compared with a cylinder of the ſame altitude, on a baſe equal to the middle ſection of the *fruſtum* made by a parallel plane. The difference between the *fruſtum* and the cylinder is always the ſame in different parts of the ſame, or of ſimilar ſolids, when the inclination of the planes to the axis, and the altitude of the *fruſtum*, are given.

In the parabolic conoid this difference vaniſhes, the *fruſtum* being always equal to a cylinder of the ſame height, upon the ſection of the conoid that biſects the altitude of the *fruſtum*, and is parallel to its baſes.

In a ſphere the *fruſtum* is always leſs than the cylinder by one fourth part of a right angled cone, of the ſame height with the *fruſtum*, or by one half of a ſphere of a diameter equal to that height; and this difference is always the ſame in all ſpheres, when the altitude of the *fruſtum* is given.

In the cone, the *fruſtum* always exceeds the cylinder by one fourth part of the content of a ſimilar cone that has the ſame height with the *fruſtum*.

In the hyperbolic conoid this exceſs is the ſame as in the cone generated by a triangle *o c e*, (*Tab.* II. *Geometry*, *fig.* 44.) formed by the axis *o c*, the aſympote *o e*, and a perpendicular *c e*, the altitude of the *fruſtum* and the inclination of the axis to their baſes being the ſame in both.

In the ſpheroid (*fig.* 45.) the cylinder exceeds the *fruſtum*; and the difference between them is the ſame as in the cone C D *r d*, the plane D *r d*, or B *k b*, being ſuppoſed parallel to thoſe which terminate the *fruſtum*. In different inclinations of thoſe planes, when the altitude of the *fruſtum* is given, that difference is reciprocally as the cube of the diameter B *b*, which is the conjugate of C A, the axis of the *fruſtum*. But if the altitude of the *fruſtum* be alſo varied ſo as to be reciprocally proportional to the diameter B *b*, then the difference between the *fruſtum* and cylinder will be always of the ſame magnitude in the ſame ſpheroid or conoid.

When the inclination of the axis of the ſolid to the planes that terminate the *fruſtum* is given, the difference between the *fruſtum* and cylinder, in the ſame, or in ſimilar bodies, is as the cube of their common altitude. Mac-Laurin's Fluxions, Introd. p. 24, 25.

Theſe propoſitions concerning *fruſtums* are of uſe in GAUGING.

FRUTEX. See SHRUB.

FRUTEX *Æthiopicus*, in *Botany*, a name given to the ſilver PINE-*tree*.

FRUTEX *Africanus*, in *Botany*, a name given to a ſpecies of trees brought from the Cape of Good Hope; a deſcription of which ſee under *Spurge-leaved* PINE.

FRUTICOSE *ſtalks of plants* are thoſe of a hard, woody ſubſtance.

FRY, in *Zoology*, ſignifies the ſpawn, or rather the young of fiſh. See FISH.

FRYTH, or FRITH, is explained, by Sir Edward Coke, as a plain between two woods, or a lawn.

Camden uſes it for an arm of the ſea, or a ſtreight between two lands, from *fretum*.

Frith, from the Saxon *frid*, *peace*, is alſo uſed for a wood; becauſe the Engliſh Saxons held woods to be ſacred, and uſed them as ſanctuaries.

FUAGE, or FOCAGE, a tax or impoſition laid on hearths or chimneys, i. e. on fire-places, or families, from which was probably derived the *hearth-ſilver*, and *chimney-money*. This duty was repealed by 1 William and Mary, ſeſſ. 1. cap. 10.

Edward the Black Prince, having Aquitain granted him, laid an impoſition of *fuage*, or *focage*, upon the ſubjects of that dukedom, viz. one ſhilling for every fire-place. After his example, Charles V. of France, laid a tax of a franc for each fire-place, for one year only. His ſucceſſor Charles VI. augmented it under the ſame name. Charles VII. rendered it perpetual, and called it *taille*.

By an ordonnance of Humbert II. dauphin of Viennois, the impoſition of *fouage*, or *fouage*, was then laid per feu, i. e. per fire, or family, *ſeu per lares focum habentes*. In Latin it was called *focagium*, q. d. *pro ſingulis focis*. Sometimes it was alſo called *fournage*, on account of the oven or furnace: in Greek καπνικον or καπνος, *fumus*, *ſmoke*. In Will. Tyr. De Bello Sacro, it is called *foagium:* for it was impoſed by the kings of Jeruſalem. The counts and other lords, likewiſe impoſed it on the

feudataries,

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feudataries, or vaſſals. Zonaras aſſures us, that the general Nicephorus firſt eſtabliſhed it among the Greeks. See CHIMNEY-*money*.

FUCA, in *Ichthyology*, a name given by Gaza, and ſome other writers, to the fiſh called phycis, by Ariſtotle, Ælian, and other writers; and *tinca marina*, by Salvian and Rondeletius. It is a fiſh nearly allied to the genus of the blenni.

FUCHSIA, in *Botany*, the name of a genus of plants of the *octandria monogynia* claſs; ſo called by Plumier, in memory of the famous botaniſt Fuchſius, Plum Nov. Gen. 14. the characters of which are theſe: the flower hath one petal with a cloſed tube, ſlightly cut into eight parts at the brim; and hath four ſtamina the length of the tube. An oval germen is ſituated under the flower, which afterwards becomes a ſucculent berry with four furrows, having four cells, containing ſeveral ſmall oval ſeeds. There is one ſpecies a native of the warm parts of America.

FUCUS is uſed for a paint, or compoſition, applied on the face, to beautify it, and heighten the complexion.

Old women make uſe of *fucuſes* and pomatums, to appear young. The *fucus* made with *ceruſs* is corroſive and pernicious to the ſkin.

Pliny ſays, that the *fucus* of the Roman dames was a kind of white earth, or chalk, brought from Chio and Samos, diſſolved in water.

The *fucus Solimanni* is a compoſition of prepared ſublimate, in great repute among the Spaniards of Peru.

FUCUS *Giganteus*, a name given by Mr. Banks and Dr. Solander, to a kind of ſea-weed of an enormous ſize, which they diſcovered in their paſſage from Rio de Janeiro to the ſtreight of Le Maire. The leaves of it were four feet long, and ſome of the ſtalks, though not thicker than a man's thumb, above one hundred and twenty.

FUCUS, in *Botany*, the name of a genus of ſubmarine plants, of the claſs of *cryptogamia* and order of *algæ*; the characters of which are, that they are of a tough ſtructure, and formed into a kind of leaves, which are flat, and variouſly divaricated. The male flowers are veſicles interwoven with ſmall fibres, and the female are veſicles interſperſed with ſmall prominences; they have a ſingle ſeed. See *Tab.* VII. *of Botany, Claſs* 24. N° 3.

The ſpecies of *fucus* enumerated by Mr. Tournefort are ſeventy-ſeven; and by Linnæus are fifty-two.

Mr. Reaumur has diſcovered, that all the *fucuſes* produce regular flowers and ſeeds, in the ſame regular manner. The flowers ſtand all over the leaves from the origin of them at the root to their utmoſt extremities, only the ribs in the middle are free from them. Every flower is compoſed of a cluſter of ſmall and extremely ſlender threads. Theſe are uſually all of the ſame length in the ſame flower, but they are ſo numerous as not to be eaſily counted; the longeſt of theſe threads are not above one twelfth of an inch in length, and the reſt are not half ſo long. They all iſſue out of a ſmall hole in the leaf, which ſerves as a ſort of cup to them. The threads are too feeble to ſupport their own weight in the air. When the ſea has left the plants, they are all found lying flat upon the leaves; though while the water covers them, they ſtand ſomewhat erect. They are not terminated at the top by apices containing a farina; but they may very eaſily contain that powder in their whole ſubſtance, and throw it off as ſoon as they expand themſelves. They are diſpoſed with no ſort of regularity on the leaves; for in ſome places they ſtand very cloſe together, in others they are placed at much greater diſtances. They grow equally on both ſides of the leaves; but the ſame flower never perforates the leaf, but all its parts appear on the ſame ſide. The flowers are much more eaſily diſcerned on the plant when it is dry, than while it is moiſt; for when dry, the filaments that compoſe them are white; whereas when moiſt, they are of a deep brown, like the leaves on which they ſtand. Of all the flowers which cover theſe plants, there are none that produce ſeeds but thoſe which are placed near the extremities of the leaves, and not all of theſe. In thoſe places where the ſeed is beginning to form itſelf, the extremity of the leaf ſwells, and forms a ſort of capſule, which contains the fruit, while the reſt of the leaf retains its former thinneſs. When the flowers are fallen, the holes in the leaf, which ſerved them for cups, become eaſily viſible in the places where the thickneſs happens, and where the ſeeds are to be lodged; and the margin of each hole is ſurrounded with a little circular protuberance, which ſtands out beyond the reſt of the ſurface. The ſwelled ends of the leaves grow often to half an inch in thickneſs, and uſually terminate in two horns, which form an acute angle; and the rib of the leaf is not viſible in theſe ſwoln parts. When theſe are cut open, whether it be tranſverſely or horizontally, they are found filled with a thick viſcous liquor, and in this are ſeen ſeveral roundiſh bodies of about a twentieth part of an inch in length; they are of a reddiſh colour, and are eaſily diſtinguiſhed, and are all found to be fixed to the ſides of the leaf. Theſe are what Dr. Robinſon, who ſeems to have been the firſt perſon who diſcovered them, took for the ſeeds; and they have really much the appearance of naked ſeeds; but, when cloſely examined, they are found to be in reality capſules containing each a great number of minute round ſeeds, which are faſtened to their ſides, as they were to the ſides of the tumour in the leaf; and theſe ſmaller capſules are in the ſame manner with thoſe full of a tranſparent viſcous liquor.

Though theſe capſules appear at firſt ſight plain roundiſh bodies; yet when more nearly examined, they are found to be rather ſhaped like glaſs bottles with ſhort necks, the neck being fixed into the ſubſtance of the leaf, and its extremity forming the protuberant circular rim that ſurrounds the little hole in the leaf, which had ſerved as a cup to the flowers. See Mem. Acad. Par. 1711, where we have figures of the *fucus*.

FUCUS *palmatus*, *handed fucus*, the name given to a ſpecies of ſea *fucus*, diſtinguiſhed from the reſt by its having no ſtalk, its leaves being divided in the manner of a hand, and its extremities divided into many curled ſegments. It is common on almoſt all the ſea coaſts of Europe, and is one of the ſeveral ſpecies of ſea plants in which Mr. Reaumur has diſcovered regular flowers and ſeeds. They are in this ſpecies however ſo ſmall, as to require the aſſiſtance of a microſcope to diſcover them; though after they have been once ſeen in that manner, as is the caſe in many microſcopic objects, they may then be eaſily diſtinguiſhed by the naked eye. This plant is faſtened to ſome ſtone by a round root, from which there ariſe four or five leaves, which at about an inch diſtance from the root divide into a number of branchings, which conſtitute the whole plant. This ſpecies carries its ſeeds at the extremities of the leaves, where they are incloſed in the interior ſubſtance of the plant; and nothing is to be diſcovered on the ſurface without the aſſiſtance of glaſſes, unleſs it be that the leaves are of a ſomewhat more duſky hue than elſewhere, which is cauſed by a number of ſmall opake bodies; and when this obſcure part of the plant is opened, there appears a number of ſmall, round, and hard reddiſh ſeeds, which may, probably, be capſules or ſeed-veſſels, and not ſingle ſeeds.

FUCUS *polyſchides*. See POLYSCHIDES.

FUCUS *thermalis*, in *Botany*, the name of a remarkable ſpecies of plant, found only in the hot water ſprings. It was firſt diſcovered by Monſ. de Monteſquieu, in the great baſon, at the boiling ſpring in Gaſcony; he was not able to diſcover that it produced either flowers or ſeeds. Its ſubſtance is entirely compoſed of ſmall bladders full of air, the ſurfaces of which are reticular, as worked in the manner of a coarſe canvas. It is obſerved to grow only in the hotteſt waters.

FUDDER, among the *Miners*, a load of lead, which is eight pigs, or ſixteen hundred weight.

FUEL, in *Philoſophy*, the *pabulum* of FIRE, or whatever receives and retains fire, and is conſumed, or rendered inſenſible thereby.

A great deal of nicety is required in chooſing the proper *fuel* to raiſe and continue the ſeveral degrees of fire, in chemical operations. The natural heat of the ſummer ſun is ſufficient for inſolations. A ſpirit-lamp may be made to give the next degree of heat to this, which may be much augmented or decreaſed, according to the number of wicks kept burning at a time.

The next degree of fire to this, is made of the lighter *fuel*; ſuch as dry ſtraw, leaves, twigs, and the like; the next in order, is that from oils, wax, reſin, pitch, &c. And laſtly, ſolid wood, coals, and turf, may be employed for the ſtrongeſt. Theſe by means of proper furnaces made to contain different quantities, may be made to give a greater or leſs degree of a ſtrong fire. To excite the greateſt degree of heat in a furnace, the rule is to uſe the denſeſt *fuel*, and in the largeſt quantity, and to have bellows placed all round the furnace: theſe are to be inceſſantly blown, and directed to the central part of the fire, in which the matter to be worked upon is lodged. Thus the greateſt degree of heat from culinary fires is to be given, and this is ſufficient for the known operations on metals, glaſs, &c.

It is a known truth, that *fuel* cannot conſume by means of heat alone, without the admiſſion of freſh air, and this is no way more clearly proved, than by this eaſy experiment. Let a ſtrong cylinder of iron, hollow within, be fitted with a firm ſcrew at each end; in the cavity of this cylinder incloſe a long piece of charcoal, and then ſcrew up both the ends faſt, and place the whole in a ſtrong fire; let it continue there for ſeveral hours; and when it is taken out and cooled, open it, and the piece of charcoal will be found ſtill black, in its own form, and no way apparently altered or diminiſhed.

It is plain from this, that the conſumption of *fuel* depends

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pends upon the rarefaction, diſlodgment, briſk agitation, and diſcharge of its inflammable vapour, by means of freſh air; and hence we have the reaſon of the known rule of extinguiſhing fires by ſmothering them.

It is provided by ſtatute, that wood-*fuel* ſhall not be felled under the aſſize. See BILLET and FAGGOTS.

FUGA *demonum*, in *Botany*, a name uſed by ſome authors for the *hypericum*, or *St.* JOHN'*s wort*.

FUGA *vacui*, in the *Ancient School Philoſophy*, a ſuppoſed averſion in nature to a VACUUM.

Moſt of the phenomena which the ancients aſcribed to the *fuga vacui*, the moderns have demonſtrated to ariſe from the gravity and preſſure of the air. This is the caſe in the aſcent of water in ſyringes, pumps, &c.

FUGALIA, in *Antiquity*, a feaſt celebrated among the Romans, ſuppoſed by ſome to be the ſame with the REGIFUGIUM, held on the 24th of February, in memory of the expulſion of the kings, and the aboliſhing of the monarchical government. Struvius, Antiq. Rom. Syntag. cap. 9. diſtinguiſhes the *fugalia* from the *regifuge*; and even doubts whether the regifugium were thus called on account of the expulſion of the kings, or becauſe the *rex ſacrorum*, after the ſacrifice was ended, fled haſtily out of the *forum* and *comitia*.

Be this as it will, the only ancient author of note that makes expreſs mention of the *fugalia*, is St. Auguſtine De Civitate Dei, lib. ii. cap. 6. And his commentator Vives ſhews a great inclination to correct the reading of the word, were it not that St. Auguſtine adds, that the feaſt was a true *fugalia*, all decency and modeſty being baniſhed from it.

That learned perſon conjectures, that the *fugalia* were the ſame thing with the *poplifugia*, or the feaſt of *Fugia*, the goddeſs of joy, occaſioned by the rout of an enemy, which was the reaſon why the people abandoned themſelves to riot and debauchery; and that the feaſt was firſt inſtituted on occaſion of the victory gained over the Ficulnates, Fidenates, and neighbouring nations, upon their attempt to take poſſeſſion of Rome, the day after the people had withdrawn from it, as related by Varro, lib. v. de Ling. Lat.

But, according to Varro, the *poplifugia*, which fell in the month of June, were held in memory of the flight or retreat of the people, in a ſedition raiſed among them: it is true, he adds, that the day followed ſoon after the retreat of the Gauls, and the time when the neighbouring nations conſpired againſt them: but this does not appear to have any relation to the *poplifugia*, being only meant to mark the æra or time when the ſedition and flight of the Roman people happened. After all, though the *poplifugia* might have been originally eſtabliſhed in commemoration of the flight of the people, and not that of the enemies, this does not hinder, but the *fugalia* of St. Auguſtine may probably be the *poplifugia* of Varro, according to the conjecture of Vives.

FUGAM *fecit*, in *Law*, a term uſed where it is found by inquiſition, that a perſon fled for felony, &c. And if flight and felony be found on an indictment for felony, or before the coroner, where a murder is committed, the offender ſhall forfeit all his goods, and the iſſues of his lands, till he is acquitted or pardoned: and it is held, that when one indicted of any capital crime, before juſtices of oyer, &c. is acquitted at his trial, but found to have fled, he ſhall, notwithſtanding his acquittal, forfeit his goods, but not the iſſues of his lands, becauſe by the acquittal the land is diſcharged, and conſequently the iſſues. 3 Inſt. 218. H. P. C. 27. 2 Hawk. P. C. 450. The party may, in all caſes, except that of the coroner's inqueſt, traverſe the finding of a *fugam fecit*; and the particulars of the goods found to be forfeited, may be always traverſed: alſo whenever the indictment againſt a man is inſufficient, the finding of a *fugam fecit* will not hurt him. 2 Hawk. 451. Making default in appearance on indictment, &c. whereby outlawry is awarded, is a flight in law.

FUGITIVE, *refugee*, a perſon obliged to fly his country, or remove from a place where he had ſome abode or eſtabliſhment, on account of his crimes, debts, or on other occaſions.

In the Roman law, a *fugitive* ſlave was ſuch a one as was apt to run away from his maſter. And in ſelling a ſlave, the maſter was obliged to declare, whether or no he were *fugitive*.

The term is alſo applied to deſerters in an army, or thoſe who fly from the combat.

FUGITIVES *goods*, *bona fugitivorum*, the proper goods of him that flies upon felony, which, after the flight lawfully found on record, do belong to the king, or lord of the manor.

FUGITIVES *over ſea*, are perſons that go over ſea without the king's licence, who, unleſs they are merchants, or eminent perſons, or king's ſoldiers, forfeit their goods; and maſters of ſhips, &c. carrying ſuch perſons beyond ſea, ſhall forfeit their veſſels; and alſo, if the ſearcher of any port ſhall negligently ſuffer any perſons to paſs, he ſhall be impriſoned, &c. Stat. 9 Edw. III. cap. 10. and 5 Ric. II. cap. 2.

FUGITIVE *pieces*, among the learned, denote thoſe little compoſitions which are printed on looſe ſheets, or half ſheets; thus called, becauſe eaſily loſt, and ſoon forgot.

FUGUE, of *fuga*, *flight*, in *Muſic*, is when the different parts of a muſical compoſition follow each other, each repeating what the firſt had performed.

There are three kinds of *fugues*; the *ſingle fugue*, *double fugue*, and *counterfugue*.

FUGUE, *ſingle*, or *ſimple*, is ſome point conſiſting of 4, 5, 6, or any other number of notes, begun by one ſingle part, and then ſeconded by a third, fourth, fifth, and ſixth part, if the compoſition conſiſts of ſo many, repeating the ſame, or ſuch-like notes; ſo that the ſeveral parts follow, or come in, one after another, in the ſame manner, the leading parts ſtill flying before thoſe which follow.

FUGUE, *double*, is when two or more different points move together in a *fugue*, and are alternately interchanged by ſeveral parts.

For the *Counter*-FUGUE, ſee COUNTER-*fugue*.

The Italians ſay, a *fugue*, or *flight of rooms*, or *chambers*, meaning a ſeries or range of rooms, the doors whereof anſwer in a right line behind each other, ſo as they may be all ſeen at once, from one extreme to the other.

FULCRUM, *Prop*, in *Mechanics*. See LEVER, and HYPOMOCHLION.

FULGURATING *phoſphorus*, a term uſed by ſome Engliſh writers to expreſs a ſubſtance of the phoſphorous kind, the preparation of which does not ſeem to have been well known to any but the inventor of it. It was prepared both in a liquid and a dry form, and not only ſhone in the dark in both ſtates, but communicated its light to the things it was rubbed on. If incloſed in a glaſs veſſel well ſtopped, it ſometimes would *fulgurate*, or throw out little flaſhes of light, and ſometimes fill the whole vial with waves of flame. It does not need recruiting its light at the fire, or in the ſunſhine, like the phoſphorus of the Bolonian ſtone, but of itſelf continues in a ſtate of ſhining for ſeveral years together, and is ſeen as ſoon as expoſed in the dark; the ſolid or dry matter always reſembling a burning coal of fire, though not conſuming itſelf. Phil. Tranſ. N° 134. See PHOSPHORUS.

FULICA, in *Zoology*. See COOT.

FULIGINOUS, an epithet applied to a thick SMOKE, or vapour, replete with SOOT or other craſs matter.

The word is formed from the Latin *fuligo*, *ſoot*; and is rarely uſed but when joined with vapour.

In the firſt fuſion of lead, there exhales a great deal of *fuliginous* vapour, which, retained and collected, makes what we call LITHARGE.

Lamp-BLACK is what is gathered from the *fuliginous* vapours of pines, and other reſinous woods, when burnt.

Some phyſicians talk of *fuliginous* vapours emitted from the ſpleen to the brain, which they will have to be the cauſe of the hypochondriac and hyſteric diſorders; thence called the VAPOURS, and by ſome the SPLEEN.

FULIGO *metallorum*, a term uſed by the *Chemiſts*, ſometimes to expreſs arſenic, and ſometimes crude mercury.

FULIGULA, in *Zoology*, a name given by Geſner to a ſpecies of duck, ſeeming to be the ſame with a kind common on the Yorkſhire ſhores. The ſame author alſo deſcribes another ſpecies under the name of *anas fuligula prima*, which ſeems the ſame with the CAPO *negro*, or *tufted* DUCK.

FULL is variouſly uſed, in oppoſition to empty, narrow, confined, &c.

The Carteſians hold, that the univerſe is *full*, i. e. that every part or point has matter in it.

When the body is *full* of humours it ſhould be purged. See PLENITUDE, and PLETHORA.

An ambaſſador has *full* power given him to act, tranſact, &c. The army was in *full* march, i. e. the whole army was in march, with all the forces it conſiſted of.

A man is ſaid to bear the arms of a family *full*, i. e. without any difference or diminution.

FULL *age*. See AGE, in *Law*.

FULL *arms*. See ARMS.

FULL *forfeiture*. See FORFEITURE.

FULL *moon*, *plenilunium*, that phaſis of the moon, when her whole diſk or face is illuminated; which is in the time of her oppoſition to the ſun.

Eclipſes of the moon always happen at the time of *full* MOON. See ECLIPSE.

FULL *and by*, a *Sea-phraſe*, denoting the ſituation of a ſhip with regard to the wind, when ſhe is cloſe-hauled, and ſailing in ſuch a manner, as neither to ſteer too nigh the direction of the wind, nor to deviate to leeward, both

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of which movements are unfavourable to her courſe; as in the former her ſails will ſhiver, and render the effort of the wind precarious and ineffectual; and in the latter ſhe will advance in a direction widely diſtant from her real courſe. Hence, keep her *full* is the order from the pilot or other officer to the helmſman, not to incline too much to windward, and thereby ſhake the ſails ſo as to retard the courſe. Falconer.

FULLER, a workman employed in the manufactories, to full, mill, or ſcour cloths, rateens, ſerges, and other woollen ſtuffs, by means of a mill, to render them thicker, and more compact and durable.

The word is formed of the Latin *fullo*, which ſignifies the ſame thing.

The *fullers* among the Romans waſhed, ſcoured, and fitted up cloaths; and their office was judged of that importance, that there were formal laws preſcribed them for the manner of performing it. Such was the Lex Metalla de *Fullonibus*. See alſo Pliny, lib. vii. cap. 56. Ulpian. leg. 12. ff. de Furtis, lib. xiii. § 6. Locati, lib. xii. § 6. ff. &c. See FULLING.

FULLERS-*earth*, *ſmectis*, or *cimolia purpuraſcens*, is a hard, denſe MARLE, moderately heavy, of a very compact and regular texture, of a rough or dry appearance, though, when cut or ſcraped, it is of a very ſmooth, unctuous, and glaſſy ſurface; it does not colour the hands, adheres but ſlightly to the tongue, melts freely in the mouth, and has a little harſhneſs between the teeth; in water it is immediately diffuſible, and falls into a fine ſoft powder. It makes no efferveſcence with aqua fortis; in the fire it acquires a yellowiſh brown colour, and a ſtony hardneſs: the natural colour of the *fullers*-earth is commonly a greyiſh brown; but it much varies, and is found from the pale greyiſh brown to the duſky and almoſt black, generally with a caſt of yellowiſh green. This ſubſtance is of great uſe in the woollen manufacture.

It ſerves to ſcour cloths, ſtuffs, &c. and imbibe the tar employed in the external diſtemperatures of ſheep, and all the greaſe and oil, and other unctuous ſubſtances, neceſſarily uſed in the preparing, dreſſing, &c. of the wool. *Fullers-earth* is dug in great plenty out of certain pits near Brick-hill, in Staffordſhire; alſo near Ryegate, in Surry; near Maidſtone, in Kent; near Nutley and Petworth, in Suſſex.

But the greateſt quantity and the fineſt earth of this kind in the world, is dug in the pits at Wavendon, near Woburn, in Bedfordſhire. The ſtrata in theſe pits lie thus: from the ſurface to the depth of ſix yards, there are ſeveral layers or beds of ſand, all reddiſh, but ſome lighter coloured than others. Under theſe there is a thin ſtratum of a ſand-ſtone, which they break through, and then for the depth of about ſeven or eight yards you have ſand again, and then there is the *fullers*-earth. The upper ſtratum of this is about a foot thick, and they call it CLEDGE; this is thrown aſide as uſeleſs, being commonly fouled with the ſand, which originally covered it, and uſually inſinuates itſelf conſiderably into it. After this they come at the fine *fullers*-earth for ſale, which lies to the depth of eight foot more. The matter of this is divided into ſeveral layers, there being commonly about a foot and half between one horizontal fiſſure and another. Of theſe ſeveral layers, the upper half, where the earth breaks itſelf, is tinged red; this ſeems to be owing to the running of the water on it, from among the ſands above, ſome of which are probably of a ferrugineous nature, or have ferrugineous matter among them. This reddiſh *fullers*-earth the workmen call crop; and between the cledge and this, there is a thin ſtratum of matter of leſs than an inch, which in taſte, colour, and external appearance, reſembles the terra Japonica of the ſhops. This may probably alſo have a ſhare in the tinging of the earth, as the water may be coloured in running through it.

The lower half of the ſtrata of *fullers*-earth they call wall-earth; this is untinged with the red colour of the other, and ſeems the moſt proper for fulling. Under the *fullers*-earth there is a ſtratum of a rough and coarſe white ſtone, about two foot thick; they ſeldom dig through this, but if they do, they find more ſtrata of ſand.

The ſtratum of *fullers*-earth ſeems all the way to lie very level, not to riſe and fall with the upper ſtrata, for when the ſurface is higher, they always find they have farther to dig for it. There are a great number of perpendicular fiſſures in the ſtratum of *fullers*-earth, and beſides this, it forms itſelf in every interval into a multitude of pieces of different ſhapes and ſizes by cracking. The place where it is dug, is that ridge of ſand-hills which runs to Shotover, in Oxfordſhire; and as the ſtrata of the earth are uſually found to continue much the ſame, for long tracts of ground, it is probable that the *fullers*-earth ſtratum runs the whole length of theſe hills, and that ſomebody will at one time or other be enriched by finding it in ſome other part of their courſe. Phil. Tranſ. N° 379. or Abridg. vol. vi. part ii. p. 220, &c.

It is abſolutely neceſſary to the well dreſſing of cloth; and hence foreigners, though they can procure wool to be clandeſtinely exported out of the kingdom, can never reach to the perfection of the Engliſh cloths, &c. without *fullers*-earth, which is very plentiful in England, and excels that of other countries in quality, as much as in quality and cheapneſs.

For this reaſon it is made a contraband commodity; and the export made equally criminal with that of exporting wool.

Abroad they make great uſe of urine, in lieu of *fullers*-earth.

This earth abounds much in the vegetative ſalt which promotes the growth of plants, and is therefore reckoned by Sir H. Plat, and others, a great improver of land. When mixed with vinegar, it diſperſes pimples and puſhes, checks inflammations, and cures burns. See CIMOLIA.

FULLERS-*weed*, *thiſtle*, or *teazle*, in *Botany*. See TEAZEL.

FULLERY, a work-houſe, or place where cloths, &c. are *fulled* or ſcoured.

The term is principally underſtood of the fulling-mill.

FULLING, the art, or act of cleanſing, ſcouring, and preſſing cloths, ſtuffs, and ſtockings, to render them ſtronger, cloſer, and firmer: called alſo *milling*.

Pliny, lib. vii. cap. 56. aſſures us, that one Nicias, the ſon of Hermias, was the firſt inventor of the art of *fulling*: and it appears by an inſcription quoted by Sir G. Wheeler, in his Travels through Greece, that this ſame Nicias was a governor in Greece in the time of the Romans.

The *fulling* of cloths, and other ſtuffs, is performed by a kind of water-mill; thence called a *fulling*, or *ſcouring-mill*.

Theſe mills, excepting in what relates to the mill-ſtones and hopper, are much the ſame with corn-mills. And there are even ſome which ſerve indifferently for both purpoſes; corn being ground, and cloths fulled, by the motion of the ſame wheel.

Hence in ſome places, particularly France, the fullers are called *millers*; as grinding corn, and milling ſtuffs, at the ſame time.

The principal parts of the *fulling-mill* are, the wheel with its trundle; which gives motion to the tree or ſpindle, whoſe teeth communicate it to the peſtles, or ſtampers, which are hereby raiſed and depreſſed alternately, according as its teeth catch on, or quit, a kind of latch in the middle of each peſtle. The peſtles and troughs are of wood; each trough having at leaſt two, ſometimes three peſtles, at the diſcretion of the maſter, and according to the force of the ſtream of water.

In theſe troughs are laid the cloths, ſtuffs, &c. intended to be *fulled*: then, letting the current of water fall on the wheel, the peſtles are ſucceſſively let fall thereon, and by their weight and velocity they ſtamp and preſs the ſtuffs very ſtrongly, which by this means become thickened and condenſed.

In the courſe of the operation, they ſometimes make uſe of urine, ſometimes of fullers-earth, and ſometimes of ſoap.

To prepare the ſtuffs to receive the firſt impreſſions of the peſtle, they are uſually laid in urine; then in fullers-earth and water; and laſtly in ſoap, diſſolved in hot water.

Soap alone would do very well; but this is expenſive; though fullers-earth, in the way of our dreſſing, is ſuperior to it; but then it muſt be firſt well cleared of all ſtones and grittineſs, which are apt to make holes in the ſtuff.

As to urine, it is certainly prejudicial, and ought to be entirely diſcarded; not ſo much on account of its ill ſmell, as of its ſharpneſs and ſaltneſs; which is apt to render the ſtuffs dry and harſh.

The true method of *fulling* with ſoap is delivered by Monſ. Colmet, in an authentic memoir on that ſubject, ſupported by experiments made by order of the marquis de Louvois, then ſuperintendant of the arts and manufactories of France. The ſubſtance of which we ſhall here ſubjoin.

FULLING, *cloth and woollen ſtuffs, with ſoap, method of*. A coloured piece of cloth, about forty-five ells, is to be laid in the uſual manner, in the trough of a *fulling-mill*, without firſt ſoaking it in water, as is commonly practiſed in many places.

To *full* this trough of cloth, fifteen pounds of ſoap are required; one half of which is to be diſſolved in two pails of river or ſpring-water, made as hot as the hand can well bear it. This ſolution is to be poured by little and little upon the cloth, in proportion as it is laid in the trough;

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trough: and thus it is to be *fulled* for at leaſt two hours; after which it is to be taken out, and ſtretched.

This done, the cloth is immediately returned into the ſame trough, without any freſh ſoap; and there *fulled* two hours more. Then taking it out, they wring it well, to expreſs all the greaſe and filth.

After the ſecond *fulling*, the remainder of the ſoap is melted, as the former, and caſt at four different times, on the cloth; remembering to take out the cloth every two hours, to ſtretch it, and undo the plaits and wrinkles which it has acquired in the trough. When they perceive it ſufficiently *fulled*, and brought to the quality and thickneſs required, they ſcour it out for the laſt time in hot water, keeping it in the trough till it be quite clean.

As to white cloths; becauſe theſe *full* more eaſily, and in leſs time, than coloured ones, a third part of the ſoap may be ſpared.

FULLING *of ſtockings, caps*, &c. may be performed ſomewhat differently; viz. either with the feet, or the hands; on a kind of rack, or wooden machine, either armed with teeth of the ſame matter, or elſe with horſes or bullocks teeth.

The ingredients made uſe of herein, are urine, green ſoap, white ſoap, and fullers-earth. But water ſoftened with chalk is far preferable.

Note, woven ſtockings, &c. ſhould be *fulled* with ſoap alone; for thoſe that are knit, fullers-earth may be uſed with the ſoap.

Indeed, it is frequent to *full* theſe kinds of works with the mill, after the uſual manner, of cloths, &c. But that is too coarſe and violent a manner, and is apt to damage the work, unleſs it be very ſtrong.

FULLO, in *Ichthyology*, a name given by Theodore Gaza, and others to the TENCH, or black *cyprinus*, called by the Greeks *pſylon*.

FULLONIANI, in *Church Hiſtory*, heretics who anathematized all who did not acknowlege, that Chriſt ſuffered in his divine nature; or who diſtinguiſhed his human and paſſible nature from his divine and impaſſible.

FULLONICA *terra alba*, white *fuller*'s earth, in natural hiſtory, a name given by ſome authors to the common white tobacco-pipe clay. See CIMOLIA *alba*.

FULLONUM *carduus*. See TEAZEL.

FULMAR, in *Ornithology*, a ſpecies of *procellaria* or *petrel*, that inhabits the iſle of St. Kilda; appearing there in November and continuing through the whole year, except the months of September and October. It lays a large white and brittle egg, which is hatched in June. This bird is ſuperior in ſize to the common gull; the bill is ſtrong, hooked at the end, and of a yellow colour. The noſtrils are compoſed of two large tubes, lodged in one ſheath; the head, neck, inferior part of the body, and tail are white; the back and coverts of the wings aſh-coloured; the quill-feathers duſky, and the legs yellowiſh. Inſtead of a back toe, it has only a ſort of ſpur, or ſharp ſtraight nail. The food of theſe birds is the blubber or fat of whales, of which they are very voracious; inſomuch that the whales are diſcovered at ſea by the flights of theſe birds; this is ſoon converted into oil and ſpouted from their bills in large quantities for their defence and for the ſupply of their young. This oil, it is ſaid, has been ſucceſsfully uſed in rheumatic caſes. The *fulmar* is of ſingular uſe to the iſlanders, as it ſupplies them with oil for their lamps, down for their beds, a delicacy for their tables, a balm for their wounds, and a medicine for their diſeaſes. The *fulmar* is alſo a certain prognoſticator of the change of the wind; becauſe, if it comes to land, no weſt wind is expected for ſome time; and the contrary, when it returns and keeps at ſea. Pennant.

FULMINANT, FULMINANS, or FULMINATING, an epithet applied to ſomething that thunders, or makes a noiſe like that of thunder.

We ſay, *Jupiter fulminans, aurum fulminans, pulvis fulminans, &c.* The *Jupiter fulminans* and the *Jupiter fulgurator* ſeem to have been very much of the ſame kind: but if they are diſtinguiſhed, we may conſider the former as the diſpenſer of the lightnings which are darted from the clouds, and the latter as the diſpenſer of thoſe leſſer lightnings that only ſhoot about and ſtruggle amidſt the clouds.

FULMINANS, *Aurum*. See AURUM.

FULMINANS, *Pulvis*, is a compoſition of three parts of nitre, two parts of ſalt of tartar, and one of ſulphur.

Both the *aurum* and *pulvis fulminans* produce their effect principally downwards: in which they differ from gun-powder, which acts *in orbem*; but principally upwards. If they be laid in braſs ladles, and ſo ſet on fire; after fulmination, the ladles will be found often perforated. Moreover, this powder does not require to be forcibly confined, as gun-powder does, in order to make a great exploſion, and the heat muſt be applied to it ſlowly. We may alſo obſerve that ſome inſtants before its exploſion, a light blue flame appears on its ſurface, which is nothing elſe than the phlogiſtic vapours beginning to kindle. No more fire or flame is perceived during its fulmination; the exploſion being ſo quick and the commotion ſo violent, that the flame is ſuffocated and extinguiſhed as ſoon as it is formed and before it can be perceived. Nor does the *fulminating* powder generally kindle the combuſtible bodies in contact with it, becauſe the time of its inflammation is too ſhort.

FULMINATING *damp*; ſee DAMP.

FULMINATING *Legion*. See THUNDERING *Legion*.

FULMINATION, in the *Romiſh canon law*, a ſentence of a biſhop, official, or other eccleſiaſtic appointed by the pope; whereby it is decreed, that ſome bull, diſpenſation, or reſcript, ſent from the pope, ſhall be executed.

Fulmination is the ſame thing with the verification, or recognition, of a letter, or inſtrument, of a prince in a lay court.

FULMINATION is alſo uſed for the denunciation, or execution, of a ſentence of ANATHEMA, made in public, with due ſolemnity.

In *fulminating* anathemas, the biſhop who pronounces ſentence, is to be clothed in his epiſcopalia, and accompanied with two prieſts in ſurplices; after ſentence is pronounced, they caſt down to the ground the lighted wax-tapers which they held in their hands.

FULMINATION, or FULGURATION, in *Chemiſtry*, a vehement noiſe, or ſhock reſembling thunder, occaſioned by the ſudden exploſion and inflammation of divers preparations; as *aurum fulminans*, &c. when ſet on fire.

FULUSCULUM, in *Botany*, a name given by the ancient Romans to a peculiar ſpecies of mullein or *verbaſcum*, of which they uſed to make the wicks of the torches with which they kindled their funeral piles. The Greeks for the ſame reaſon called this ſpecies *necuia*. Dioſcorides indeed calls it *lychnitis*, λυχνιτις; and Nicander, *thryallis*, θρυαλλις. The way they uſed it was this: they beat out the ſtalk of the plant, as we do hemp, and when it was ſeparated into looſe fibres, they plunged it into melted reſin; this gave it a conſiſtence again, and when cold, it was a kind of flambeau.

FUMADOES, in *Commerce*, a name given to pilchards, garbaged and ſalted, then hung in the ſmoak and preſſed; ſo called in Spain and Italy, whither they are exported in great abundance. Vid. Stat. 14 Car. 2 cap. 31.

FUMAGE, a term uſed in ſome parts of the kingdom, for dung, or manuring with dung.

FUMAGE. See FUAGE.

FUMARIA, ſee FUMITORY.

FUMER, in *Zoology*; ſee POLE-*cat*.

FUMET, a term uſed among ſportſmen for the ordure or dung of harts: otherwiſe called fewmets.

FUMIGATION, in *Medicine*, and *Chemiſtry*, is underſtood of things taken in the way of fume, or ſmoke; or that are turned into ſmoke, or ſteam.

The *fumigations* preſcribed by diſpenſatory writers are reduced to two kinds; the one conducive to health, the other only to pleaſure; and of each kind ſome are of moiſt, or liquid ingredients, others of dry ones.

The *fumigations* for pleaſure are compoſed of fragrant and ſweet-ſcented ſubſtances, and are uſed in form of powders, troches, or medicated candles. The firſt are uſually prepared of ſtorax, benjamin, lignum aloes, cinnamon, camphor, muſk, ambergris, and civet, mixed in due quantities, and all reduced together to a powder. The ſecond kind, or troches, are compoſed of the ſame kind of powdered ingredients, and are made into a paſte with a mucilage of gum tragacanth, and then cut into form. And the laſt kind, or candle *fumigations*, are prepared of the melted ſweet gums, with labdanum, made up into the form of large candles, with as much of the before mentioned ſweet ingredients as can be received into the maſs. Theſe, though only meant for luxury and pleaſure, yet have medicinal virtues; and as they abound in cordial ſubſtances, cannot but revive the ſpirits, and reſiſt contagion. The moiſt *fumigations* of this kind conſiſt of the powders before named, blended among a large quantity of roſe and orange-flower water, and of ſolutions of ſtorax, and other of the ſweet gums in ſpirit of wine.

The *fumigations* uſed to reſtore health are of ſeveral kinds. Some are meant only as corroboratives, and theſe are compoſed of much the ſame ingredients with thoſe uſed for pleaſure; others are uſed to dry up abundant humors, to purge the lungs, or to promote the menſes. In all diſorders of the uterus, there ſhould be added to theſe *fumigations*, galbanum, caſtor, and aſſa fœtida. A common *fumigation* is alſo uſed, by throwing tobacco on coals, and receiving the ſmoke through a funnel; and to this are ſometimes added colt's foot leaves, with other pectoral herbs, and a little ſulphur. Theſe are very uſeful for drying up ulcerations of the lungs, and other diſorders of the breaſt.

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The moiſt *fumigations*, for the ſake of health, conſiſt either of ſome ſimple liquor, ſuch as vinegar, wine, aqua vitæ, or roſe-water; and in ſome caſes, as for the diſcuſſing hard tumors, a red-hot brick, or ſtone, is thrown into vinegar, and the ſteam is received on the part. This is alſo a *fumigation* often uſed in times of peſtilential contagion, and that with great ſucceſs. Decoctions of uterine herbs are alſo frequently uſed for *fumigations* in ſeveral diſorders of the womb.

Olibanum, amber, ſtorax, and balſam of Tolu, make a fine dry *fumigation* for a catarrh: and in hyſteric caſes, great benefit is often found from holding the head, with the mouth open, over a hot ſolution of an ounce of aſſa fœtida in a pint of ſtrong wine-vinegar.

A northern phyſician has an expreſs treatiſe to juſtify the uſe of *fumigations* in many caſes.

It is dangerous taking mercury by *fumigation*. This *fumigation* is a kind of potential calcination; the vapour of mercury, laid on the fire, corroding and reducing into a calx the little laminæ of metals ſuſpended over it.

Fumigations with cinnabar have often been recommended as very efficacious in ſome of the worſt circumſtances of the venereal diſeaſe. From a caſe related in the Medic. Eſſ. Edinb. vol. iv. art. 8. it appears, that this practice may be attended with very violent effects. Half a dram of factitious cinnabar burnt under the noſe and mouth of the patient, is there mentioned as having raiſed a ſpitting in three hours.

FUMIGATION, *powder of*, was invented at Moſcow, in 1771, for preventing the infection of the plague. It is prepared of different degrees of ſtrength in the following manner: 1. Take leaves of juniper, juniper-berries pounded, ears of wheat, guaiacum wood pounded, or, if this cannot be had, the cones of pines or firs, of each ſix pounds; common ſalt-petre pounded, eight pounds; ſulphur pounded, ſix pounds; Smyrna tar or myrrh, or, inſtead of this, the common tar of pines and firs, two pounds; mix all theſe ingredients together, and they will produce a POOD of the powder of the firſt ſtrength. 2. Take ſouthernwood or mugwort, cut into ſmall pieces, five pounds; leaves of juniper, cut in the ſame manner, four pounds; juniper berries pounded, three pounds; common ſalt-petre pounded, four pounds; ſulphur pounded, two pounds and a half; Smyrna tar or myrrh, one pound and a half; mix theſe together, and they will yield half a POOD of the powder of the ſecond ſtrength. The efficacy of the powder of *fumigation* was tried on ten malefactors under ſentence of death, who were confined three weeks in a lazarette, and expoſed in every poſſible way to the infection of the plague, and none of them were at all injured by it.

FUMIGATION is alſo uſed for the act of making a ſuſpended body receive the fumes or ſteams of one or more other bodies, in order to calcine it, to correct it, or impart to it ſome new quality.

Ceruſs is made by the *fumigation*, or vapour, of vinegar, gnawing and corroding plates of lead.

FUMIGATOR, formed of *fumus*, *ſmoke*, in *Surgery*, an inſtrument uſed for injecting clyſters of the ſmoke of tobacco. Clyſters of this kind have been applied in the ILIAC *paſſion*, in the HERNIA *incarcerata*, and in other caſes of an obſtinate conſtipation, or obſtruction of the bowels; and as they are admirably adapted to excite the ſuſpended or extremely languid periſtaltic motion of the inteſtines, which are reckoned among the moſt irritable parts of the body, and are allowed to retain the vital influence longer than any other, they have been peculiarly ſerviceable in caſes of recovery from apparent death by DROWNING, &c. The inſtrument commonly uſed for the injection of theſe clyſters is formed with an iron or braſs capſula for containing a certain quantity of tobacco, to which capſula are faſtened two pipes; one of them made of bone, to be inſerted into the anus; and the other of ivory, in the ſhape of that end of the trumpet which is applied to the mouth; by means of which the ſmoke of the burning tobacco in the capſula is forced through the firſt pipe into the anus. The Dutch have made the bowl of this inſtrument large enough to contain three fourths of an ounce of tobacco; it is conſtructed of wood, lined with braſs or tin, and covered by a top of wood lined in the ſame manner; the top is ſcrewed upon the other; the inſtrument is uſed by means of a wooden tube or blow-pipe, ſcrewed to the top, and adapted either to the mouth, or to a pair of bellows. The inſtrument uſed by the French is compoſed of a box reſembling the bowl of a pipe, covered by a lid, at the upper part of which is a hole or chimney, for giving air to the tobacco at pleaſure. From the ſide of this cover proceeds a tube, about four inches in length, incorporated with it, and adapted at the other extremity to the end of a flexible tube. At the lower part of this box is inſerted a kind of tubular handle, which admits the nozzle of a pair of bellows, faſtened to it by means of an iron pin paſſing tranſverſely through both. By this contrivance, when the tobacco is lighted, it is not neceſſary to touch the heated box; and the bellows ſerves as a handle by which to direct all the neceſſary movements: the whole inſtrument is made of copper.

Mr. Wrigleſworth, in conſequence of hints and obſervations communicated to him by Dr. Cogan, has conſtructed a *fumigator* free from the inconveniences attending thoſe already mentioned. The bowl or body of this new inſtrument is made of caſt braſs, and is large enough to contain about an ounce and a half of tobacco. The pipe projecting from the lower part of it is bored out of a ſolid piece of braſs, and alſo thoſe to which each extremity of the leathern tube is affixed. The cover is likewiſe made of caſt braſs; from the upper extremity of which projects a neck about an inch and a half in length, the opening or bore of it being about half an inch in diameter. The cover is fixed to the box by means of two nitches made on each ſide of a circular ridge or edge, admitting two ears, that project from the upper part of the box, which by a circular motion lock upon the brim. The nozzle of the bellows is accurately adapted to the neck of the cover, and is about an inch and a half or two inches long; the lower end of the nozzle is rounded and ſmooth, like the lower extremity of a glyſter-pipe, and perforated like a cullender, in order to prevent the aſhes of the tobacco from riſing into the bellows. The bellows are faſtened upon the cover or lid in a manner ſimilar to the preceding; an ear projects from the upper part of the neck, and is admitted into a nitch, in a circular rim, upon the nozzle. The pipe projecting from the lower extremity of the bowl, locks into the croſs-pipe to which the leathern tube is affixed, in the manner of a bayonet. By this kind of faſtening the whole apparatus may be made ready in the ſpace of a minute, and forms one compact body, free from the hazard of falling in pieces, and thus interrupting the operation; and yet either part may be taken off when the occaſion requires, with the utmoſt eaſe and expedition. The bowl is incloſed in a thick caſe of wood, removeable at pleaſure; which ſecures the hand from injury during the whole proceſs. The ſame ingenious artiſt has alſo conſtructed a machine ſo formed, as to contain the above deſcribed *fumigator*, with every requiſite for beginning an operation in the recovery of perſons apparently drowned, &c. ſuch as brandy, ſalt, ſpirit of ſal ammoniac, tinder-box, flint and ſteel, and cloths to rub the body. This machine is light and portable, being not much larger than a caſe of ſurgical inſtruments. Reports of the Humane Society, 1775, p. 82, &c.

FUMING, in *Metallurgy*, the firſt calcination of the ores of metals, intended to diveſt them of their ſulphurs. See ROASTING.

FUMITORY, *Fumaria*, in *Botany*, a genus of the *diadelphia hexandria* claſs: the empalement of the flower is compoſed of two equal oppoſite leaves; the flower is of the ringent kind, approaching nearly to the butterfly flowers; the upper lip is plain, obtuſe, and reflexed; the nectarium at the baſe is obtuſe and little prominent; the under lip is like the upper; but the baſe is keel-ſhaped; the chaps of the flower are four-cornered, and perpendicularly bifid; there are two equal broad ſtamina in each flower, included in the two lips, each being terminated by three ſummits. In the centre is ſituated an oblong germen, which afterward becomes a ſhort pod with one cell, including roundiſh ſeeds. There are twelve ſpecies. Miller.

The common *fumitory*, which is frequent in our gardens and corn-fields, and flowers from April to June, is eſteemed a very great medicine in obſtructions of the liver and ſpleen; it attenuates ſerous, bilious, and aduſt humours, and carries them gently off by ſtool and urine. It is famous for the ſcurvy, and is alſo given in infuſion in the jaundice, and in the itch, and all other cutaneous diſorders.

FUNAMBULUS, among the Romans, was what we call a *rope*-DANCER, and the Greeks, *ſchœnobates*.

The term is alſo uſed for ſuch as, letting themſelves down by a rope, or cord, make their eſcape out of a city, or place beſieged, as is obſerved by Du-Cange.

Julius Capitolinus, and Horace, make mention of *funambuli*. Acron on Horace aſſures us, that it was the orator Meſſala who firſt introduced the word *funambulus*, in lieu of *ſchœnobates*, uſed by the Greeks. For the Greeks ſeem to have had ſome of theſe rope-dancers from the firſt inſtitution of their ſcenic games, which are ſaid to have been invented about the time of Icarius, father of Erigone; or of Dionyſius, ſurnamed Liber Pater, whom Theſeus firſt introduced into Athens.

At Rome, the *funambuli* firſt appeared under the conſulate of Sulpicius Præticus and Licinius Stolo, who were the

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the first introducers of the scenic representations. It is added, that they were first exhibited in the island of the Tiber; and that the censors Messala and Cassius afterwards promoted them to the theatre.

In the *Floralia*, or *ludi Florales*, held under Galba, there were *funambulatory* elephants, as we are informed by Suetonius. Nero also shewed the like, in honour of his mother Agrippina. Vopiscus relates the same of the time of Carinus and Numerianus.

There was a *funambulus*, it seems, who performed at the time when the Hecyra of Terence was acted; and the poet complains, that the spectacle prevented the people from attending to his comedy: *Ita populus studio stupidus in* funambulo *animum occupârat.*

FUNCTION, the act of doing something for which the agent was appointed, or which he was obliged to.

Thus we say, the stomach performs its *function*, i. e. digests well; the fumes of wine disturb the brain in the performance of its *functions*.

Physicians divide the *functions* of the human body into *vital*, *natural*, and *animal*.

FUNCTIONS, *vital*, are those necessary to life; and without which it cannot subsist: as, the actions of the heart, brain, lungs, &c.

FUNCTIONS, *natural*, are those which change the food, &c. so as to assimilate it to our own nature: such are the actions of the viscera, and the vessels which receive, retain, secern, &c. the humours.

FUNCTIONS, *animal*, are those without which we cannot perceive, will, remember, &c. Such are feeling, seeing, imagining, judging, passions, voluntary motion, &c.

FUNCTION is also used figuratively in speaking of the offices, duties, or occupations a person is engaged in.

The actions of an ambassador must be distinguished from his *functions*; the one regard his character, the other his person.

FUNCTION. The term *function* is used in algebra, for an analytical expression any way compounded of a variable quantity, and of numbers, or constant quantities: therefore every analytical expression, in which, besides a variable quantity x, there are constant quantities, is a *function* of x. Thus $a+3x$, $ax-4xx$, $ax+b\sqrt{aa-xx}$, c^x, &c. are *functions* of x.

The difference of *functions* consists in the manner in which they are compounded; and depends, therefore, upon the operations by which quantities may be compounded and mixed. These operations are, addition, subtraction, multiplication, and division, the raising to powers, and extraction of roots, to which the resolution of equations ought to be referred. Beside these operations, which are called algebraical, there are other transcendental ones; such as exponential, logarithmic, and many others, arising from the inverse method of fluxions.

Functions may arise from the most simple and analytical operations: thus we have the multiple *functions* $2z$, $3z$, $\frac{3}{4}z$, az, &c. and the powers of z, as z^2, z^3, $z^{\frac{1}{2}}$, z^{-1}, &c. are called *functions*.

Functions are divided into *algebraical* and *transcendental*: *algebraical functions* are those formed by algebraic operations only; such are those above specified, except c^x, which belongs to the following species.

Transcendental functions are those formed by transcendental operations: such are exponential quantities or powers, the exponents of which are variable quantities; whereas, in algebraic *functions* the exponents are always constant quantities.

It is to be observed as to *transcendental functions*, that those *functions* only of a variable quantity are to be deemed transcendental, which not only enter the composition with, but also affect the variable quantity: thus if z signifies a circular arc, or a logarithm, then will ca^z, and the like expressions, be *transcendental functions* of z. But if the transcendental operation appertains only to constant quantities, the *function* is no more than algebraic: thus if c denote the circumference of a circle, the radius of which is $= 1$, c will be a transcendental quantity, and yet the expressions $c+z$, cz^2, $4z^c$, are but algebraic *functions* of z. Some indeed have doubted whether z^c ought to be ranked among algebraic *functions*, or not; but the doubt is of small weight. And some choose to call the powers of z, the exponents of which are irrational numbers, *interscendent functions*: thus, $z\sqrt{2}$ is an interscendent *function* of z.

On the subject of *functions*, their divisions, transformations, explication by infinite series, &c. Mr. Euler should be consulted, who has treated this matter very fully in the first chapter of his Analys. Infinitorum.

FUND, FUNDUS, a Latin term, used for the bottom of certain things; and particularly of certain parts of the body.

FUND *of the eye*, FUNDUS *oculi*, is that part possessed by the choroides and retina.

The images of objects are represented in an inverted situation, in the *fund* of the eye. See VISION.

FUNDUS *uteri*, or *bottom of the womb*, is the body or principal part thereof; so called in contradiction to the cervix, or neck; the osculum, or mouth; and the vagina, or sheath. See *Tab. Anat. (Splanch.) fig.* 9. *lit. a. fig.* 11. *lit. d.*

FUNDUS *vesicæ*, or *bottom of the bladder*, is the cavity thereof, wherein the urine is contained. In men it is placed over the rectum; and in women over the matrix.

FUND *of the gall bladder*, the *stomach*, &c. See GALL-*bladder*, STOMACH, &c.

FUNDUS *plantæ* is that part of a plant, where the stalk just meets and joins the root.

FUNDUS *cæli* is the point opposite to the point of culmination; or the point of the ecliptic, wherein it is intersected by the meridian beneath the horizon.

FUND, in *Commerce*, is used for the capital or stock of a merchant, company, or corporation; or the sum of money they put into trade.

In this sense we say absolutely, the *funds*, the *public funds*, meaning the stock of the great companies, or corporations, as the Bank, South-sea, East-India, &c.

FUNDS, *public*, are the taxes appropriated by parliament to the support of civil government, and the payment of the principal and interest of money borrowed for public services. These *funds*, in Britain, have been all formed into the four following classes or divisions: the AGGREGATE *Fund*, the SOUTH-SEA *Fund*, the GENERAL *Fund*, and the SINKING *Fund*. Of all these, but more especially the last, we shall give an account in the order in which they have been now named.

The *aggregate fund* was established by an act of Geo. I. cap. 12. in 1715. It had this name given it, because it consisted of a great variety of taxes and surpluses of taxes and duties which were in that year consolidated, and given as a security for the discharge of the interest and principal of debts due to the Bank of England, and some other public debts; and also for the payment of 120,000*l.* per ann. to the civil list. Into this *fund* are brought the two thirds and one half subsidy of tonnage and poundage; half the inland duties on tea and coffee; the house money granted by the 7th of Will. III. the duty on hops; the duties on low wines, brandy, and British spirits; all arrears of land-taxes; all public monies not appropriated; the surpluses of the nine penny excise, of the five sevenths of the Bank nine penny excise, of the revenues in the annuity acts of the 4th, 5th, and 6th of queen Anne, &c. and, by an act of the 1st of Geo. III. all the duties constituting the revenue of the civil list. The whole produce or income of this *fund* had been for a few years before 1778 about 2,600,000*l.* per ann.

The *South-sea fund* was established, by stat. 3 Geo. I. cap. 9. in 1716; and is so called, because appropriated to pay the interest of the South-sea company's capital. It consists of a duty on candles, and certain imposts on wines, vinegar, tobacco, and East-India goods. Its produce of late has been about half a million per ann.

The *general fund* was also established, by stat. 3 Geo. I. cap. 7. in 1716, and consists of a subsidy on goods exported; a tax on hackney-coaches and chairs; duties on soap, hides, stamps, and policies of insurance; 700*l.* per week letter-money; a moiety of the inland duties on tea and coffee; and 39,855*l.* per annum out of the hereditary excise on beer for bankers annuities. All these taxes and payments have for some years amounted to a little more than a million per ann. and are appropriated to the discharge of the interest of 7,808,087*l.* (originally 10,000,000*l.*) capital stock of South-sea annuities, together with charges of management.

All that remained of the produce of the taxes thus digested into these three *funds*, after satisfying the charges upon them, was in the same year (or 1716) carried into a fourth *fund*, to which was given the name of the *sinking fund*, because appropriated to the purpose of sinking the public debts. The words of the act of the 3d of Geo. I. which established this *fund*, are, "All the monies to arise from time to time, as well of the excess and surplus of an act made this session for redeeming the *funds* of the Bank of England; and of the excess or surplus by virtue of one other act made likewise this session for redeeming the *funds* of the South-sea company; as also, of the excess or surplus of the duties and revenues by this act appropriated as aforesaid; and the overplus monies of the said *general fund* by this act established; shall be appropriated to the discharging the principal and interest of such national debts as were incurred before the 25th of December, 1716, and are declared to be national debts; and to or for no other use, intent, or purpose whatsoever."

The operations and progress of this *sinking fund* form so import-

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important a part of the hiſtory of Britain, that a more particular account of it will be here proper.

Before its eſtabliſhment there had exiſted many ſmaller *funds* of the ſame nature; that is, ſuch duties or taxes had been provided for paying the intereſts of particular loans, as afforded ſurpluſſes by which the principal itſelf was to be gradually redeemed: this was the common practice in the reigns of king William and queen Anne. Moſt of the public duties were given for terms of years; and at the end of thoſe terms they ceaſed of courſe, unleſs continued for farther terms by new acts of parliament: and, in general, it was provided, when any money was raiſed, that the principal ſhould be cancelled either by time, as in the caſe of the ſale of long and ſhort annuities, or by the ſurpluſſes of the duties charged with the payment of the intereſt. This was an excellent plan; but it was by no means carried ſteadily into execution.

In the year 1720, moſt of the long and ſhort annuities were converted into redeemable perpetuities, at the expence of above three millions; and the ſurpluſſes of the duties charged with particular loans were often ſo broken into, by being either charged with new loans before they had cancelled the old, or ſpent on current ſervices, as to be rendered incapable of anſwering the end intended by them.

In conſequence partly of this bad management, the public debts at the acceſſion of the houſe of Hanover were ſo much increaſed as to be generally reckoned inſupportable; and their reduction was made one of the firſt objects of parliamentary attention. This gave riſe, in 1716, to the inſtitution of the *fund* of which we are giving an account, the father of which was (as has been generally ſaid) Sir Robert Walpole, but, in reality, the Earl of Stanhope. All the taxes, except the land-tax, and five pence per buſhel malt-tax, were now made perpetual, and diſtributed into the three *funds* which have been deſcribed, the ſurpluſſes of which, for ever afterwards, were to be held ſacred, and to be applied inviolably, according to the words of the act juſt recited, to the redemption of the national debt. Theſe taxes have been always voted by parliament from year to year: they are, on this account, diſtinguiſhed by the name of the annual taxes, and wholly employed, as far as they will go, in bearing the current expences of every year.

A conſiderate perſon might have ſuſpected, that the ſame cauſes which had rendered former partial appropriations ineffectual, would deſtroy the efficacy of this. There ſeemed, however, to be reaſon for hoping the contrary: for,

Firſt, the future happineſs and glory of the kingdom were thought to depend on this appropriation; and the law which eſtabliſhed it was declared to be a fundamental law of the realm. In conformity to this, ſecondly, the words of this law were made as ſtrong as they could well be; and, in order to give additional force to it, a repetition of it, in the ſame words, was inſerted in an act of the 5th of Geo. I. cap. 3. Particular notice ſhould be taken of theſe words: they order that all the ſurpluſſes of the taxes then made perpetual, ſhall be applied to the diſcharge of the public debts, and "to no other uſe or "intent whatever." When, therefore, a debt had been paid off, the addition ariſing from that payment to the ſurpluſſes (or the annuity diſengaged by it) became a part of the *fund*, and, together with it, was to be employed in diſcharging farther debts. And the ſame being true of every ſucceſſive annuity diſengaged by every payment, the *fund*, if never miſapplied, muſt neceſſarily have operated in ſinking the public debt, in the ſame manner that money accumulates, when put out to bear compound intereſt. And in this way this *fund* did in fact operate for a few years. While in its infancy, it was watched over with great care: the improvement, and the inviolable application of it, were recommended in moſt of the ſpeeches from the throne, and echoed back in the addreſſes of the houſe of commons. It is particularly obſervable, that ſo well did our miniſters then underſtand the nature and importance of this *fund*, that rather than encroach upon it, they frequently borrowed money in order to defray the neceſſary expences of government. From ſome publications in 1726 it appears, that ſome perſons had been led to apprehend this zeal of the miniſtry would not be permanent, becauſe it was not their intereſt to pay off the public debt, on account of the dependence and influence created by it. In anſwering this objection, the writers on the ſide of the court called ſuch an apprehenſion an indecent jealouſy, and took upon them to aſſure the public, "that in no "poſſible exigence of affairs could our miniſters ever "approve of or recommend the alienation of the *ſinking* "*fund*." Happy would it have been for Britain had this proved true: but in a little time it appeared, that the apprehenſions which had been ſtiled indecent jealouſies, were too well grounded. Men in power came ſoon to ſee, that this *fund* was advancing too faſt in its operations, and to change their zeal for it into a reſolution to deſtroy it: this will abundantly appear from the following facts.

Charging the income of the *ſinking fund* with the payment of the intereſt of new loans, is an encroachment upon it, no leſs ſubverſive of its efficacy, than depriving it of groſs ſums; there being no difference between taking from it the annual intereſt of a ſum, and that ſum itſelf. Between the years 1727 and 1732 ſeveral encroachments of this kind had been made upon it; but, being of a leſs obvious nature, they paſſed without meeting with any particular oppoſition. The finiſhing blow was given it in the year 1733. In that year, in order to keep the land-tax at one ſhilling in the pound, as it had been the year before, it was neceſſary either to borrow half a million for the current ſervice, or to take this ſum from the *ſinking fund*. The laſt method was choſen, and propoſed by Sir Robert Walpole to the houſe of commons. Long and warm debates enſued. A propoſal to alienate, in a time of profound peace, a *fund* which the law had made ſacred, and the alienation of which *no poſſible exigence of public affairs* could juſtify, only for the ſake of keeping the land-tax for one year at one ſhilling in the pound, juſtly kindled the indignation of the patriotic party. They urged the prohibition of the law, the faith of parliament, and the ſecurity of the kingdom. The propoſer of the alienation was reminded of his inconſiſtency and treachery, in endeavouring to beat down that very monument of glory which he had boaſted of having erected for himſelf; and Sir John Barnard warned him, that he was drawing upon himſelf the curſes of poſterity. But all arguments were vain. The miniſtry pleaded that the landed intereſt wanted eaſe; that there was no occaſion for being in a hurry to pay the national debt; and that the circumſtances of the kingdom had altered ſo much ſince the eſtabliſhment of the *ſinking fund*, that the competition then among the public creditors was, not who ſhould be firſt, but who ſhould be laſt paid. Thus argued, among others, Sir Robert Walpole. His reaſons prevailed; and the houſe of commons, not uſed to refuſe him any thing, conſented.

The practice of alienating the *ſinking fund* having been thus begun, went on of courſe. In the next year, or 1734, 1,200,000*l.* was taken from it. In 1735, and 1736, it was anticipated and mortgaged.

Thus expired, after an exiſtence of a few years, the *ſinking fund*; that ſacred bleſſing (as it was once thought) and the nation's only hope. Could it have eſcaped, it would long before this time have eaſed Britain of all its debts, and left it a ſafe and happy country.

In order to obtain a juſter ſenſe of this, let us here compare what it would have done had it never been miſapplied, with what it has done.

Though the act that eſtabliſhed it was paſſed, as already ſaid, in 1716, it did not begin its operations till 1719, when three quarters of a million in old Exchequer bills were paid off with it. The intermediate time had been employed in laying the foundations of this *fund*, and providing an income for it, by a general reduction of the public debts, from an intereſt of ſix per cent. and other higher intereſts, to five per cent. What made this reduction then practicable was a rapid fall of the intereſt of money, which begun (in conſequence of an increaſe of trade producing an influx of money) a little before the acceſſion. The legal intereſt of money was reduced in 1714, from ſix to five per cent. and the means uſed by government for accompliſhing this reduction were, firſt, the addition (at Michaelmas 1717) of the intereſt of ſome debts bearing five per cent. to the principal, in order to make uſe of the produce of the taxes which ſhould have paid that intereſt, in diſcharging the bankers debt and ſome other debts bearing ſix per cent.

Secondly, loans at five per cent. obtained chiefly from the Bank, and the South-ſea company, to pay off ſuch of the public creditors as did not chuſe to accept a lower intereſt than ſix per cent.

After this reduction, the three *funds*, before deſcribed, produced a ſurplus of above half a million per annum. In 1727 this ſurplus was increaſed to 939,103*l.* and in 1733 (the year when the practice of alienating it begun) it had been increaſed ſo much by the redemptions made with it, and by a ſecond reduction of intereſt in 1727 from five to four per cent. that its medium for five years had been 1,212,000*l.* per annum. Had it, from the year 1732, been allowed no increaſe beyond this (except from the intereſt of debts paid by it), and been applied for the firſt twenty-five years to the payment of debts bearing four per cent. intereſt, and afterwards to the payment of debts bearing three per cent. it would in the preſent year (1779) have completed the redemption of one hundred

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hundred and forty-nine millions of debt, leaving the public, during this whole period, in poſſeſſion of all the ſurpluſſes which have ariſen in the revenue beyond 1,212,000*l.* except thoſe produced by redemptions. It is not poſſible to conceive the beneficial effects with which this would have been attended, or the vigour which would have been all along given to public credit by ſuch a *fund*, and by the proſpect it would have given of the total annihilation in this year of almoſt all the public debts, and the diſengagement of taxes bringing in above five millions per ann. to be either aboliſhed, or (ſhould a war prove neceſſary) to be continued a few years longer, for carrying it on without making any addition to the public burdens. No perſon who duly attends to this, and wiſhes well to England, can avoid execrating the policy which firſt produced, and has ſince continued, the alienation of the *ſinking fund*, and converted an expedient for ſaving the kingdom, into a ſupply for extravagance and a ſupport of corruption and deſpotiſm. This, however, is a policy which it may be expected men in power will always uſe when they can; for few of them have ever ſhewn themſelves ſuperior to the temptations of power, or virtuous enough to avoid uſing all means to ſtrengthen and extend it.

Many ſchemes of different kinds have been formed for paying the public debts; and certain it is, that nothing can be of more importance. But the nature of things doth not admit of any method of doing this ſo expeditiouſly and effectually as an unalienable *ſinking fund*; for in ſuch a *fund* (it has been ſhewn) money is improved at compound intereſt, and therefore in the moſt perfect manner. The writers, therefore, who have employed themſelves in contriving ſuch ſchemes might have ſpared their labour. The beſt of all ſchemes has been long known and eſtabliſhed, and received all the weight and efficiency which could be given it by the moſt ſolemn acts of legiſlature. But no legiſlature can give ſecurity againſt itſelf. No parliament can do any thing which it may not undo, eſpecially if under any undue influence.

We have now ſeen what the *ſinking fund* would have done, had it ſuited the views of the Britiſh miniſtry in 1733 to ſuffer it to go on with its operations. Let us next compare this with what it has done.

In 1737 and 1738, a million of the ſtock of Bank annuities and two millions of the ſtock of South-ſea annuities were redeemed with it. For twelve years after 1738, it was wholly applied to the current expences of every year In 1749, the intereſt of near fifty-eight millions of the public debts was reduced from four to three one half per cent. intereſt for ſeven years, and afterwards to three per cent. for ever; and by this third reduction, an addition was made to the *ſinking fund* of near 600,000*l.* per ann. But notwithſtanding this addition, no more than three millions of the public debts were redeemed by it, during the interval of peace between the years 1748 and 1756

By an act of the 25th of Geo. II. 1752, a change was made in the *ſinking fund*, which it is neceſſary to mention.

Before this act the *ſinking fund* conſiſted only of the clear ſurpluſſes of the aggregate, the general, and the South-ſea company's *funds*. By the war, which begun in 1740, there was an addition made to the public debts of near thirty-two millions. This occaſioned a great increaſe of taxes; and the practice was, whenever any new tax produced leſs than the intereſt with which it was charged, to make good the deficiency out of the *ſinking fund*, and afterwards to replace the ſum taken from it out of the ſupplies for the following year. But whenever a tax produced more than the charge upon it, the overplus, inſtead of being carried to the *ſinking fund*, was made a part of the ſupplies for the year. By the act juſt mentioned, all the new taxes, together with all the annuities to the payment of which they had been appropriated, were ordered to be carried into the *ſinking fund*, and formed into one general account. Moſt of the new taxes having proved deficient, this *fund* at firſt loſt more than it gained by the change. But the loſs was afterwards more than made up; firſt, by the ſaving which was produced by the reduction of intereſt from three one half per cent. to three per cent. in 1757; and, ſecondly, by the addition, in the ſame year, of the ſalt-duties to this *fund*, after they had completed the redemption of a million with which they had been charged in 1745.

The war which began in 1756, added ſeventy-one millions and a half to the public debts. This produced a new increaſe of taxes, which (in conformity to the conſolidating act juſt mentioned) have been brought to the general *ſinking fund* account, together with the annuities or intereſts with the payment of which they are charged. And it is now the conſtant practice, whenever a new *fund* or tax is created for paying the intereſt of a loan, to carry both into the *ſinking fund*; in conſequence of which this *fund* gains when the tax happens to produce more, but loſes when it produces leſs than the intereſt which it has been given to pay. The *ſinking fund*, therefore, which, before the conſolidating act, conſiſted only of the ſurpluſſes of the aggregate, general, and South-ſea company's *funds*, conſiſts now of the clear ſurplus of all the appropriated taxes. There is but one tax excepted; and that is, the additional tax upon houſes and windows, granted in 1758 towards paying the intereſt of four millions and a half then borrowed. This tax has never been made a part of the *ſinking fund*; and, having always proved deficient to the amount of about 45,000*l* per ann. the deficiency is conſtantly made good by the *ſinking fund*, and afterwards replaced from the ſupplies.

Before the laſt reduction of the intereſt of the public debts, the *ſinking fund*, having ſuffered greatly from various encroachments upon it, produced little more than a million per ann. But after this reduction, and its increaſe by the addition of the ſalt-duties, it produced near two millions per ann. In 1764 it produced at Michaelmas, after making good deficiencies, 2,105,000*l.* nearly. For five years after 1764, its average produce, reckoned to Chriſtmas in every year, was 2,234,780*l.* For five years, ended in 1774, its average produce was 2,610,759*l.* In 1775, it produced 2,917,869*l.* In 1776, 3,166,517*l.* In 1777 it was charged with an annuity of 100,000*l.* per ann. to the civil liſt; and, after paying this annuity and half a year's intereſt of five millions borrowed in that year, it produced nearly 2,700,000*l.* In 1778 it was taken at three millions; but did not produce, after paying the ſaid annuity, and making good the intereſts of the new loans in 1777 and 1778, more than two.

It appears from this detail, that ſince the peace in 1763 the income of the *ſinking fund* has increaſed conſiderably. The cauſes of this have been partly the falling in of life-annuities, and the greater productiveneſs of the taxes occaſioned by the increaſe of luxury. But the principal cauſe has been the falling in of the intereſt of about ten millions and a half of the public debts, which had been diſcharged during the twelve years of peace between 1763 and 1775. This diminution of the public debts has been made, not by the *ſinking fund*, but by a contribution from the Eaſt-India company of 400,000*l.* per ann. begun in 1768, and continued for five years; by the profits of ten lotteries; by the compoſition for maintaining French priſoners; ſale of French prizes taken before the declaration of war in 1756; and other extraordinary receipts, amounting in all to above eight millions. This *fund*, therefore, did not pay off more than two millions and a half, the reſt of its produce having been employed in bearing the expences of the peace eſtabliſhment, which, during this period, was nearly double to what it had been in any former period.

To the ſum juſt mentioned, add three millions paid off in the peace between 1748 and 1756, and three millions paid off in 1736 and 1737, and it will appear that the whole amount of the public debts paid off by the *ſinking fund*, ſince its firſt alienation in 1733, is only eight millions and a half; whereas it has been ſhewn, that had only 1,212,000*l.* per ann. of it been applied inviolably to the redemption of the public debts, one hundred and forty-nine millions would have been paid, and conſequently the nation extricated and ſaved.

It has been ſaid, that when money is wanted for defraying public expences, it makes no difference whether it is obtained by diverting the *ſinking fund*, or by a new loan. There cannot be a worſe fallacy than this. Money in a *ſinking fund*, if never alienated, is improved at compound intereſt; but, when procured by a loan, bears only ſimple intereſt. A nation, therefore, whenever it applies the income of ſuch a *fund* to current expences rather than the redemption of its debts, chuſes to loſe the benefit of compound intereſt in order to avoid paying ſimple intereſt; and the loſs in this caſe is equal to the difference between the increaſe of money at compound and ſimple intereſt. The following calculation will ſhew what this difference is.

One penny put out at our Saviour's birth to five per cent. compound intereſt, would, before the preſent year 1779, have increaſed to a greater ſum than would be contained in a hundred and fifty millions of earths, all ſolid gold. But, if put out to ſimple intereſt, it would, in the ſame time, have amounted to no more than ſeven ſhillings and ſix pence. All governments that alienate *funds* deſtined for reimburſements, chuſe to improve money in the laſt rather than the firſt of theſe ways. See, on the ſubject of this article, Dr. Price's Appeal to the Public on the Subject of the National Debt. Alſo his Obſervations on Reverſionary Payments, &c. chap. iii. And Additional Obſervations on Civil Liberty, part iii.

FUNDA-

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FUNDAMENT, the anus or aperture, through which an animal voids his excrements.

FUNDAMENTAL, ſomething that ſerves as a baſe, reſt, ſupport, or foundation, for any thing.

The apoſtles creed contains the *fundamental* points of religion.

The Salic law is the *fundamental* law of the polity of France.

FUNDAMENTAL, in *Muſic*, denotes the principal note of a ſong or compoſition, to which all the reſt are in ſome meaſure adapted, and by which they are ſwayed; called alſo the KEY of the ſong.

FUNDAMENTAL *baſs*, is that which is formed only of the *fundamental* ſounds of HARMONY, in ſuch a manner, that in every concord it leads us to perceive the true *fundamental* ſound of that concord; whence it appears, that it can have no other contexture than that of the *fundamental* ſucceſſion of the harmony. The *fundamental* ſounds are the octave above the principal ſound, the twelfth and the ſeventeenth major above the ſame ſound.

In order to underſtand the nature of the *fundamental* baſs, it is neceſſary to know, that every concord, though compoſed of many ſounds, has only one ſound which is *fundamental*, viz. that which has produced that concord, and which ſerves for its baſs. But the baſs, which prevails below all the other parts, does not always expreſs the *fundamental* ſounds of the concords; for of all the ſounds of a concord, we are at liberty to transfer to the baſs that which we think preferable, with regard to the movement of this baſs, the pleaſantneſs of the tune, or the expreſſion. In this caſe, the true *fundamental* ſound, inſtead of being in its natural place, which is the baſs, is transferred to the other parts, or not expreſſed at all; and ſuch a concord is called a reverſed concord. See REVERSING.

In reality, there is no difference between a reverſed concord and the direct concord by which it is produced; for the ſounds are always the ſame: but theſe ſounds forming different combinations, the combinations reſulting from them have for a long while been conſidered as ſo many *fundamental* concords, and diſtinguiſhed by different names. M. Rameau has ſhewn, in his Traité de l'Harmonie, that many of theſe pretended concords are only different modifications and alterations of a ſingle concord: thus, the concord of the ſixth is only a perfect concord, the third of which is transferred to the baſs; in which, by introducing the fifth, we ſhall have another concord of the ſixth and fourth. Here, then, are three combinations of a concord which has but three ſounds; thoſe that have four are capable of four combinations; for each of the ſounds may be transferred to the baſs. But if below this another baſs be introduced, which, in all the combinations of the ſame concord, always affords the *fundamental* ſound, it is evident that the number of the conſonant concords is reduced to three, and that of the diſſonant to four; to which, if we add all the concords by SUPPOSITION, which may likewiſe be reduced to the ſame *fundamentals*, we ſhall find harmony ſimplified to a degree which could never have been expected, conſidering the ſtate of confuſion in which M. Rameau found the rules relating to this part of muſic. It is certainly, as this author obſerves, very aſtoniſhing, that perſons have been able to advance the art to its preſent pitch of perfection, without knowing its foundation, and to propoſe all its rules with ſuch exactneſs, without having diſcovered the principles on which they depend. The movement of the *fundamental* baſs is regulated by the laws of harmonic ſucceſſion, in ſuch a manner, that if this baſs deviates from the order which is preſcribed, there is a fault in the harmony. With ſkill to regulate and obſerve the connection between the ſeveral ſounds that are united together, are the two moſt important rules relating to the *fundamental* baſs; and the principal mechanical rule which is ſuggeſted by it, is to let the *fundamental* baſs proceed only by conſonant intervals, except when the cadence is broken; i. e. when the *fundamental* baſs, inſtead of aſcending from the fourth, after a concord of the ſeventh, as in a perfect cadence, aſcends only by one degree; or after a concord of the ſeventh diminiſhed, in which caſe it riſes diatonically. As for the diatonic deſcent, this movement is not allowed in the *fundamental* baſs, or at moſt only in the caſe of two perfect concords ſeparated by a reſt or pauſe, either expreſſed or underſtood. This rule admits no other exception. M. Rameau, indeed, has made the *fundamental* baſs deſcend diatonically, for particular reaſons, in the concords of the ſeventh.

The *fundamental* baſs, whenever it is juſtly formed, conſiſts either of perfect concords with conſonant movements, without which theſe concords could have no proper connection, or diſſonant concords in the *acts of cadence*, which always reſult from two *fundamental* ſounds, one of which precedes, and the other terminates the cadence. In every other caſe, the diſſonance can neither be well placed, nor rightly preſerved. Hence it follows, that the *fundamental* baſs can never proceed but in one of theſe three ways: 1. By aſcending or deſcending from the third or from the ſixth; 2. From the fourth or the fifth; or, 3. By aſcending diatonically, by means of the diſſonance that forms the connection, or by particular licence, above the perfect concord. Every other movement of the *fundamental* baſs is faulty.

Although the *fundamental* baſs ought, in general, to be below the *thorough-*BASS, there are, however, caſes, in which the latter is below the former: ſuch are thoſe of *concords by* SUPPOSITION, ſo called, becauſe the thorough-baſs ſuppoſes below the concord a new ſound which does not belong to that concord, which exceeds its limits, and is, therefore, below the *fundamental* baſs.

The *fundamental* baſs, the ſole intention of which is to ſerve as a proof or teſt of the harmony, is ſuppreſſed in the execution, where it would have a very bad effect; producing, at leaſt, a very tedious monotony, by the frequent returns of the ſame concord, which are more agreeably diſguiſed and varied, by its different combinations, in the thorough-baſs. It may be added, in general, that the indiſpenſible rules of the *fundamental* baſs may be reduced to the three following.

1. There ought always to be at leaſt a common ſound in the harmony of two ſucceſſive *fundamental* ſounds. 2. In every DOMINANT, the diſſonance ought to be ſo managed, that the dominant may not become TONIC. 3. Every dominant ought to deſcend from the fifth, and every SUB-*dominant* ought to aſcend from the fifth.

But beſides it may be obſerved, that the *fundamental* baſs is ſometimes irregular; and in the number of its irregularities we may reckon the concords of the ſeventh diminiſhed, and the broken cadences. The thorough-baſs is only the *fundamental* baſs reverſed for the ſake of melody; ſo that when the *fundamental* baſs is compoſed, the thorough-baſs may be had by REVERSING the concords. E. gr. This *fundamental* baſs of one ſound, *ut ſol ut ſol ut ſol ut*, may give this more melodious thorough-baſs, *ut ſi ut rè mi fa mi*. The thorough-baſs muſt be made conformable to the *fundamental*, only when it approaches cadences, or is terminated there. The thorough-baſs admits alſo concords by SUPPOSITION. Every note in the thorough-baſs, which bears the concord of the falſe FIFTH, ought to riſe diatonically; and every note which bears the concord of the TRITONE, ought to deſcend diatonically. The knowlege of the *fundamental* baſs, or the rule for finding the *fundamental* baſs of a given tune, depends much upon that of the MODE or MODULATION. Encyclopedie, art. *Fondamentale* BASSE.

FUNDAMENTAL *concords* are of three kinds; viz. the perfect concord, the concord of the ſixth, and the concord of the ſeventh. The firſt or perfect concord, is greater or leſs, according as the THIRD is greater or leſs. The ſecond is of three ſorts: in the two firſt ſorts, the SIXTH is always greater, and the third greater or leſs, as the mode is greater or leſs. Theſe two concords differ only by their third. Between theſe two there is another concord, which on many occaſions produces a very good effect, and is particularly uſed by the Italians; whence it is called the concord of the ſuperfluous ſixth, or of the Italian ſixth. It is compoſed of a greater third, or ſuperfluous fourth, or TRITONE, and a greater third, as *fa la ſi rè* ♯. There are ſeveral kinds of the *fundamental* SEVENTH: the firſt is formed of a greater third, and two leſſer thirds, as *ſol ſi rè fa*; the ſecond is formed of a leſſer third, a greater third, and a leſſer third, as *rè fa la ut*; the third is formed of two leſſer thirds, and a greater third, as *ſi rè fa la*; the fourth is formed of one greater third, one leſſer, and one greater, as *ut mi ſol ſi*; the fifth is called the concord of the diminiſhed ſeventh, and formed of three leſſer thirds, *ſol* ♯ *ſi rè fa*. Encyclopedie, art. *Accords* FONDAMENTAUX.

FUNDAMENTO, in the *Italian Muſic*, is in general every part that plays or ſings the baſs; but the thorough-baſs is more particularly ſo called, becauſe it is the baſis or foundation of all harmony.

FUNDUCLÆ, an Ægyptian coin, a ſort of ſequin, of the value of a hundred and forty-ſix medines. Pococke's Egypt, p. 175.

FUNDULUS, in *Zoology*, a name uſed by many for the ſmall fiſh, called by others COBITIS, and by the generality of people in England, the LOACH.

FUNDULUS is uſed alſo by Schoneveldt, and ſome others, to expreſs the common gudgeon. The confuſion of calling two fiſh by the ſame name, which is peculiarly appropriated to neither, is very evident in this and numerous other inſtances; but it is always to be avoided by uſing expreſſive and genuine names. Thus even the word gobio, the common name of the gudgeon, confounds

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founds that fiſh with another very different genus; and Artedi is greatly to be applauded, who has found that our common gudgeon is no peculiar genus of fiſh at all, but is a ſpecies of the cyprinus. As ſuch he has given it the proper ſpecific name of the five inch ſpotted cyprinus, with the lower jaw ſhorter than the upper, and with two cirri or beards at the mouth; under this name the ſpecies is always to be known at ſight, and can never be confounded with any other genus.

FUNERAL, the ceremonies performed at an interment; or the laſt offices paid to the deceaſed. See BURIAL.

The word is formed of the Latin *funus*; and that of *funalia*, on account of the torches (which were *funes, cera circumdati)* uſed in the *funerals* of the Romans; though others derive *funus* from the Greek φονος, *death*, or *ſlaughter*.

The firſt perſons who ſeem to have paid any particular reſpect to their dead were the Egyptians, who erected monuments for tranſmitting the remembrance of their virtues to future ages. See PYRAMID.

Whenever a perſon died among the Egyptians, his parents and friends put on mournful habits, and abſtained from all banquets and entertainments. This MOURNING laſted from forty to ſeventy days, during which time they embalmed the body. See EMBALMING.

When this ceremony was finiſhed, the embalmed body was reſtored to the parents, who placed it in a kind of open cheſt, which was preſerved either in their houſes, or in the ſepulchres of their anceſtors. Before the dead were allowed to be depoſited in the tomb, they underwent a ſolemn judgment, which extended even to their kings; and if the iſſue of the judgment proved unfavourable, they were deprived of the rites of burial; and this cuſtom ſeems to have been practiſed among the Iſraelites; for we read, that their wicked kings were not interred in the ſepulchres of their anceſtors.

The *funeral* rites among the ancient Romans were very numerous. The deceaſed was kept ſeven days; and every day waſhed with hot water, and ſometimes with oil, that, in caſe he were only in a ſlumber, he might be thus waked; and every now and then his friends meeting, made a horrible outcry or ſhout, with the ſame view; which laſt action they called *conclamatio*.

The third conclamation was on the ſeventh day; when, if no ſigns of life appeared, the defunct was dreſſed and embalmed by the pollinctores; placed in a bed near the door, with his face and heels towards the ſtreet; and the outſide of the gate, if the deceaſed were of condition, was garniſhed with cypreſs boughs.

In the courſe of theſe ſeven days, an altar was raiſed near his bed-ſide, called *acerra*; on which his friends every day offered incenſe; and the libitinarii provided things for the *funeral*.

On the ſeventh day a crier was ſent about the city, to invite the people to the ſolemnization of the *funeral* in theſe words: *Exequias* L. Tit. L. *filii, quibus eſt commodum ire, jam tempus eſt. Ollus* (i. e. ille) *ex ædibus effertur*.

The people being aſſembled, the laſt conclamation ended, and the bed was covered with purple; a trumpeter marched forth, followed by old women, called *præficæ*, ſinging ſongs in praiſe of the deceaſed; and laſtly, the bed followed, borne by the next relations. And if the perſon were of quality and office, the waxen images of all his predeceſſors were carried before him on poles.

The bed was followed by his children, kindred, &c. *atrati*, or in mourning: from which act of following the corpſe, theſe *funeral* rites were called *exequiæ*.

The body thus brought to the roſtra, the next of kin *laudabat defunctum pro roſtris*, made a *funeral* oration in his praiſe, and that of his anceſtors.

This done, the body was carried to the *pyra*, or *funeral* pile, and there burnt: his friends firſt cutting off a finger, to be buried with a ſecond ſolemnity.

The body conſumed, the aſhes were gathered; and the prieſt ſprinkling the company thrice with clean water, the eldeſt of the *præficæ* crying aloud, *ilicet*, diſmiſſed the people, who took their leave of the deceaſed in this form, *Vale, vale, vale: nos te ordine quo natura permiſerit, ſequemur*.

The aſhes, incloſed in an urn, were laid in the ſepulchre, or tomb. The firſt Romans did not burn their dead, but interred them, as we do. Pliny, lib. vii. cap. 54. aſſures us, that the cuſtom of burning was not introduced till after they had learnt that their enemies dug up, and expoſed, the bodies of their ſoldiers buried in remote countries. And yet Plutarch, in his Life of Numa, obſerves, that Numa was buried; as having expreſly forbid them by his teſtament to burn him: this ſhews that the Romans had practiſed burning before his time.

This cuſtom of burning the dead, ſo religiouſly obſerved by the Greeks and Romans, was held in abhorrence by ſeveral other nations. Herodotus relates, that the Perſians deteſted it, as holding fire to be a god. The Egyptians declined to burn their dead, as taking fire for an inanimate beaſt, and judging it impiety to commit the bodies of the deceaſed to be devoured by beaſts. The cuſtom of burning among the Romans ceaſed under the empire of the Antonines. See BURNING and MOURNING.

In the Romiſh church, when a perſon is dead, they waſh the body, and put a crucifix in its hand. At its feet ſtands a veſſel of holy water, that they who come in may ſprinkle both themſelves and the deceaſed. In the mean time ſome prieſt ſtands by the corpſe, and prays for the deceaſed till it is laid in the earth. In the *funeral* proceſſion the exorciſt walks firſt, carrying the holy water; next the croſs-bearer, afterwards the reſt of the clergy, and laſt of all the officiating prieſt. They ſing the *miſerere*, and ſome of the Pſalms; and at the end of each Pſalm, a *requiem*. We learn from Alet's ritual, that the faces of deceaſed laymen muſt be turned towards the altar, when they are placed in the church; and thoſe of the clergy towards the people. The corpſe is placed in the church, ſurrounded with lighted tapers; after the office for the dead, maſs is ſaid; then the officiating prieſt ſprinkles the corpſe thrice with holy water, and as often throws incenſe on it. The body being laid in the grave, the friends and relations ſprinkle the grave with holy water.

FUNERAL *charges* are not allowable againſt a creditor, except for the coffin, ringing the bell, parſon, clerk, and bearer's fees; but not for the pall and ornaments. See DEBT.

FUNERAL *column*. See *Funeral* COLUMN.

FUNERAL *games, ludi funebres*, were a part of the ceremony of the ancient *funerals*.

They conſiſted chiefly in proceſſions, and ſometimes in mortal combats of gladiators around the *funeral* pile.

The cuſtom was very ancient; though it had not always been the ſame. At firſt, they cut the throats of a number of captives before the pyra, as victims to appeaſe the manes of the deceaſed. This Achilles does in Homer, Iliad φ, at the *funeral* of Patroclus; and Æneas, in Virgil, lib. ix. at that of Pallas, ſon of Evander. Cæſar, in his Commentaries, lib. viii. relates, that the Gauls alſo did the like.

But at length it appeared barbarous, thus to butcher men; and therefore to ſave the horror of the ſpectacle, yet without the dead's loſing any thing thereby, they made the poor captives fight and kill one another, only ſaving ſome few of ſuch as came off victors.

This cuſtom was borrowed from the Greeks by the Romans; among whom the cruel diverſion was called *munus*.

The firſt who introduced it at Rome was Junius Brutus, at the obſequies of his father; or, according to others, Ap. Claudius, and M. Fulvius, during their conſulate.

The like horrible combats were alſo occaſionally exhibited by the magiſtrates; and ſometimes they were added to the theatrical pieces.

The emperor Claudius decreed, that whereas theſe accurſed games were till then frequent and arbitrary; it ſhould be the practice for the future, only to perform them regularly every year at the expence of the ſtate; and that the ædiles ſhould have the care and direction thereof. But he conceived a horror for them himſelf, and ſoon after aboliſhed them; though it was ſtill allowed particular perſons to have them, provided they were worth forty thouſand ſeſterces per annum. They were not finally aboliſhed before the time of Theodoric king of the Goths, at the end of the fifth century.

FUNERAL *honours*. See HONOURS.

FUNERAL *oration*, or *ſermon*, a diſcourſe pronounced in praiſe of a perſon deceaſed, at the ceremony of his *funeral*.

The cuſtom of making *funeral* orations is very ancient. The Romans had it of a long ſtanding; and it was always one of the neareſt relations that made the harangue. Auguſtus did the office to his grandmother Julia, when only twelve years of age. Suet. Aug. cap. 8. And we have divers parallel inſtances.

The cuſtom ſeems to have begun with the republic; at leaſt, the firſt *funeral* oration we read of, was that of Brutus, who expelled the kings, and was the firſt conſul; who, having been killed in a battle againſt the Hetrurians, *laudabatur pro roſtris*, was praiſed in the forum by Valerius Publicola his colleague.

Indeed, ſome authors will have the practice more ancient. They maintain it to have been in uſe among the Greeks; and that Solon, who, according to Aulus Gellius, gave laws to the Athenians, in the time when the elder Tarquin reigned in Rome, was the firſt author thereof; ſomething like which, it ſeems, the orator Anaximenes has left in writing. See Polydore Virgil De Invent. Rer. lib. iii. cap. 10.

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FUNGIFER *lapis*, the *muſhroom-bearing ſtone*, a name given by authors to a coarſe ſtone found in Italy, and many other places lying near the ſurface of the earth, which they ſay will at any time produce *muſhrooms*, on being moiſtened with warm water.

FUNGITÆ, in *Natural Hiſtory*, a name given by authors to a ſpecies of ſea-coral, often found adhering to ſea-ſhells, or to the larger corals in its recent ſtate, and very often found alſo foſſile, or buried at great depths in the earth; they are uſually immerged in ſtone, and ſometimes in clay. The more frequent of theſe are of a conic ſhape; ſometimes they are flatted and diſcoide, and uſually ſtriated longitudinally; they ſometimes are found in their foſſil ſtate adhering to ſhells or corals, but more uſually ſeparate. To this and ſome other bodies of this kind, Mr. Lloyd has given the name *columella*; to one of them that of *branchiale*, from its reſembling the gills of a fiſh; and to another, that of *undulago*, from its undulated figure.

FUNGOIDES, *baſtard-muſhroom*, in *Botany*, the name of a genus of plants, the characters of which are the ſame with thoſe of the fungus, from which it differs only in being of a hollowed form, reſembling a cup, or empty open box. See CLAVARIA, ELVELA, and PEZIZA.

FUNGOUS *fleſh*, is a ſpongeous excreſcence, or (as we popularly call it) *proud fleſh*, frequently growing on the lips of wounds, ulcers, &c.

The *ſarcocele* is the effect of a ſort of *fungous* fleſh.

In ulcers, Wiſeman obſerves, there frequently ariſes a ſpongeous, or *fungous* fleſh, either from the too great afflux of humours, or through the ſurgeon's unſkilfulneſs. It muſt be ſuppreſſed, or taken off by drying medicines, or even by cauſtics; as lapis tutiæ, burnt alum, precipitate of mercury, Roman vitriol, &c.

FUNGOUS *tumors*. See TUMOR.

FUNGUS, in *Natural Hiſtory*. See MUSHROOM.

FUNGUS, in *Surgery*, a fleſhy TUMOR, or excreſcence, very ſpongeous, ſoft, and pale; ariſing on the membranes, tendons, and other nervous parts, in conſequence of ulcers, wounds, contuſions, and ſtrains.

Funguſes are frequently formed on the meninges, or membranes of the brain, in wounds of the head when not well covered, or defended from the external air: they are alſo frequent about the joints; which laſt grow very inſenſibly.

But where the ſkin is open, finding more room, they grow to a prodigious degree in a very little time, aſſuming the form of a muſhroom, or *fungus*.

There are alſo *funguſes* of the anus, and uterus. They are all ſuppoſed to proceed from a retention and depravation of the nutritious juice.

The *fungus* is a general kind of excreſcence, whereof there are divers particular ſpecies: as the *ficus*, the *ſarcoma*, *condyloma*, &c.

FUNGUS *of the brain*. Mr. Queſney aſſures us, that ſpirits are not ſo proper for preventing the growth of *funguſes* from the brain, as balſam florivanti, or oleum terrebinth. Mem. de l'Acad. de Chirurg. tom. i.

FUNGUS, in *Mineralogy*, a name given by Dr. Liſter, to a blackiſh bituminous ſubſtance, found in ſome of the mines of Derbyſhire. It adheres to the ſides of the fiſſures of rocks, and lies in ſeams of the ſtrata. It is of a blackiſh colour and fatty ſubſtance, which never dries in the air, but always remains as moiſt as when taken out of the mine. Some maſſes of it are ſoft and like a jelly, others are hard and firm, and in theſe there are ſeveral lumps of pure bitumen in many parts. This is inflammable like reſin. It is light, but breaks finer, and ſhines like good aloes when freſh broken, but that it is a little darker coloured, and has ſome tinge of purple in it. In ſome pieces the purple is wanting, and there is a green in the place of it. On being diſtilled, it yields firſt a limpid and inſipid water, then a whitiſh water of a ſharp taſte, and finally a yellow and clear oil, much reſembling oil of amber, but the proceſs affords no volatile ſalt in the neck of the receiver, in which it differs from AMBER when treated in the ſame manner. Phil. Tranſ. N° 6.

FUNGUS *oculi*, a name given by ſome of the writers on the diſeaſes of horſes to a diſtemper of the eye, to which that animal alone is ſubject. The firſt author who has communicated an obſervation of this diſorder to the world is Dr. Lower, in the Philoſophical Tranſactions. He obſerves, that horſes alone are ſubject to it, and calls it a ſpungy excreſcence of the uvea; it is commonly of a dark muſk-colour, and grows out of the edge of the uvea, and though of little conſequence in its firſt ſtages, yet if it grows very large, or if the number of the *funguſes* increaſe, it weakens and obſtructs the creature's ſight, and ſometimes wholly takes it away. The uvea is a muſcular part, and its chief uſe is to dilate or contract itſelf in a proper manner for the admiſſion of objects with as much light as the eye can bear, ſo that the brighter the light is, to which the eye is expoſed, the more this membrane is contracted into a narrow compaſs, and the more dark the place is, the more the opening is dilated. This ſudden change, and the office of this part, may be more conveniently ſeen in the eye of a cat, than in that of any other animal, but it is the ſame in all, in a greater or leſs degree. If the edge of this coat be loaded with a very large excreſcence of this kind, or if ſeveral, though ſmaller, grow all round it, it muſt neceſſarily happen, that the pupil, or ſight, is very much if not totally obſtructed, and the animal ſees very little, or not at all. The horſes of this kind are very ill furniſhed for ſeeing in the ſunſhine, but do very well in dark days, or in the duſk of the morning or evening, when the diſeaſe is not too violent. It is obſervable, that when theſe *funguſes* grow in the eyes of young horſes, they become much ſmaller, when they are taken to dry meat in the ſtable, and increaſes again when they are turned out to graſs. Whether this be owing to the difference of dry and moiſt food, is not eaſy to determine, but it is moſt probably owing to the difference of paſture; the horſe at graſs, being obliged to carry its head much lower than thoſe which feed in the ſtable. Thoſe *funguſes* that are fixed on the upper part of the uvea, are apt to grow the largeſt, and to hinder the ſight moſt; and thoſe which grow in the middle of the uvea, hinder the ſight more by diſtracting the object, than thoſe which grow in either corner or angle of it. The cure is not eaſy; all that can be attempted muſt be by dry diet, and attenuating medicines; and a palliative remedy may be the hanging ſomething over to ſhade the eye, and keeping it from being expoſed nakedly to the ſun, the conſequence of which will be, that the pupil will not be ſo cloſely contracted, and conſequently the light not ſo much obſtructed. Phil. Tranſ. N° 32.

FUNICULUS *umbilicalis*. See UMBILICALIS.

FUNNEL *of a chimney*, the ſhaft, or ſmalleſt part, of the chimney, from the waiſt upwards.

Palladio orders, that the *funnel* be raiſed three, four, or five, feet at leaſt, above the roof, that it may carry the ſmoke clear from the houſe into the air.

Care, too, is to be taken, as to the width; becauſe, if it be too wide, the wind will drive back the ſmoke into the room; and if too narrow, the ſmoke will not be able to make its way. Chamber-chimneys, therefore, are not to be made narrower than ten or eleven inches; nor broader than fifteen. See CHIMNEY.

FUNNEL *faſhioned flowers*. See *Infundibuliform* FLOWERS.

FUNNEL *Polype*. See POLYPE.

FUR, in *Commerce* &c. See FURR.

FURBISHER, a perſon who furbiſhes, or poliſhes arms, and gives them a brightneſs and luſtre.

In the general ſenſe of the word, it includes what we now call *armourers* and *ſword cutlers*; in a more reſtrained ſenſe, it is appropriated to thoſe who clean, and ſcour up old ſwords, guns, and halberds, and put them in order.

Among the officers of the Tower, there is a *furbiſher* of ſmall arms, another of ſwords; and the like there is in moſt other armories of England; as at St. James's, Windſor, Cheſter, Plymouth, Hull, and Berwick.

FURBISHING, the act of cleaning, ſcouring, and poliſhing, arms; as guns, piſtols, ſwords, &c.

The word is formed of the French *fourbiſſure*, which Hicks derives from *furben*, which in the language of the ancient Franks ſignified to clean and poliſh: though M. Huet chooſes rather to derive the French *fourbir*, and *fourbiſſure*, from the Engliſh *furbiſh* and *furbiſhing*. Skinner obſerves, that ſome authors derive the Engliſh *furbiſh* from the Latin *furvus*, and *fervor*; but for his part, he rather derives it from the German *farb*, colour; and *farben*, to dye, or give a colour.

Furbiſhing is principally performed with emery.

FURCA, FORK, in *Antiquity*, a kind of puniſhment, or rather an inſtrument of puniſhment, among the Romans.

The form of the Roman *furca* is very obſcurely deſcribed by the ancients, and much controverted by the moderns. All we know for certain is, that it was of wood, and reſembled a fork; whence it is called, in writers, ξυλον διπλουν δικρων διδυμον, that is, *lignum duplex*, *bicornutum*, *geminum*; a double forked, or horned, timber. Plutarch, treating of the *furca*, ſays, it is originally the piece of timber wherewith the beam of the waggon is upheld; he adds, that it is the ſame with what the Greeks call *apoſtates*, and *ſterigma*; and the *ſterigma* is deſcribed, by Heſychius, as the forked piece of timber put under the yoke of the waggon.

From theſe accounts, Godwyn takes the *furca* to have been the beam of a waggon, to which the yokes are faſtened.

The puniſhment of the *furca* was of three kinds; the firſt, only *ignominious*, was when a maſter forced his ſervant, for ſmall offences, to carry a *furca*, or fork, on his ſhoulders,

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ders, about the city; confeſſing his fault, and warning others to beware of the like: whence ſuch ſervant come to be denominated *furcifer*.

The ſecond kind was *penal*; when the party, having the *furca* on his neck, was led about the circus, or other place, and whipped all the way.

The third was *capital*; the malefactor having his head faſtened to the *furca*, and ſo being whipped to death.

In after-times of the empire, when this ſort of puniſhment became interdicted, the form of the *furca* was changed, and made like our GIBBETS, or gallows. See CROSS, &c.

FURCA *& flagellum*, in our old writers, denotes the meaneſt of all ſervile tenures, when the bondman was at the diſpoſal of his lord for life and limb. *Ipſe tenet in villenagio ad* furcam & flagellum *de domino ſuo, &c.*

FURCA, *and foſſa*, in our ancient cuſtoms, i. e. gallows and pit, denoted a right, or juriſdiction, of puniſhing felons; viz. men with hanging, women with drowning.

FURCHE, in *Heraldry*, a croſs forked at the ends. See CROSS.

FURCULA, in *Anatomy*, the ſame with CLAVICULA.

FURFUR literally ſignifies BRAN; and is therefore uſed for the ſcales, ſcurf, or dandriff, which grow upon the ſkin; having ſome likeneſs thereto. See CUTICULA.

FURFURATION, the falling off of *furfures*, in combing, &c.

FURIA, in the *Italian Muſic*, is uſed for a very quick and ſtrong manner of ſinging or playing.

FURIAN *Law*, in *Roman Antiquity*, a teſtamentary law, ſo called from C. Furius, the tribune, by whoſe intereſt it was enacted. This law forbad any Roman citizen to leave by legacy above the value of one thouſand aſſes to any one perſon, and at the ſame time condemned the legatee to pay four times the ſum which was given him above what the law ſtipulated. See VOCONIAN *Law*.

FURIES, *Eumenides, Diræ*, in the *Heathen Theology*, and *Poetry*, were infernal deities, ſuppoſed to be the diſpenſers of the divine vengeance, the puniſhers of wicked actions both here and hereafter, and the inflictors of terrors, wars, and peſtilence.

The *Furies* were reputed the miniſters of Pluto, and the avengers of crimes. Strabo paints them clothed in long robes falling to their heels, but girt about the breaſt. They were three in number; TISIPHONE, MEGÆRA, and ALECTO.

The poets ſpeak of great numbers of *Furies*, ſome of whom were employed in tormenting criminals in Tartarus, and others wandering over the earth to tempt, or to puniſh the wicked here. Thus Virgil ſpeaks of the

—*agmina ſæva ſororum.* Æn. vi. ver. 571.

But the three, above named, were ſuppoſed to exceed all the reſt in cruelty and malice, and the power of doing miſchief, and are called, by way of eminence, *the Furies*, and ſometimes the *Diræ*, a name peculiar to theſe three. They were three ſiſters, and born at one birth of the goddeſs of night.

Patin, Spanheim, &c. will have it to be them which we ſee on a medal of the emperor Philip, ſtruck at Antioch, on whoſe reverſe are repreſented three women dreſſed as above mentioned, and armed with a key, and burning torches, poniards, and ſerpents.

Struvius, Antiq. Rom. Synt. cap. i. p. 182. adds, that the three *Furies* may probably be no other than the triple Hecate, whom the ancients believed to purſue and torment the wicked in hell, on earth, and in heaven.

Some of the poets add a fourth *Fury* called *Lyſſa*; a Greek word, ſignifying madneſs, or rage.

They repreſent the *Furies* as old, ſqualid, and meagre, with pale cheeks having a kind of feveriſh fluſh on them, with eyes inflamed, their heads twiſted round with ſnakes, and furniſhed with whips and burning torches in their hands, to puniſh the guilty.

The daffodil was ſacred to the *Furies*, and ſuch as offered ſacrifices to them were crowned therewith. This we learn from Euſtathius, on the firſt book of the Iliad, p. 87.

Theſe *Furies* were alſo called *Pænæ*, Ποιναὶ, on account of the puniſhments they inflicted on criminals; as their denomination *Furies* aroſe from the rage and madneſs which they threw into the conſcience. Voſſ. De Idolol. lib. viii. cap. 18.

The Greeks called them *Eumenides*; the origin of which name is much controverted among the learned. The etymology that ſeems beſt authorized, derives it from εὐμενὴς, *gentle, mild*; which was applied to them on occaſion of Oreſtes's being abſolved of the murder committed by him on the perſon of his mother. Minerva, it ſeems, appeaſed and pacified the *Furies*, ſo that they ceaſed to purſue him; upon which the Athenians ever after denominated them *Eumenides*.

But it muſt be obſerved, that, in truth, the Athenians called them by the ſame name long before Oreſtes's time, as appears from the Œdipus of Sophocles. There was a temple in Athens, near the Areopagus, conſecrated to the *Eumenides*, whom the Athenians called *venerable goddeſſes*: Ariſtides, and the ſcholiaſt of Thucydides, ſpeak of this temple as erected in memory of the judgment of Oreſtes.

FURIGELDUM, in *our old Writers*, a mulct paid for theft.

FURINALIA, in *Mythology*, feaſts inſtituted in honour of *Furina*, the goddeſs of robbers among the Romans. They were celebrated on the ſixth day before the calends of September. The goddeſs *Furina* had a Temple at Rome, and a prieſt called *flamen Furinalis*. Cicero repreſents this goddeſs as the ſame with the Furies; and Turnebus, in his Adverſaria, defends this opinion, alledging that Plutarch, in ſpeaking of the wood, conſecrated to *Furina*, where the younger Gracchus was killed, calls it the wood of the Erynnies, or of the FURIES.

FURLING *lines* are ſmall lines made faſt to the top-ſails, top-gallant-ſails, and the mizzen-yard-arms; ſerving to *furl* up thoſe ſails, i. e. to wrap and bind them up cloſe to the yard. The mizzen has but one *furling* line, but all the reſt have two, one at each end. Thoſe that are uſed for the larger ſails are generally flat, and are known by the name of gaſkets.

FURLONG, an Engliſh long meaſure, containing the eighth part of a mile.

The Engliſh *furlong* is equal to forty poles or perches, and the perch to 16½ feet. Though in an old law-book, printed in Henry the VIIIth's time, we read, that ſix hundred feet, of five ſcore to the hundred, make a *furlong*.

In Scotland the *furlong* is equal to forty FALLS.

Hercules is ſaid to have run a ſtadium, or *furlong*, at one breath.

FURLONG is alſo uſed for the eighth part of an acre, or half a rood.

FURLONG is ſometimes alſo uſed for a piece of land of more or leſs acres.

Omnibus Chriſti fidel. Johannes Blunt de Eye, arm.—Dedit Thomæ Croft & Franciſco Lovel, arm. unum furlongum *terræ arabilis continen. per æſtimationem quatuor acras, &c. Dat.* 20 *Jan.* 3 *Eliz.*

FURLOUGH, in *Military Language*, a licence granted by an officer to a ſoldier to be abſent for ſome time from his duty. See DESERTERS.

FURNACE, an utenſil, or veſſel, proper to contain fire, or to raiſe and maintain a vehement fire in, whether of coal or wood.

There are divers kinds of *furnaces*, of various forms, and for various uſes.

The domeſtic *furnace*, uſed in making confections, &c. is uſually of iron, or earth.

Thoſe uſed by the goldſmiths, refiners, &c. are much larger, and of a different ſtructure.

Thoſe wherein lime, bricks, &c. are burnt, are called *kilns*.

FURNACE is particularly uſed for a kind of oven, wherein the ores of metals, after beating, waſhing, &c. are melted down by a great coal or wood fire.

The ſtructure or application of theſe *furnaces* are ſomewhat different, for the different metals.

Swedenborg has laid down, from his own experience, certain rules for the general conſtruction of theſe *metallurgic furnaces*, by which they will always be made more advantageous to the proprietor, cæteris paribus, than any other kind. Theſe rules are, that the chimney be always placed as nearly as may be, behind the center of the *furnace*; that the ſmaller the depth of the fire-place, provided it be ſufficient to hold the coals, the better; that all *furnaces* muſt be the better, the wider they are forwards, and the higher they are, ſo as not to loſe the benefit of reverberation.

FURNACE is more ſtrictly applied to thoſe uſed in the melting of iron, which authors frequently confound with iron forges, though there is a conſiderable difference between them.

This *furnace* is a brick ſtructure, much in the ſhape of an egg ſet on end, wherein the iron ore, after it has been burnt in a kiln, is put, intermixed with cinders and charcoal, and the whole melted, till it trickle down in a receiver underneath; where the ſcum and droſs being taken away, the metal is thrown into furrows made in a bed of ſand, and thus is caſt into ſows or pigs of iron.

The forge is a place where the pigs are heated, and fuſed a ſecond, and even a third time, to prepare and fit them farther for uſe. See FORGE and IRON.

Theſe *furnaces*, as they are employed in running the moſt difficult of fuſion of all metals, ſo they are of all others contrived the largeſt, and capable of carrying heat to the greateſt degree. When they are to be uſed, they are

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firſt filled up to the top with coals; and the lower part being lighted, the top, and all other parts of the *furnace*, where the air could have paſſage, are cloſed firmly up with iron plates laid one over another. The conſequence of this is, that the fire is put out, and the whole is kept in this ſtate ten or twelve days. At the end of this time the *furnace* is opened, and the coals are found all black, without a ſingle ſpark of fire in any part, yet extremely hot, and reduced to a tenth part of their quantity. When the *furnace* has been thus opened about a quarter of an hour, the matter begins to take fire of itſelf by the mere contact of the air. The firſt appearance of this is very remarkable; there ariſes a very bright flame from ſome of the coals, which plays about their ſurface, and ſpreads itſelf from one to another, without the appearanee of the leaſt ſpark of fire in any part of any of the coals. The ore of the iron is for the firſt day put only in the middle of the *furnace*, and that but in ſmall quantity; the next day more, and every day afterwards more and more is put on, and by degrees it is ſpread over the whole ſurface of the *furnace* to the edges. This is the method of working the ore to the utmoſt advantage, and with the moſt diſpatch. The whole proceſs for one *furnace* of ore is finiſhed in about eight days from the time of the opening the top; all the uſe of the firſt quantity of coal, is only thoroughly to warm the ſides and walls of the *furnace*; and it is after this to be kept carefully ſupplied with fuel, and the ore only ſpread out towards the ſides as the extreme heat, moſt ſenſible in the center, increaſes. If too much be laid on of the ore at firſt, there is always a loſs from the quantity of metal. The quantity of the coals neceſſary to any given quantity of ore, differs in proportion to the advantageous or faulty ſtructure of the *furnace*. In the very beſt conſtructed ones, the weight of the coals and of the ore need be no more than equal. The flame which makes its way out of the bottom of the *furnace* is of different colours, according to the nature of the ore and of the coals; ſometimes red, ſometimes yellow, and ſometimes green. That which iſſues out from the top of the *furnace* is of a red colour, and aſcends in a ſort of ſpiral line, reſembling the ſound of diſtant falls of water as it mounts up. With all the care that can be taken to heat the ſides of the *furnace*, and to keep them hot, the middle is always much the hotteſt, and the ore ſooneſt runs into metal there. Swedenborg de Ferro & Igni.

FURNACE, in *Chemiſtry*, is a receptacle either of brick, iron, ſtone, or clay, wherein the fire, neceſſary for the ſeveral operations, is contained, determined, and directed.

The *furnace* conſiſts of ſeveral parts: as a place for the veſſel or body to be wrought on; a hearth, or hole for the aſhes; a chimney; a grate; a door; a dome; and a fan, or elſe regiſters, whereby to let in air, to increaſe or abate the fire.

The perfection of a *furnace* conſiſts in its maintaining a conſtant, equable fire; and this eaſily tempered, and at an eaſy expence.

To have the expence eaſy, the whole action of the fire, or fuel, muſt be employed on the ſubject that is to undergo the operation.

It muſt be equable, ſince different degrees of fire have different effects: ſo that if any given degree would anſwer any given intention, an alteration of that degree will prevent the intention from taking place. And on theſe circumſtances does all the variety of *furnaces* depend.

Furnaces are either *fixed* and immovable, called *athanors*; or *portable*, called *catholic*, i. e. univerſal, as being proper for all operations, where the body to be operated on is not too large.

The firſt ſpecies of athanor, or fixed *furnace*, is fitted to maintain an equal heat, and ſuch as ſhall laſt a long time without addition of freſh fuel.

The ſecond is the *furnace* of the *balneum Mariæ*, fit for the diſtillation of the more ſubtil ſpirits.

The third is the digeſting *furnace*. See DIGESTION.

The fourth is the anemius, or *wind furnace*, called alſo *melting furnace*, and *metallic furnace*; uſed in the fuſion of metals, minerals, and vitrifications.

It is called *wind furnace*, becauſe the air drives forcibly in, to blow up the coals.

For an account of the principal *furnaces* uſed in chemical and other operations, ſee the following articles.

FURNACE, *almond*, or *alman*. See ALMOND.

FURNACE, *aſſaying*, *cupelling*, or *eſſay*. See *Tab.* III. *Chemiſtry*, *fig.* 37. is made in the following manner: 1. Make with iron plates a hollow quadrangular priſm, eleven inches broad and nine inches high *a a*, *b b*, ending at top in a hollow quadrangular pyramid *b b*, *c c*, ſeven inches high, terminating in an aperture at top ſeven inches ſquare. This priſm muſt be cloſed at bottom with another iron plate, which ſerves as a baſis or bottom to it *a a*. 2. Near the bottom make a door *e*, three inches high, and five inches broad, that leads to the aſh-hole. 3 Above this door, and at the height of ſix inches from the baſis, make another door *f*, of the figure of a ſegment of a circle, four inches broad at its baſis, and three inches and a half high in the middle. 4. Then faſten three iron plates on the forepart of this *furnace*; let the firſt of them *g g*, eleven inches long and half an inch high, be faſtened, ſo that its lower edge ſhall reſt againſt the bottom of the *furnace*, with three or four rivets, and in ſuch a manner, that there may be between the upper edge of the ſaid plate and the ſide of the *furnace* a groove ſo wide, as that the ſliders of the lower door *k k* may be put into it, and freely move backwards and forwards therein: theſe muſt be made of a thicker iron-plate. The ſecond iron-plate *h h*, eleven inches long, three inches high, and perfectly parallel to the foregoing plate, muſt be faſtened in the ſpace between the two doors, in ſuch manner, that both the upper and the lower edge of it may form a hollow groove with the ſide of the *furnace*. One of theſe grooves, which is turned downwards, ſerves to receive the upper edges of the ſliders that ſhut the lower door N° 2. The other, that turns upwards, is to receive the inferior edges of the ſliders of the ſmall door above, N° 3. The third plate, *i i*, which is like the firſt, muſt be rivetted cloſe above the upper door, in ſuch manner, that it may form a groove turning downwards, and contiguous to the upper edge of the upper door, N° 3. 5. In order to ſhut up both doors, N° 2 and 3, you muſt adapt to each of them two ſliders made of iron plates, that may move within the above mentioned grooves *k k*, *l l*; but the two ſliders belonging to the upper door, N° 3. muſt have each a hole near the top; that is, one a ſmall hole one fifth part of an inch broad, and one inch and a half long *m*; and the other a ſemi-circular aperture, one inch high and two inches broad *n*. Let, beſides, each ſlider have a handle, that they may be laid hold of when they are to be moved. 6. Moreover, let five round holes, one inch broad, be bored in the *furnace*, two of which muſt be made in the fore-part of the *furnace o o*, two others in the back-part, all at the height of five inches from the bottom, but three inches and a half diſtant from each ſide of the furnace; and, finally, a fifth hole *p*, at the height of one inch above the upper edge of the upper door *f*. 7. In ſhort, let the inſide of the furnace be armed with iron-hooks, jetting out half an inch, and about three inches diſtant from each other, to faſten the lute with which the *furnace* is to be covered over within. 8. Let then an iron, moveable, hollow, quadrangular pyramid *q*, three inches high, be adapted to the upper aperture *d* of the *furnace*, at the baſis ſeven inches broad, ending upwards in a hollow tube *r*, three inches in diameter, two inches high, almoſt cylindrical, though ſomewhat convergent at top. This prominent tube ſerves to ſupport a funnel or flue, which is almoſt cylindrical, hollow, made of iron-plates, and two foot high, and which, when a very ſtrong fire is required, is put perpendicularly upon the ſhorter tube, in ſuch manner, that it enters cloſe into it, one inch and a half, or two inches deep, and may again be taken off at pleaſure, when there is no need of ſo ſtrong a fire. But this pyramidal cover *q* muſt beſides have two handles *s s*, adapted to it, that it may be laid hold of, and thus be taken away or put on again: and that this, being put on the aperture *d* of the *furnace*, may not be eaſily thrown down, let an iron plate be rivetted to the right and left upper edge of the furnace *c c*, and be turned down towards the inſide, ſo as to make a furrow open before and behind, into which the lateral edges of the cover may enter and be faſtened, and at pleaſure be moved backwards and forwards, whenever it muſt be put on, or moved. 9. Let a ſquare ledge, made of a thick iron-plate, be faſtened at the top of the upper edge of the lower door *e*; this is deſigned to ſupport the grate and the lute: but it muſt be made of two pieces, that it may be eaſily introduced into the cavity of the *furnace*. Thus you will have an aſſay-oven, which muſt afterwards be covered over on the inſide with LUTE. This you are to do as follows: That the fire may be better confined, and that the iron may not be deſtroyed by growing red-hot, the whole inſide of the *furnace* muſt be covered over with lute, one finger or one finger and a half thick. But, before you cover the inſide of your *furnace* with this lute, you muſt firſt put within the *furnace* ſmall iron bars, equal in length to the diameter of the oven, quadranglar, priſmatical, half an inch thick, having their extremities ſupported by a ſquare iron ledge, and three-fourths of an inch diſtant from each other; and you muſt faſten them ſo, that their flat ſides may be oblique with regard

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to the tranſverſe ſection of the *furnace*, and that the two oppoſite angles may look one upwards and the other downwards; the bars muſt not be laid flat, but edgeways, by which ſituation you hinder the aſhes of the fuel of the fire from being detained too long between the interſtices of the ſaid iron-bars, and from making an obſtruction that would oppoſe the free draught of the air. The *furnace* being then covered over with lute, and dried up by a gentle heat, is at laſt fit for docimaſtical operations, and eſpecially for ſuch as muſt be performed in the aſſay-oven.

If then an operation is to be made in the *furnace* hitherto deſcribed, you muſt let through the four lower holes above deſcribed, of the *furnace o o*, placed before and behind, and directly oppoſite to each other, two iron-bars one inch thick, and long enough that their extremities on every ſide may jut out of the holes a ſmall matter. Theſe ſerve to ſupport the MUFFLE and its bottom. You then introduce the muffle through the upper aperture of the *furnace d*, and place it upon the above deſcribed iron-bars, in ſuch manner, that the open foreſide of it be contiguous to the inward border of the upper door *f*. The fuel of the fire is introduced through the top of the furnace *d*; the cover of which, on this account, muſt be moveable, and not very heavy *q*. The beſt fuel for the fire is charcoal made of the hardeſt wood, eſpecially of beech, broken into ſmall pieces of the bigneſs of an inch, wherewith the muffle muſt be covered over ſome inches high. We then reject larger bits of coals, becauſe they cannot fall through the narrow interſtices, between the ſides of the muffle and thoſe of the *furnace*, and cannot of courſe ſufficiently ſurround the circumference of the muffle. Whence it happens, that there are on every ſide places void of fuel, and the fire is either not ſtrong enough or unequal. But if, on the contrary, you uſe coals too ſmall, then a great part fall immediately through the interſtices of the grate into the aſh-hole; and the tendereſt particles of them turn too ſoon into aſhes, and by increaſing the heap of aſhes, obſtruct the free draught of the air, which is here greatly requiſite.

A perfect management of the fire is moſt commonly neceſſary in the performing of operations in this *furnace*; therefore the reader muſt give attention to what follows: if the door of the aſh-hole *e* is quite open; and the ſliders of the upper door *f* drawn towards each other, ſo as to touch one another in the middle of the door; and if, beſides, the cover *q*, and the funnel adapted to its tube *r*, is upon the top *q* of the *furnace*, the fire will be then in the higheſt degree poſſible; though, in the mean time, it is hardly ever neceſſary to put the funnel on, except in a very cold ſeaſon: but if, after having diſpoſed the furnace in the manner juſt deſcribed, you put red burning coals into the open upper door *f* of it, the fire is ſtill more increaſed thereby: however, this artifice is never, or very ſeldom, neceſſary. When you ſhut the upper door with only that ſlider that has a narrow oblong hole in it *m*, then the heat becomes a little leſs; but it diminiſhes ſtill more when you ſhut the door with the other ſlider that has in it the ſemi-circular hole *n*, which is larger than that of the firſt ſlider: nay, the heat again is leſs when you take away the funnel put at the top of the cover: finally, the door of the aſh-hole being either in part or totally ſhut, the heat is ſtill diminiſhed, becauſe the draught of the air, ſo neceſſary to excite the fire, is thereby hindered: but if, beſides all theſe, you likewiſe open the upper door quite, then the cold air, ruſhing into the muffle, cools the bodies put under it, that are to be changed, to a degree never required in any operation, and ſuch as will entirely hinder the boiling of lead. If, during the operation, the fire begins to decay, or to grow unequal, it is a ſign that there are places void of coals between the ſides of the *furnace* and thoſe of the muffle; therefore, in this caſe, you muſt ſtir your coals on every ſide with an iron rod, which is to be introduced through the upper hole *p* of the *furnace*, that they may fall together, and thus act in a proper manner and equally. See Cramer's Art of Aſſaying, by Dr. Mortimer, p. 75. See *portable* FURNACES.

FURNACE, called *Athanor*, or *tower-furnace*, is repreſented in *fig.* 38. See ATHANOR. It is thus conſtructed. 1. Let a ſmall ſquare hollow tower *a a a a* be formed of ſuch ſtones, or of bricks made of Stourbridge clay, or Windſor loam, as may reſiſt the fire; let the ſides of it be ſix inches thick, and forming a ſquare cavity within, of ten inches on each ſide *b b b b*. The height of it is determined according as it is to keep up the fire long, without any addition of new fuel: five or ſix feet are moſt commonly ſufficient. 2. At the bottom of this tower make an opening *c*, ſix inches broad, and as many inches high; hang to it an iron door, being on every ſide one inch broader than the opening, and ſuch as may ſhut it very cloſe: for which purpoſe the external edge of this opening muſt be excavated all round in ſuch a manner, that it may form a groove one inch broad, into which the edges of the door may be received. 3. At the diſtance of ten inches from the bottom of the tower, put a grate *d*, made of priſmatical quadrangular iron bars, one inch thick, and three quarters of an inch diſtant from each other: let alſo each of theſe iron bars be ſo ſituated with regard to the tower, that the two oppoſite acute edges of each may look perpendicularly, one downward, the other upwards, that, by this means, the aſhes may eaſily fall into the aſh-hole. 4. Make above this grate an opening circular at top *e*, ſix inches high, ſeven inches broad, that may, as well as the aſh-hole, N° 2. be opened and ſhut with an iron door. 5. Adapt to the top of the tower an iron cover *f*, exceeding the aperture of the tower all around two inches, and having a handle, wherewith it may be eaſily taken away, and put on again. Thus you are to make the *furnace* called in Latin *furnus primarius*. 6. Then cut out in any ſide of the tower, for inſtance in the left, an oblong ſquare aperture, going up obliquely towards the outſide *g g*, four inches and a half high, ten inches broad, having its inward inferior edge one inch and a half, or two inches above the grate *d*; that by the intervening of this hole, the cavity of this tower may communicate with another immediately to be deſcribed. 7. Nearly over-againſt the ſame ſide of the tower, make a cavity with ſtones, whoſe inferior part muſt be a hollow priſm *h, h, h, h*, ſix inches high, twelve inches broad, ending at top in a ſemi-cylindrical arch *i, i*, deſcribed by a radius of ſix inches; that by this means, the height of the whole cavity may be twelve inches in the middle. Let this anterior cavity be totally open, though, when requiſite, it is to be ſhut very cloſe with an iron plate *k, k*, whoſe inward ſurface is to be conſtructed in the ſame manner as is preſcribed for the ſliding door of the melting-furnace, and then luted two inches thick within. Moreover, let there be in the middle of this plate, a round hole, four or five inches in diameter, and let the circumference of this hole have an iron cylindrical border made to it, and prominent within; that by means of it, the lining of lute within may be ſupported, and kept from falling down eaſily. Let a notch one inch broad, and two inches deep be made in the outward circuit of the aperture of this cavity, to receive the extremity of the plate that ſhuts the aperture. The hole of this plate either is ſhut with a ſtopple, or ſerves to paſs the neck of the retort through. This plate likewiſe is faſtened with two bolts *n, n*, to be put horizontally with iron hooks *o, o, o, o*, driven into the wall near the edge of the aperture, ſo that one bolt may faſten the upper part of the plate, and the other the lower. 8. It is moreover proper, that the ſquare aperture *g, g*, through which the fire enters from the tower into the cavity hitherto deſcribed, N° 7. may be ſhut and opened at pleaſure with an iron ſlider: for if this is not done, an exceſſive fire, employed ſometimes by an unexperienced hand, cannot be ſo eaſily checked. For this purpoſe, let a ſlit half an inch broad, and eleven inches long, be left in the wall that conſtitutes the upper part of the cavity N° 7. and is contiguous to the tower; ſo that it may exceed the length of the ſquare aperture *g, g*, a ſmall matter on every ſide, and reach before and behind into the ſmall groove, going down along the perpendicular ſides of the ſaid aperture, *g, g*, and retain the iron ſlider to be put into it to keep it ſteady. However, let this iron-ſlider be ſix lines thick, eleven inches broad, and five inches high; and let a couple of ſmall iron chains, *p, p*, be faſtened on each ſide of its upper edge, wherewith the ſlider may be lifted up and let down again. Therefore let a couple of ſtrong iron nails be drove into the contiguous wall of the tower, perpendicularly over thoſe places in which the ſaid ſmall chains are faſtened to the iron ſlider, that any of the links of the chains may be ſuſpended on them at pleaſure. Moreover, let the upper edge of the ſlit above deſcribed be entirely ſhut up with ſtones and cement, leaving only two ſmall holes through which the ſmall chains may be paſſed. On the left of this cavity (N° 7.) and at the diſtance of eight inches from the bottom of it, let a ſquare, *q, q q, q*, chimney or funnel be erected with bricks, three inches and a half in the clear, four foot high, and a ſmall matter convergent upwards, ſo that the diameter of it at top may be three inches. This funnel muſt be contrived to be ſhut cloſely with an iron ſlider, having a handle to it, *r, r*, which ſlider muſt move freely between a double iron ſquare frame faſtened in the walls of the funnel, at ſuch a height from the hearth as ſhall ſeem convenient to any artificer. 10. Below this chimney let a ſquare aperture be made, like the forego-

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ing (N° 6. *g*, *g*), leading obliquely up to the bottom of another cylindrical cavity, *u*, *u*, *u*, *u*, which is eight inches deep, described by a radius of six inches, open at top, and there converging inwardly into a border one inch thick, and six lines broad, designed to support an iron pot. Likewise, cut in the anterior wall of this cavity, and at the upper part of its mouth, a segment two inches and a half deep, five inches broad, and stooping forward, *v*, *v*, to receive the neck of the retort. 11. To this cavity (N° 10.) belongs an iron pot, *w*, *w*, eleven inches broad, and about nine inches deep, which must be encompassed with an iron ring, *x*, *x*, one inch broad, and fastened at the distance of one inch and a half from the upper end of the pot. Let a segment, *y*, be likewise cut off the upper edge of this pot, which segment must be four inches and a half deep, and five inches broad; the iron ring just described must be bent all round the edges of this segment. 12. Overagainst the aperture, *t*, *t*, which communicates from the first cavity (N° 7.) into the second (N° 10.) let another such aperture, *z*, be made, two inches distant from the bottom of the second cavity (N° 10.) perfectly like the foregoing, *g*, *g*, *t*, *t*, and communicating obliquely upwards with a third cavity, 1, 1, 1, 1, like and equal to the second cylindrical cavity, *u*, *u*, *u*, *u*, that the fire may pass from the latter into the former. 13. In the hinder part of the wall which makes the aperture just mentioned, *z*, let a chimney like the foregoing, *q*, *q*, *q*, *q*, and of the same height, 2, 2, 2, 2, be erected, which may be shut with a slider like that, 3. 14. Finally, on the left side of the third cavity let an aperture be made in the same manner, 4, and like the foregoing ones, *g g t t z*; more remote however from the bottom of the cavity, without a passage at the other extremity, and communicating only with the cavity of the third chimney, 5, 5, 5, which must be erected in the same manner as the two foregoing ones, *q*, *q*, *q*, *q*, 2, 2, 2, 2. Thus you will have a *furnace* very proper for a great many operations.

We are now to speak of the use of the athanor just described; and chiefly to mention to what operations each of its parts serve in particular, and then how the fire may and must be governed in it. 1. You must put at the upper arched door, *e*, of the tower a semi-cylindrical muffle twelve inches long, which must be introduced through the door; which for this reason must be of the same height and breadth as that door, three quarters of an inch thick, and open behind, being shut there by the hinder part of the athanor, as far as which it must reach. For this purpose, a tile must be set upon the grate, *d*, to support the muffle. Let also this muffle have small pieces cut out near its basis, as common assay muffles. You may put under this muffle your cement pots, or such bodies as must be calcined with a long and violent fire; which can be done without a muffle, though not so neatly. 2. In the first chamber, *h*, *h*, *h*, *h*, *i*, *i*, you may make the most violent distillations with an open fire; for retorts or large vessels are introduced into it, after you have taken away the door, *k*, *k*, *k*, and are put either upon the hearth itself of this chamber, or upon a particular support of stone. But you must place these vessels in such manner, that their necks may easily pass through the hole of the door, when put on again; for which purpose, they chuse a support sometimes higher, sometimes lower, according to the different heights of the vessels. When afterwards the door is put on again, and fastened with both its bolts, *n*, *n*, you must close with lute all the chinks which lie open about the neck of the vessel, and between the edges of the door and the entrance of the chamber. Then you apply to the neck of the vessel a cylindrical segment, ten or more inches long; by means of which the heat and the boiling vapours coming forth are gradually diminished; lest the recipient, which is always chosen a glass vessel, should split. The recipient, which must be united with the other orifice of the said segment, is supported either by the pavement, or by a certain kind of trivet, the construction of which is such, that it may be set higher or lower by means of three screws. 3. In this same chamber, instead of distillations, you may also make cementations, calcination, &c. in which case the round hole of the iron plate may be shut and again opened with a stopple, that one may view the inside. 4. The second and third cavities, *u*, *u*, *u*, *u*, 1, 1, 1, 1, serve chiefly to such operations as are made in baths (or beds) of *sand-ashes*, or *filings*. For instance, you put into each of these cavities a pot, *v*, *v*, and you stop with thin lute or with sand, which must previously be moistened, the slip between the iron ring, *x*, *x*, and the border of the cavity, upon which this ring rests. 5. Besides, you may also make in these two cavities, distillations by a reverberating fire, as well as in the first: only the fire is less violent in these, though sufficient to extract aqua fortis. You then take out the iron pot, *v*, *v*, and inverting it, you put it upon the mouth of the chamber; so that the brim of the pot, being the depth of one inch and a half above the iron ring *x*, *x*, wherewith this pot is surrounded, may be received within the mouth of the cavity, and so that the segment cut in the pot *y* may, together with the segment cut out from the side of the cavity *v*, *v*, form a hole to let the neck of the vessel through. 6. All the apparatus being thus ready, you first introduce through the top of the tower *b*, *b*, *b*, *b*, a few burning coals; and put upon them some of the unkindled fuel of the fire, that the cavity of the tower may, according as it is thought necessary, be filled either entirely or only in part. Then with all speed you put upon it the iron cover *f*, and strew the border of this on the outside with sand or ashes, which you press gently with your hands: for if you should neglect this point, all the fuel contained in the tower would be kindled, and may endanger setting the house on fire.

We shall here annex a few general rules concerning the regimen of the fire in this furnace: for it is hardly necessary to explain all particulars, since practice will easily hint them to such as shall be ever so little acquainted with chemistry. The fire may be made very strong in the first chamber *h*, *h*, *h*, *h*, *i*, *i*, when the door of the ash-hole *c*, and the funnel *q*, *q*, *q*, *q*, of the chamber is quite open, and when the iron slider, suspended with chains 6. *p*, *p*, does not hinder the fire from passing freely from the tower into this cavity. But the closer the funnel is shut, together with the door of the ash-hole, the more the violence of the heat diminishes: and this will be soon effected, if the iron slider suspended with chains is let down in part: for the fuel contained in the tower burns at least as high as the space between the lower edge of the iron slider and the grate *d*. Observe besides, in those operations wherein the round hole of the door is stopped with a plug, that when the strongest fire is required, this hole must not be kept long open; because the air rushing violently through it, soon cools the bodies put into the cavity. The operations above mentioned may be performed in the second and third chamber, in, and at the same time, and with the same fire, as they are in the first chamber; for the fire penetrates from the first cavity into the second, and increases when the funnel 2, 2, 2, 2, erected on it is opened: but before you do this, the funnel of the first cavity must be shut as much as that of the second is opened. By the same means, you may hinder the fire, which serves for the operations made in the two first cavities, from going out through the funnels, and you force it out, on the contrary, through the third cavity and through its funnel 5, 5, 5, that it may also act upon the bodies placed in that cavity. For the more the funnel erected upon the third cavity is open, the more one, or even both funnels of the other two cavities must be closed: thence it is plain, that you cannot kindle the strongest fire in the third cavity, unless there be one equally strong in the other two; and that, on the contrary, the heat in the third cavity may be rendered less, by closing its funnel; though it be violent in the others. The same is true of the second cavity, with regard to the first. Finally, you cannot make the strongest fire under the muffle placed within the upper door *e* of the tower, unless you have an equal fire in the first cavity, which fire may consequently be increased, by shutting the door quite against the muffle *e*, and diminished by opening it; there being mean while an equal heat in the first chamber, and in the following ones. Cramer, and Chem. Dict. Appendix. This sort of *furnace* is now much neglected, since the long and laborious operations of the ancient chemists, who were in search of the art of making gold, have been discontinued: it is also subject to an inconvenience, as the fuel in the tower is apt to stick there, or fall down at once in too great quantity.

FURNACE, *bellows*, or *blast*, is one of the two kinds of *furnaces* used in coinage for the fusion of metals. It consists of a flat hearth at bottom, into which the air may be admitted by a hole contrived therein.

On a level with the hearth is a second aperture, which gives passage to the pipe of the bellows, from which the *furnace* is denominated: about a foot over this is a moveable grate, which may be taken off, and put on, at pleasure: lastly, over this is the place where the crucible is set, which is square, and made of the same earth with the crucible, of breadth sufficient to bear a range of coals around the crucible. To melt a metal in this *furnace*, they lay a little plate of forged iron over the grate, and on this they set the crucible, which is likewise covered with an iron or earthen lid; then they fill the *furnace* with charcoal, and when it is well lighted, and the crucible sufficiently hot, they stop the vent-hole: lastly, throwing on fresh coals, they stop the *furnace* with an iron lid; thus continuing to work the bellows, and supply

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ply fresh fuel, till the metal be in fusion. These bellows should be double, like those used by the smiths, that the blast may be continual; though no heat can be produced by this means, to exceed that which may be obtained in a good *wind*-FURNACE. The principal use of bellows is to excite a great heat in a little time.

Dr. Lewis, in his ingenious contrivance of *portable* FURNACES, proposes to fit up a black leaden crucible or pot for a *blast furnace*, in which no other aperture is required than a round one in the side, through which the nose of the bellows passes; and the fuel is to be thrown in at the top. The pot chosen for this purpose should be of the largest size; and if a cover or dome, or an additional part for enlarging its capacity be wanted, another pot, with a portion of its lower narrow part sawed off, makes a very convenient one. A round plate or slip, sawed from the solid part of the bottom, serves very commodiously both for a grate and for a support to the crucible; eight or nine holes, about three quarters of an inch in diameter, are bored round the outer part of the plate, for the transmission of the air forced in by the bellows, which holes are made to widen downwards, to prevent their being choked up by pieces of the fuel. Four or five small crucibles may be placed together on the middle of this plate. See *fig.* 39. The bellows which Dr. Lewis chiefly employed is the organ bellows, so constructed, that the upper board, instead of rising obliquely on hinges at one side, rises equally on all sides, and continues always horizontal. The leather of this kind of bellows is more flexible than that of the common ones, and does not, like them, resist unequally according to the greater or less extension of the folds. The board is pressed down, and the air forced out by a weight on the top, which weight, acting always perpendicularly, has always an equal power, and the air is driven out in one unvaried current. This advantage may also be given to the common bellows by hanging the weight at the extremity, on an arc, furnished with a groove for receiving the cord, and whose center is the point on which the board moves: by this contrivance, the heat is kept up uniform, and may be easily increased at pleasure, by increasing the weights; and for this purpose, the nozzle of the bellows should be wider than usual, that the air may be more freely discharged from it. The bellows is of no incumbrance in the LABORATORY, being inclosed in a wooden case, whose cover does the office of a common table; to the nozzle, which just comes through the cross bar at the bottom of the table, is occasionally fitted a pipe reaching to the *furnace*. The bellows, thus disposed, will also serve for impelling and concentrating the flame of a lamp on bodies exposed to it. For this purpose, an upright tin tube is fitted on the nozzle by a short elbow at its lower end; and at its upper end is a moveable elbow, into which is inserted a lesser pipe, having a very small aperture in its extremity; this aperture, being applied to the flame of a lamp placed upon the table, and the pipe blown through, the flame lengthens in the direction of the blast, and converges into a small space, producing there a very great heat. The bellows above described may be made lighter and more commodious, by using a stiff rod, for moving the lower board, instead of the flexible cord or chain commonly employed. Some, instead of a bellows, have substituted an ÆOLIPILE, which is about half filled with water, and set on burning charcoal, with its neck directed to and at a small distance from the fire to be excited; as soon as the water begins to boil, an elastic vapour issues vehemently through the small orifice, and animates the fire like air impelled by bellows; whence this instrument has been called the Æolian bellows and philosophers bellows: some have employed the æolipile in the same manner as the common bellows, by inserting its neck into the cavity beneath the grate of a *furnace*; but Dr. Lewis condemns this method, and observes, that, in all cases, where the vapour does not pass through a portion of the atmosphere before its admission to the burning fuel, it extinguishes, instead of exciting, the fire.

In operations, which require a considerable degree of concentrated heat, it has been proposed to impel a number of flames into one point, by streams of air driven from different parts of the circumference of the fuel to the middle, by means of several bellows placed round the *furnace*. But a number of bellows being incommodious, Dr. Lewis has contrived to multiply the streams of air with one bellows. The pot, which serves as a *furnace* for this purpose, has a number of holes bored at small distances, in spiral lines all over it, from the bottom up to such height as the fuel is designed to reach to. The crucible is placed on a proper support, in the bottom; and the holes are obliquely directed towards the crucible, so that the impelled heat plays in a kind of spiral upon its surface: the pot, which serves for the blast *furnace*, already described, with an iron ring at the top, receives this perforated pot so far, that all its holes are within the cavity, which cavity has no other outlet than the round aperture for the bellows; and, therefore, the air, thus blown in, will distribute itself through the perforations of the inner pot. See *fig.* 40. C represents the *furnace*, D a transverse of it, and E is its cover, being an iron plate with a round hole in the middle, and a handle. By means of this contrivance, the crucible is expeditiously heated, and with a small quantity of fuel, to an intense degree; and yet the exterior parts of the fuel have no great heat, so that the operator may approach the apparatus without inconvenience. A close-bottomed pot, like that used for the blast *furnace* already described, without a grate, will make a *furnace* for the fusion of metals, the revival of metallic calces, and the smelting or assaying of ores, *trans carbones*, as it is called, or in contact with the burning fuel, as practised in the large works. The *furnace* being intensely heated, and almost filled with *fuel*, some of the subject-matter is sprinkled upon the coals, chiefly about the middle, and towards the side opposite to the bellows, but with care that it no where touch the side; more charcoal is thrown over it; and the fire, according to the nature of the subject, is kept up strong, or abated, by lessening the weight upon the bellows; and the alternate injection of the subject-matter and charcoal continued; the metal and slag, melting and dropping down through the coals, are collected in the bottom. Lewis's Com. Phil. Techn. p. 18, &c.

FURNACES *for making the finer kinds of colours*, are those for subliming CINNABAR for making VERMILION, for subliming *king*'s YELLOW, and for calcining blood for making *Prussian* BLUE, OKER, ULTRAMARINE, &c. For the method of their construction and use, the curious reader is referred to Dossie's Handmaid to the Arts, vol. i. p. 15, &c.

FURNACE, *enamelling*. See ENAMEL, and Handmaid to the Arts, vol. i. p. 267, &c.

FURNACE, *founders*, is of divers kinds, according to the different kinds of work to be cast. See FOUNDERY *of small works*, &c.

The statuaries, or figure-makers, use two kinds of *furnaces*; which see described under FOUNDERY *of statues*.

FURNACE, *glass-house*, is the place wherein the ingredients or materials of glass are fused and vitrified.

There are three kinds of *furnaces* used in the glass-works. The first, called the *calcar*, serves to prepare or calcine the frit in. It is made in fashion of an oven, ten feet long, seven broad, and two deep. The fuel, which is sea-coal, is put in a trench, on one side of the *furnace*; and the flame reverberates from the roof back upon the frit. The coals burn in an iron grate, and the ashes fall hence into a hole underneath.

The second is the *working furnace*, serving to melt the metal in, or make the glass. Its figure is round, three yards in diameter, and two high, being arched over: round the inside there are eight or more pots placed, and piling-pots on these: the number of pots is always double that of the boccas or mouths, or that of the workmen, that each may have one pot refined to work out of, and another for metal to refine in, while he works out the former.

The *furnace* has two partitions: the lower separating the pots from the fire-place, has a circular hole in the center, covered with a grate, through which the flame passes from the fire-place into the *furnace*; from the arched sides and roof whereof it is reverberated into the melting-pots.

The second partition divides this from the leer, or annealing *furnace*: through the boccas, or working-holes, the metal is taken out of the pots, and the pots put into the *furnace*; these boccas are stopped with moveable covers, made of lute and brick, to screen the workmen's eyes from the fire: on each side the bocca is a boccarella, out of which coloured glass, or the finer metal, is taken from the piling-pot. To the *furnace*, likewise, belong ovens, or holes, near the leer, for the calcining of tartar, iron, &c.

The *leer*, which serves to anneal and cool the vessels, and which Agricola makes a particular *furnace*, consists of a tower, besides the leer: the tower lies directly over the melting *furnace*, with a partition betwixt them a foot thick, having an aperture, called *occhio*, or *lumella*, through which the flame or heat ascends out of the *furnace* into the tower: on the floor or bottom of this tower, the vessels, fashioned by the artists, are set to anneal; this has also two boccas, or mouths, by which the glasses are put in with a fork, and set on the floor.

The leer is an avenue five or six yards long, continued to the tower; through this the glasses, when annealed, are drawn in iron pans, called *fraches*, by which they come

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to cool by degrees; being quite cold, by that time they reach the mouth of the leer, which enters the ſaroſel, or room where the glaſſes are to be ſet.

The third is the *green-glaſs furnace*, which is a kind of compound of all the former. It is made ſquare (the two former being circular), having an arch at each angle thereof, for annealing and cooling the glaſſes. The metal is wrought on two oppoſite ſides, and on the other two they have their calcars, into which are made linnet-holes for the fire to come from the *furnace*, to bake the frit; as, alſo, to diſcharge the ſmoke. Fires are made in the arches, to anneal the veſſels; ſo that the whole proceſs is done in one *furnace*.

The materials wherewith the inſides of theſe *furnaces* are built, are not brick (which would ſoon melt down into glaſs, as alſo all the ſofter ſtones), but hard and ſandy kinds, by Imperatus called *pyramachia*. See GLASS, and GLASS-*pots*.

FURNACE, *glaſs painters*. See *Painting in* GLASS.

FURNACE, *hatters*, are of three kinds; a little one under the mould whereon they form their hats; a larger, in the ſcouring room, under a little copper full of water and lees; and a very large one under the great copper, in which they dye their HATS.

FURNACE, *lamp*, is a kind of ATHANOR, in which the heat is produced and maintained by the flame of a lamp introduced within it. This *furnace* has evidently no occaſion for an aſh-hole, a grate, or a fire-place. It has only one opening below, through which the lamp is introduced, and a kind of ſmall chimney made in its upper and lateral part, for circulation of air, to keep up the flame of the lamp, and to give vent to the ſmoke. A *furnace* of this kind is very convenient for diſtillations, which require little heat. It may be eaſily furniſhed with a water-bath, or ſand-bath; and it is particularly uſeful for digeſtions. Dr. Lewis obſerves, that in the common lamp-*furnaces*, the lamps require frequent ſnuffing, and ſmoke much; and the ſoot, accumulated on the bottom of the veſſel placed over them, is apt, at times, to fall down, and put out the flame. Theſe inconveniencies were, in a great meaſure, remedied by the following conſtruction.

The lamp conſiſts of a braſs pipe, ten or twelve inches long, and about a quarter of an inch wide, inſerted at one end into the reſervoir of the oil, and turned up at the other to an elbow, like the bole of a tobacco-pipe, the aperture of which is extended to the width of near two inches. On this aperture is fitted a round plate, having five, ſix, or ſeven ſmall holes, at equal diſtances, round its outer part, into which are inſerted as many pipes about an inch long: into theſe pipes are drawn threads of cotton, all together not exceeding what in the common lamps form one wick; by this diviſion of the wick, the flame expoſes a larger ſurface to the action of the air, the ſuliginous matter is conſumed and carried off, and the lamp burns clear and vivid.

The reſervoir is a cylindric veſſel, eight or ten inches wide, compoſed of three parts, with a cover on the top. The middle partition communicates, by the lateral pipe, with the wicks; and has an upright open pipe ſoldered into its bottom, whoſe top reaches as high as the level of the wicks; ſo that, when this part is charged with oil, till the oil riſes up to the wicks in the other end of the lamp, any farther addition of oil will run down through the upright pipe into the lower diviſion of the reſervoir. The upper diviſion is deſigned for ſupplying oil to the middle one; and, for that purpoſe, is furniſhed with a cock in the bottom, which is turned more or leſs, by a key on the outſide, that the oil may drop faſt enough to ſupply the conſumption, or rather faſter, for the overplus is of no inconvenience, being carried off by the upright pipe; ſo that the oil is always, by this means, kept exactly at the ſame height in the lamp. For common uſes, the middle diviſion alone may be made to ſuffice; for, on account of its width, the ſinking of the oil will not be conſiderable in ſeveral hours burning. In either caſe, however, it is expedient to renew the wicks every two or three days; oftener or ſeldomer, according as the oil is more or leſs foul; for its impure matter, gradually left in the wicks, occaſions the flame to become more and more dull. For the more convenient renewing of them, there ſhould be two of the perforated plates; that, when one is removed, another, with wicks fitted to it, may be ready to ſupply its place.

One of the black-lead pots, deſcribed under the article *portable* FURNACES, makes a proper *furnace* for the lamp. A pot of this kind requires no other aperture than one in the bottom for admitting air, and one in the ſide for the introduction of the elbow of the lamp. The ſtopper of the ſide aperture conſiſts of two pieces, that it may be conveniently put in after the lamp is introduced; and it has a round hole at its bottom fitting the pipe of the lamp. By theſe means, the *furnace* being ſet on a trivet or open foot, the air enters only underneath, and ſpreads equally all round, without coming in ſtreams; whence the flame burns ſteady. The heat ſhould not be raiſed higher than about the 450th degree of Fahrenheit's thermometer, which degree of heat is ſomewhat more than ſufficient for keeping tin in perfect fuſion. See *fig.* 41. Over the lamp *furnace*, as repreſented in the figure, there is a broad pan, which is employed as a water-bath, and contains a long-necked matraſs or bolt-head; a more commodious veſſel of the ſame kind, compoſed of a glaſs receiver, with a long pipe inſerted into its mouth; and a cucurbit, or body with a glaſs-head, for diſtillation. Lewis's Com. Phil. Techn. p. 29.

FURNACE, *letter-founders*, is very ſmall, not exceeding a foot and a half in height, and a foot in diameter; being placed on a wooden ſtand, or bench, to raiſe it to a proper height for the artiſt, who works ſtanding. It is made of the ſame earth with crucibles. See *Letter*-FOUNDERY.

FURNACES, *lute for*. See LUTE.

FURNACE, *melting*. See *Wind* FURNACE.

FURNACE, *plumbers*, is of three kinds: in the firſt they melt the lead, whereof ſheets are to be caſt.

This is only a ſort of large copper, or receptacle like a copper, made of free-ſtone, and coated well round with potters clay, having a little iron pan at bottom.

In the ſecond they melt the lead to be caſt in moulds for pipes, &c. which are not to be ſoldered.

The third is the tinning *furnace*, which is a ſquare frame of wood, or ſometimes a maſs of ſtone-work, with a brick hearth, whereon is made a charcoal fire, which ſerves them for the applying of thin tin leaves on the works. See PLUMBERY.

FURNACES *for baking and burning porcelain, or China ware*. See PORCELAIN.

FURNACES, *portable*, are thoſe, which, with regard to their ſize, and the facility and moderate charge of their conſtruction, are peculiarly adapted to experimental enquiries. The term *portable*, when applied to *furnaces* more generally, and in oppoſition to *fixed*, has been already explained. Under this head we ſhall give an account of Dr. Lewis's ingenious contrivance in the conſtruction of ſuch *furnaces*. For this purpoſe he makes uſe of two black lead crucibles, of the ſize marked 60, the dimenſions of which are about twelve inches high in the inſide, near eight inches wide at the mouth, and about the middle of their height ſix and a half. Each crucible has its mouth ground ſmooth and flat, upon a ſtone, with a little ſand; and a round hole ſawed in its bottom with the common compaſs ſaw of the carpenters. In the ſide, a little above the bottom, another round hole is made, and oppoſite to this a ſquare one; above which is cut a larger ſquare one. See *fig.* 42. A. All the apertures are fitted with ſtoppers, cut out of pieces of broken crucibles; the ſquare apertures are made a little narrower internally than externally, at each of their ſides, ſo that the ſtoppers, whoſe outward ſurface is even with that of the outſide of the pot, can neither be puſhed inwards, nor fall out, when the pot ſtands on either end. The round ſtoppers are made to fit cloſe, by grinding them into the apertures; and they are taken out with a kind of fork, the points of which are introduced into two ſmall holes in each ſtopper, and at the ſame diſtance from one another in all of them. The grate for this *furnace* conſiſts of an iron ring, with croſs bars fixed in it. See *fig.* 42. B. Three of theſe grates, of different widths, are required for different uſes; one of which is made to reſt againſt the converging ſides of the pot, in the lower narrow part, juſt above the lowermoſt ſquare hole; another ſo large that it may enter no farther than nearly to the top of the uppermoſt hole; and the third of the ſame width with the outſide of the mouth of the crucible. The lower and middle grates are ſupported either by grooves round the pot, or by pins in their circumference, reſting on notches within the pot. A grate might be made for theſe *furnaces* of four or five iron rings, placed within one another, each of which ſhould be furniſhed with three pins at equal diſtances, projecting from its circumference; and the pins of the inner ring ſhould be contrived to drop down into correſponding notches made in the next, and the pins of the ſecond rings into notches in the third; the notches being made in the middle of the ſpaces between every two pins. A grate of this kind, being compoſed of moveable parts, may be enlarged or diminiſhed at pleaſure, ſo as to fit *furnaces* of different widths, by adding or removing a ring on the outſide.

In order to render the *furnaces* ſufficiently durable, they are bound round in three or four different parts, with copper-wire, about the ſize of a crow quill, and made pliable by heating it on live coals, ſo as not to interfere with the doors or holes; or they may be ſurrounded by iron

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iron or copper hoops, inſtead of wire. In either caſe the mouth is effectually ſecured by a thin copper hoop, which prevents the edges from breaking or wearing; and the ſmall ſpace left between the *furnace* and the upper edge of the hoop is filled with a little moiſt loam, or with clay mixed with powdered pots. The inſide of the *furnace* ſhould be waſhed over with Stourbridge clay, diluted in water; and when it is deſigned for continued ſtrong fire, or for bearing the action of corroſive bodies, it ſhould be lined to ſome thickneſs with a lute, compoſed of Stourbridge clay, beaten up with about twice its meaſure of coarſe ſand, or of glaſs-houſe pots, in coarſe powder. The handle of theſe *furnaces* is made of an iron rod, or ſtrong iron wire, about three feet long, bent like the bale of a pail to the width of the *furnace*, and faſtened in two oppoſite holes made in the *furnace* through the copper hoop.

Beſides the black lead crucibles, which make the body of the *furnace*, there are required a foot for them to ſtand upon, a chimney, and an iron hoop. The beſt ſort of foot is a flat, heavy, iron ring, with three legs five or ſix inches high, in one of which is a ſcrew for raiſing or lowering it, ſo that the *furnace* may be made to ſtand level on an uneven floor. A foot may alſo be formed of an inverted crucible, by making an aperture in the bottom, and ſawing three arches at equal diſtances in the ſides, ſo as to leave between them legs of ſufficient ſtrength; or an inverted *furnace* will anſwer the purpoſe. The aſhes that fall down are received in an iron pan placed underneath.

The chimney is compoſed of three pipes of forged iron plate, not leſs than one eighth of an inch thick; and each of the pipes is a foot and a half or two feet long. The loweſt pipe is encompaſſed with a heavy ring about an inch above the lower end, which enters into the hole in the top of the inverted pot, in order to keep it ſteady; the upper end of the ſecond pipe is received into the lower end of the next, and the end of this is in the ſame manner received by the third. The upper end of the chimney is made ſquare, that it may fit into the larger door of the furnace, and ſerve occaſionally as a lateral chimney.

The hoop is formed of a forged iron plate, not leſs than one ſixth of an inch thick, turned round and welded together at the ends. See a perpendicular ſection of it, *fig.* 42. C. It is about ſix inches deep, and of the ſame width externally with the top of the *furnaces*, but its thickneſs being leſs than that of the *furnaces*, it is internally wider. One end of this hollow cylinder has an iron ring paſſing round it within ſide, and on this end it commonly ſtands upon the mouth of one of the pots: near this end is a ſemi-circular aperture, whoſe door is rivetted on a large iron plate, which opens downwards on hinges, and drops no lower than to an horizontal ſituation. See *fig.* 42. D.

One of the black-lead crucibles, prepared in the manner above deſcribed, with the lower ſmall grate introduced into it, is a *furnace* for open fire; the lower ſquare aperture under the grate is the door of the aſh-pit, and the upper one above the grate is a door to the fire-place. The fuel, which is always charcoal, is put in at the top, and is ſupplied with air through the apertures beneath the grate; by cloſing or opening which the fire is diminiſhed or increaſed.

By introducing into the open *furnace* an iron pot, empty, or containing ſand, this becomes a *furnace* for a *capella vacua*, or ſand *furnace*, in which caſe the fuel is put in through the fire-place door.

Farther, a veſſel broader than the *furnace* may be placed on the top, with three iron ſupporters under it, to procure a ſpace for the paſſage of the air. The flat iron pan, uſed on other occaſions for receiving the aſhes, may be employed in this manner as a veſſel for calcinations, for the evaporation of ſolutions of lixivial ſalts, &c. For veſſels of a deeper kind, as a copper ſtill, the capacity of the *furnace* is increaſed by placing over it the iron hoop, by which it is enabled to receive the body of a ſtill, of a ſize ſufficient for the purpoſes of an experimental laboratory. See STILL.

If one pot be inverted over the other, with the iron hoop between them, we ſhall have a *furnace* for cupellation, calcination under a muffle, and the other purpoſes of that which is called the *aſſay* FURNACE; and alſo for experiments of enamelling, of baking colours on earthenware and glaſs, &c. The chimney, or a part of it, may be occaſionally ſet upon the top, for raiſing the fire when it proves too languid. The ſame combination of the two pots and hoop will ſerve as a *reverberatory*, for diſtillation in coated glaſs retorts, earthen retorts, or long-necks, provided that the middle grate be introduced into the undermoſt pot, and two iron bars are laid acroſs in its upper part, to ſupport the diſtilling veſſel, whilſt its neck comes out at the door of the hoop. The *reverberatory* and *aſſay* FURNACE are, in reality, no other than the *wind* FURNACE, with a muffle or a retort in the fire inſtead of a crucible.

Furnaces of this kind may be uſed as a common ſtove, for keeping a room warm with a ſmall quantity of fuel. For this purpoſe the ſmall grate is introduced into the lower part of the undermoſt pot, the fire-place door is cloſed, and the aſh-pit door or bottom hole left open for admitting air. It is then charged with ſmall pieces of charcoal with lighted coals thrown above them, its top is covered by the largeſt of the grates, on which is placed the hoop and dome, filled with balls of baked earth, or with pieces of brick, ſo diſpoſed as to leave ſmall vacuities between them. When the ſtove is placed in the middle of a room, its injurious air may be carried off by a pipe inſerted laterally into the larger door of the dome, and communicating at the other end, which ſhould be raiſed eight or ten inches, with the chimney of the room; and all other apertures of the dome ſhould be cloſed. The *furnace*, thus charged, will keep up a moderate and nearly equal warmth for many hours, without injury or offence. See *fig.* 43. See *Bellows* FURNACE and *Wind* FURNACE. See alſo LABORATORY.

FURNACE, *reverberating*, or *reverberatory*, is a ſimple *furnace*, the fire-place of which is covered with a piece of the ſame diameter and form as the *furnace*, which is generally cylindrical. This piece is croſſed in its lower part by two bars of iron placed horizontally and parallel to each other, and at its upper edge it has a ſemi-circular cut. This piece forms a third cavity, which is called the laboratory, becauſe it is intended to receive the retorts, containing the matter to be diſtilled. The ſemi-circular cut is made to give paſſage to the neck of the retort, which ought to be inclined at an angle of forty-five degrees. The two bars at the bottom of the laboratory are deſigned to ſupport the veſſel placed there. Above the piece laſt deſcribed there is placed a fourth piece, in the form of a ſpherical cap or an inverted dome, of equal diameter with that of the other piece to which it is fitted; in its lower edge there is a ſemi-circular cut, correſponding with that of the lower piece; and theſe together form a circular opening: the dome has in its top another opening or ſhort tube, through which the air contained in the *furnace* paſſes, and ſerving for a kind of chimney. The uſe of the dome is to keep the heat all round the retort, and to apply a certain degree of heat to the upper part or vault of the retort, by reflecting or reverberating it; whence it is called a *reverbatory*. In conſequence of this diſpoſition, the vapours which riſe in the retort are determined more efficaciouſly to paſs through its neck. Reverberatory *furnaces* are uſed for diſtillations with a retort, in which a certain degree of heat is neceſſary; and diſtillation may be performed in them either in naked fire, by placing the retort immediately on the bars, or in a ſand-bath, by placing on theſe bars an iron veſſel, with a ſemi-circular cut in its upper edge, containing fine ſand to the thickneſs of one or two fingers; then the retort is placed in the veſſel, and it is to be filled with ſand up to the arch of the retort: See *fig.* 44. in which *a* repreſents the aſh-hole door; *b* the fire-place door; *c*, *c*, *c*, *c*, the regiſters; *d*, the dome or reverberatory; *e*, the conical funnel; *f*, the retort in the *furnace*; *g*, the receiver; and *h*, *h*, the iron bars for ſuſtaining the retort.

FURNACE, *ſimple*, is a kind of hollow tower, cylindrical or priſmatical, with two doors, or principal openings; the one below, called the door of the aſh-hole, and the other immediately above this, called the door of the fire-place. Between theſe two doors a grate is placed horizontally acroſs the interior part of the *furnace*, dividing its whole cavity into two parts, the lower part being called the aſh-hole, becauſe it receives the aſhes which fall from the fire-place. The door of the aſh-hole gives admittance to the air for maintaining the fire within the *furnace*. The upper cavity is called the fire-place, becauſe it contains the combuſtible matters; and freſh fuel is introduced through the door of the fire-place.

This *furnace* is ſufficient for many chemical operations: in the firſt place, amidſt the coals, crucibles may be placed for the fuſion of fuſible materials, as lead, tin, biſmuth, &c. or for the calcination of matters which require but little heat for their calcination, ſuch as the alkali for making Pruſſian blue, bezoar mineral, &c. On this *furnace* may alſo be placed baſons for evaporation, alembics for diſtilling in the water-bath, pots filled with ſand for digeſtions and diſtillations to be performed by means of a ſand-bath and a gentle heat, either with alembics or retorts. For operations requiring a longer duration, this *furnace* is formed into an ATHANOR. See FURNACE, called *Athanor*. Macquer's Chem. Dict. Eng. edit.

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FURNACES, *ſmelting*. See ORES and SMELTING.

FURNACE, *wind*, is the ſecond *furnace* uſed in the fuſion of metals for coinage. At bottom it has a hearth made hollow, in manner of a cupel, with a vent-hole in the fore part thereof; over the vent-hole is a grate ſealed in the maſſive of the *furnace*; over the grate is the place for the crucible, which is uſually of forged iron.

The fire being lighted, the crucible is ſet in, with a cover over it; and a capital, or cover of earth or iron, is laid likewiſe over the *furnace*; and at the top of this capital is a hole, five or ſix inches in diameter.

It is called *wind-furnace*, becauſe the air, entering through the vent-hole at bottom, which is always open, ſerves the ſame purpoſe as the bellows in other *furnaces*.

Gold is uſually melted in the bellows-*furnace*, as requiring an intenſer heat before it fuſes. Silver and copper are commonly melted by the *wind-furnace*.

Cramer, in his Art of Aſſaying Metals, gives the following account of the conſtruction and uſes of the *wind* or *melting furnace*: it is formed of iron plates, the inner ſurfaces of which are covered with lute. The cavity of it may be formed according to an elliptical mould. 1. Make an hollow ellipſis, the foci twelve inches aſunder, and the ordinate five inches long; cut it off in both its foci, that it may aſſume the figure *fig.* 45. 2. Then make in this hollow body, and near its lower aperture, four holes, eight lines in diameter, and directly oppoſite *c*, *c*. 3. Then faſten two flat iron rings *d*, almoſt one inch and a half broad, at both the upper and the lower inward edge of this oval cavity; and fill the inſide of it with ſmall iron hooks, jutting out about ſix lines, and three or four inches diſtant from each other. Theſe, together with the rings juſt mentioned, ſerve to faſten the lute. Thus will the body of the *furnace* be made: only you muſt add at the outſide two iron handles *e*, *e*, to be rivetted on each ſide of it, that it may be taken hold of and moved. 4. Then make the cover of the furnace, which may be formed like the part cut off from the ellipſis, ſee *fig.* 46. Let this have an opening *b* made in it, four inches high, five inches broad at bottom, and four inches at the top; and adapt to this an iron door hung on hinges to ſhut it cloſe, and having at the inſide a border faſtened to it, anſwering exactly to the circumference of the door, and as prominent inwardly as the thickneſs of the lute to be applied to it requires: for the ſame purpoſe, let ſmall iron hooks be faſtened to the inſide of the door, which is intercepted by the ſaid border. And leſt this cover ſhould be burnt within by the force of the fire, you muſt cover the inſide of it with the LUTE deſcribed under that article: therefore it muſt be likewiſe furniſhed with a ring and iron hooks to faſten the lute; as was ſaid before, when we ſpoke of the body of this *furnace*. Beſides this, you muſt faſten two iron handles *fig.* 46. *c*, *c*, on the outſide of this cover. Then a round hole muſt be made in the top of it, being three inches in diameter, prolonged into a hollow tube *d* almoſt cylindrical, and a few inches high, upon which the iron funnel deſcribed may, in caſe of neceſſity, be put after the manner mentioned in the ſame place where we ſpoke of the aſſay-oven. 5. After this, the lining of both the body and cover of the *furnace* within is made in the ſame manner above deſcribed. Moreover, you muſt make for this *furnace* two moveable bottoms, viz. one to receive the aſhes, and admit the air; the other to ſerve for reductions. The firſt is made with an iron plate, formed into a hollow cylinder, open at top, and to be ſhut at bottom with an orbicular iron plate, as with a baſis, five inches high, and of ſuch a diameter, as that it may receive the inferior orifice of the body of the *furnace*, *fig.* 45. the depth of half an inch, ſee *fig.* 47. therefore let an iron ring *c*, half an inch broad, be faſtened on the inſide of the ſaid bottom, and at the diſtance of half an inch from its upper border, to ſupport the body of the *furnace* put into it. Again, let this bottom have a ſquare door, four inches high, and as many inches broad, that may be ſhut cloſely with a door hung on hinges, that you may by means of it increaſe or diminiſh the draught of the air, and thus govern the fire at pleaſure. Then, on the left ſide of this door, and at about half the height of this bottom part, let a round hole *d* be made, one inch and a half in diameter, to admit the pipe of the bellows when need requires. Next to this, let another bottom part be made of the ſame matter and figure as the foregoing: let it be likewiſe of the ſame diameter, but two inches higher, ſo that it may be of the height of ſeven inches. Likewiſe let it have round it a like iron ring below its upper border, to ſupport the body of the *furnace* to be received in it. But let a hole two or three inches broad, and one inch high, *fig.* 48. *c*, be cut out juſt below the ring in the ſide of this bottom part; then let another round hole be made in the left ſide of this firſt hole, fit to admit the pipe of the bellows *d*. Farther, let another round hole like the foregoing *e* be made on the right, and at the diſtance of one inch from the bottom: then let the whole inſide of this bottom part (the part above the ring excepted) be overlaid with lute, and a bed be made at the bottom, of a figure like that repreſented by the line *f*, *g*, *h*. The matter of which this is made is common lute pulveriſed, paſſed through a ſieve, and mixed with ſuch a quantity of duſt of charcoal, ſifted in the ſame manner, ſo that the mixture being moiſtened and preſſed down, may at leaſt be lightly coherent. Of this matter preſſed on the bottom of the bottom part a bed is made, like a ſegment of a ſphere, having in the middle a ſmall cavity ſomewhat lower, and made extremely ſmooth, after the manner proper for large aſh veſſels or teſts.

This *furnace* is chiefly fit for fuſions, which may be made in it with and without veſſels. When you are to melt with a veſſel, put the body of the *furnace*, *fig.* 45. upon the firſt bottom, *fig.* 47. that has a door to it to open on hinges; introduce two iron bars through the holes of the *furnace*, *fig.* 45. *c*, *c*; put upon them the iron grate, which you are to introduce through the upper mouth of the *furnace*: then put in the middle of this grate a brick or ſquare tile, very ſmooth every where, warmed, and perfectly dry: otherwiſe, the veſſels put upon it, eſpecially the large ones, are eaſily ſplit by the moiſt vapours coming out of it in the operations. Let the height and width of this ſtone be a ſmall matter broader and higher than the bottom of the crucible or pot to be ſet upon it; for if it were leſs high, the bottom of the veſſel could not be ſufficiently warmed; and if it were leſs broad, the veſſel might eaſily fall from it: then put upon this tile the veſſel containing the matter to be melted, and ſurround it immediately with coals on every ſide, which muſt be ranged according to the method preſcribed before, in our deſcription of the *aſſay furnace*: then you govern the fire, by opening and ſhutting the door of the aſh-hole, *fig.* 47. *b*: you excite it by putting the cover, *fig.* 46. upon the body of the *furnace*; and if, beſides, you put a funnel upon the cylindrical mouth *d* of this cover, the melting fire becomes ſtill more violent: but if you moreover introduce the bellows through the hole of the bottom part, *fig.* 47. *d*; and the joint of the *furnace* with the bottom part, and the door of the aſh-hole, unleſs it can be ſhut very cloſe, being exactly ſtopt with thin lute, or Windſor loam, the fire thus excited by the blaſt of the bellows is carried to the higheſt degree, and far ſurpaſſes that which may be made in a ſmith's forge. Another advantage of this method is, that the veſſels are not ſo eaſily broken, becauſe the blowing of the bellows cannot affect them immediately, and becauſe a fire perfectly equal is excited on every ſide. One may eaſily examine with this apparatus, how ſtones are affected by the violence of the fire only. Now, if you have a mind to perform any operation without a veſſel, and with a naked fire; for inſtance, to melt and reduce the calxes or ſcoriæ of copper, tin, lead, and iron, or the ores of theſe metals; the body of the *furnace* muſt be put upon the other pedeſtal, having a bed in it, *fig.* 48. However, you muſt, before this, open with a knife the oblong hole *c*, and the round one *d* of this bottom part, which are ſtopped with the lute ſticking to the inſide: then you apply at the round hole *d* on the left ſide of the bellows, in ſuch manner that the nozzle of it, being directed obliquely downwards, may blow ſtrongly againſt the bed *f*, *g*, *h*: by this means, all the aſhes that fall into the bed are blown away, and the ſtrength of the fire determined to ſuch a degree, that all the melted bodies that fall into the ſaid bed remain in their ſtate of fuſion; and were it otherwiſe, the melted bodies would immediately wax cold, and adhere in grains to the bed, whereas they ought to have melted into one regulus. The oblong hole in the fore-part of this bottom-part *c*, ſerves to diſcover, by means of a poker, whether the matter in the bed be melted or not: it ſerves likewiſe to take away through it whatever might ſtop the bellows, and in ſome caſes to take away the ſcoria: then you put firſt coals into the *furnace* one ſpan high, and blow them well with the bellows, to make them burn, that the bed may be very hot before the matter to be melted is put into it; for if this is not previouſly done, the melted maſs ſeldom runs into a regulus, but remains diſperſed among the ſcoriæ, which ſoon grow hard. The bed being well heated, and freſh coals added to the fire, put into it ſuch quantity of the matter to be melted as cannot hinder the fire from being carried to the requiſite degree; which cannot be determined otherwiſe than by experience: again, put freſh coals, and upon them another quantity of the matter to be melted; they may be, like ſtrata, one upon another: but if the maſs, once melted, could not long ſuſtain the ſtrength of the fire, or if you had a mind to melt a greater quantity

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quantity of matter than what can be contained in the bed, you muſt open the round lower hole, *fig.* 48. *e*, that you may make a channel paſſing from that hole through the lute, and reaching to the ſmall cavity at the bottom of the bed *g*: to this hole, at the outſide, apply an earthen diſh like the bed within, or any proper recipient, ſurrounded with burning coals, into which the matter melted running from the bed through the hole, *fig.* 48. *e*, may be collected, as repreſented by *fig.* 49.

With regard to the elliptic or parabolic figure of the ſides and dome of a *furnace*, we may obſerve, that many have recommended this form of conſtruction, expecting that the rays of fire, ſtriking all over the internal ſurface, would be reflected back into a ſmall focal ſpace, in the ſame manner as the ſolar rays are concentrated by burning concave ſpecula. An elliptic *furnace* was prepared with great care by Dr. Lewis; but he was much diſappointed in its effects; for he could not find, that any focal reflection obtained in it, or that any advantage reſulted from the exactneſs of its figuration, or from the preciſe ſpecies of its curvature. Com. Phil. Techn. p. 26.

The *melting furnace* uſed in the manufacture of braſs is in the form of the fruſtum of a hollow cone. At the bottom of the *furnace*, or greater baſis of the fruſtum, is a circular grate, or iron plate, which is covered with a coat of clay and horſe-dung, to defend it from the action of the fire, and pierced with holes, through which the air, maintaining the fire, paſſes. The crucibles, filled with the proper materials (ſee BRASS), ſtand upon the circular plate, forming a circular row with one in the middle. The fuel is placed betwixt the crucibles, and is thrown into the *furnace* at the upper part of it, or the leſſer baſis of the fruſtum, in which is fitted a cover made of bricks or clay, kept together by bars of iron, and pierced with holes. This cover ſerves as a regiſter; when the heat is to be increaſed, the cover is partly or entirely taken off, and a free draught is permitted to the external air, which paſſes along a vault under-ground to the aſh-hole, through the holes in the circular grate or plate, betwixt the crucibles, and through the upper mouth, along with the ſmoke and flame, into an area, where the workmen ſtand, which is covered with a large dome or chimney, through which the ſmoke and air aſcend. When the heat is to be diminiſhed, the mouth of the *furnace* is cloſed with the lid, through the holes of which the air, ſmoke, and flame paſs. The crucibles are to be kept red-hot during eight or ten hours, and in ſome places much longer, even for ſeveral days, according to the quality of the calamine; during which time the zinc riſes in vapour from the calamine, unites with the copper, and renders that metal fuſible by conſiderably leſs heat than it is alone. To render the metal very fluid, that it may flow into one uniform maſs at the bottom, the fire is to be increaſed a little before the crucibles are taken out, for pouring the fluid metal into moulds. By this proceſs, ſixty pounds of braſs may be obtained from ſixty pounds of good calamine, and forty pounds of copper, though a conſiderable quantity of zinc is burnt and diſſipated during the operation; but leſs of this vapour eſcapes by uſing granulated copper. See GRANULATION. Macquer's Chem. Dict. Eng. ed. note, under BRASS.

Dr. Lewis, in his apparatus of portable *furnaces*, conſtructs a wind *furnace*, for the fuſion of metals, the aſſaying of ores, and ſimilar operations, by inverting one pot over the other, and placing on the top either the entire chimney, deſcribed under *portable* FURNACES, or two, or one of its pipes, according to the degree of fire which is required. The ſecond fized grate is preferable to the ſmaller one, becauſe it has more interſtices for admitting air to the fuel. The crucible, containing the materials for operation, is placed on a circular ſlip of brick, or of a broken pot, a little wider than its bottom, laid on the middle of the grate, to prevent the impact of the cold air. The charcoal is put in through the fire-place door, or larger aperture of the dome, or upper pot, which ſhould always be cloſed after each ſupply of fuel. The *furnace* ſtands on its trivet, or open foot, with the flat iron pan underneath, which ſerves to receive the aſhes, and to preſerve the fluid contents of the crucible, if it ſhould happen to fail, during the fuſion. The two oppoſite holes in the upper part of the dome afford the conveniency of paſſing an iron rod through, for ſafely lifting it when intenſely heated. See *fig.* 50. This *furnace* may be eaſily converted into a *blaſt furnace*, by introducing the noſe of a pair of double bellows into the round hole in its ſide; in which caſe, all the other apertures beneath the grate muſt be cloſed, while the bellows acts, that the air forced in by it may be prevented from eſcaping.

A ſtronger wind *furnace*, capable of bearing a long continuance of vehement fire, may be conſtructed of two large pots; the lowermoſt of which has only a round hole in the bottom for admitting air; and the upper one, or dome, a ſimilar hole, correſponding to the chimney, with a door in the ſide, through which the fuel is put in. The *furnace* is placed upon an inverted pot, which has a hole in its top anſwering to that in the bottom of the *furnace*, another large one in its ſide, and its mouth ground ſmooth, that it may apply itſelf every where cloſe upon the flat ſtone, or iron plate, which ſerves as a ſtand for it. Into the ſide aperture of this lower pot, which is both the foot and aſh-pit of the *furnace*, an iron pipe is inſerted, ſomewhat wider than the wideſt part of the chimney, and two or three feet long, on the end of which may be fitted a wooden one of more conſiderable length. The whole of this pipe may be laid horizontal, ſo as to reach into an adjoining apartment; or rather, if there is a conveniency, the wooden pipe may be ſunk perpendicularly through the floor into a room underneath, and the horizontal iron one joined laterally to it at the top; its uſe is for conveying into the *furnace*, inſtead of the adjacent air rarefied by the heat, the colder and denſer air at a diſtance; and its effect in animating the fire will be in proportion to the coldneſs and denſeneſs of the air to which it reaches.

This *furnace* is repreſented in *fig.* 51. The pipe of a bellows may be adapted to a hole made in the ſide of the foot, or aſh-pit, of this *furnace*, for producing a more vehement fire; and the air-pipe is at the ſame time ſtopped by means of a moveable regiſter in the end next the *furnace*. This regiſter is a circular iron plate, fixed on an axis, which is placed acroſs the pipe; the extremity of the axis projecting on the outſide, the plate is thereby readily turned, ſo as either to allow a free paſſage for the air, or to cloſe the whole bore of the pipe. Lewis's Com. Phil. Techn. p. 11. 24, &c.

FURNACE *of a mine*, in the *Art of War*. See CHAMBER and MINE.

FURNAGE. See FORNAGE.

FURNITURE, in *Dialling*, certain additional points and lines drawn on a dial, by way of ornament.

Such are the ſigns of the zodiac, length of days, parallels of declination, azimuths, meridians of the principal cities, Babylonic and Italian hours, points of the compaſs, &c. See DIAL.

For drawing *furniture* on dials, the ANALEMMA, or trigon of ſigns, is an inſtrument of principal uſe.

FURO, in *Zoology*, a name given by ſome authors to the FERRET, called by others alſo *furunculus* and *ictis*.

FUROR *uterinus*, a ſpecies of madneſs, peculiar to women, exciting them to a vehement deſire of venery, and rendering them inſatiate therewith, and manifeſting itſelf by obſcene ſpeech and wanton behaviour. As the diſorder increaſes, the patient ſcolds, laughs, and cries by turns. The immediate cauſes of this diſeaſe are an inflammation, tenſeneſs, and irritability of the uterus and pudenda of women, and particularly of the clitoris and vagina, in which the venereal ſtimulus reſides, or the too great abundance and acrimony of the humours of theſe parts. In order to the cure, which, if the diſorder be taken in time, may be expected, the patient ſhould be bled in proportion to her ſtrength. Camphor, in doſes of fifteen or twenty grains, with nitre, and ſmall doſes of the Thebaic tincture, may be repeated at proper intervals. Some preſcribe the ſac. ſaturn. in doſes of three to five grains. Beſides bleeding, cooling purges ſhould alſo be repeated in proportion to the violence of the ſymptoms, &c. What is uſeful in maniac and hypochondriac diſorders, is alſo proper in this caſe, regard being had to the conſtitution and habit of the patient. Injections of barley water, with a ſmall quantity of hemlock juice, may be frequently thrown up into the uterus, and theſe have been much recommended.

FURR, or FUR, in *Commerce*, the ſkins of divers kinds of wild beaſts, dreſſed with the hair on; to be uſed as a lining, or doubling, of garments, robes. &c. either for warmth, ornament, or diſtinction of rank and dignity.

The word is formed of the French *fourrure*, a *lining*; which Du-Cange derives from *furrura*, uſed, in the barbarous Latin, for the ſame thing. We alſo meet with *forratura*, *foderata*, *fodraium*, and *fodratura*, in the ſame ſenſe.

The robes of kings, dukes, and peers, are lined with divers kinds of *furrs*, and, in particular, ermine, to render them more magnificent.

The ſame may be obſerved of ſeveral chief magiſtrates, judges, and doctors of different faculties, in the univerſities.

The kinds of *furrs*, or ſkins, chiefly dreſſed in alum, and with the hair on, are thoſe of the ermine, ſable, ſquirrel, coney, caſtor, otter, dog, fox, wolf, tiger, bear, &c.

The ſtatute 28 Hen. VIII. cap. 13. mentions divers kinds of *furr*, viz. *ſables*, which are a rich *furr*, of colour between

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tween black and brown, the ſkin of a beaſt called a ſable, in bigneſs between a pole-cat and an ordinary cat, bred in Ruſſia and Tartary; *lucerns*, the ſkin of a beaſt of that name, nearly the ſize of a wolf, in colour neither red nor brown, but between both, mingled with black ſpots; they are bred in Muſcovy, and their ſkins are a very rich *furr*; *genets*, a beaſt's ſkin ſo called, in ſize between a cat and a weazle, mailed like a cat, and of that nature; they are of two kinds, black and grey; the black is moſt precious, which hath black ſpots upon it, hardly to be ſeen: this beaſt is the product of Spain; *foins*, which are of faſhion like the ſable, the top of the *furr* black, and the ground whitiſh, bred for the moſt part in France; the *marten*, a beaſt very like the ſable, the ſkin ſomething coarſer, produced in England and Ireland, and all countries not too cold; but the beſt are from Ireland. Beſide theſe, there are the *fitch* and *pole-cat*; the *calabar*, a little beaſt in ſize near the ſquirrel; *miniver*, being the bellies of ſquirrels; and *ſhanks*, or what is called *budge*, &c. all of them *furrs* of foreign countries; ſome whereof make a large branch of their inland traffic.

FURRS, *timber of*. See TIMBER.

FURR, in *Heraldry*, a repreſentation of the ſkins of certain wild beaſts, ſeen, both in the doublings of the mantles of coat-armour, and in the armour itſelf.

The heralds uſe two metals, five colours, and two *furrs*, or hairy ſkins; viz. ermine and vair.

The origin of theſe *furrs* Mackenzy aſcribes to the ſhield's being anciently covered with ſkins; which ſkins, or coverings, were afterwards repreſented in the ſhields; a more probable derivation, in our opinion, than to ſay they were placed on ſhields, becauſe they had been worn in mantles and garments.

Furrs either conſiſt of one colour, which is white; or more than one; and theſe either two, or more than two.

Furrs of two colours are either ermine, being white with black ſpots; ermines, black with white ſpots; erminois, whoſe ground is yellow, and the powdering black; or pean, which is black powdered with yellow.

Furrs of more than two colours are called VAIR, and VAIRY.

FURRIER, a perſon who trades, or works, in *furrs*, or lines robes, &c. therewith.

FURRING *of a ſhip*, is laying on double planks on her ſides. This is done after the ſhip is built, and is by the ſailors called *plank upon plank*. But there is another way of *furring*, which is more properly ſo called; and that is, when a ſhip's planks are ripped, and new timbers are put on the former timbers, and on them other planks; which is done ſometimes to make a ſhip bear the ſails the better.

FURRINGS, or FURRS, in *Architecture*, the making good of the rafter-feet in the cornice.

When rafters are cut with a knee, theſe *furrings* are pieces which go ſtrait along with the rafter, from the top of the knee to the cornice.

When rafters are rotten, or ſunk hollow in the middle, there are pieces cut thickeſt in the middle, and tapering towards each end, which are nailed upon them to make them ſtrait. Such pieces are called *furrs*; and the putting them on is called *furring* the rafters.

FURROW, among *Gardeners*, denotes a ridge or ſwelling on the ſide of a tree, ſtalk, or fruit.

FURROW is alſo uſed for the deep trench left between ridges, to drain off the ſuperfluous moiſture.

FURUNCULUS, in *Surgery*. See BOIL.

FURUNCULUS, in *Zoology*, the name given by many authors to the FERRET, called alſo the *furo* and *ictis*.

FURZE, GORSE, or WHINS, *Ulex*, in *Botany*, a genus of the *diadelphia decandria* claſs. Its characters are theſe: the flower has a two-leaved empalement, is of the butterfly kind, and has five petals; the ſtandard is large, erect, oval, heart-ſhaped, and indented at the point; the wings are ſhorter and obtuſe; the keel is compoſed of two obtuſe petals, whoſe borders are joined at the bottom. It has ten ſtamina, nine joined, and one ſeparate, terminated by ſingle ſummits; with an oblong cylindrical germen ſupporting a riſing ſtyle, crowned by a ſmall obtuſe ſtigma; the germen afterward turns to an oblong turgid pod, with one cell, opening with two valves, incloſing a row of kidney-ſhaped ſeeds. There are two ſpecies, the common one of which is too well known to need deſcription.

Theſe plants propagate themſelves very plentifully by ſeeds; for as the ſeeds ripen, the pods open with the warmth of the ſun, and the ſeeds are caſt out by an elaſtic ſpring to a great diſtance all around; where they ſoon vegetate, and are not eaſily deſtroyed when well rooted.

Some years ago the ſeeds of this plant were ſown to form hedges about fields; where if the ſoil was light, the plants ſoon became ſtrong enough for a defence againſt cattle; but as theſe hedges in a few years became naked at the bottom, and ſome of the plants frequently failed, which made gaps in the FENCE, this method has of late been diſuſed. But ſome perſons who have ſown the ſeeds of this plant upon very poor, hungry, gravelly, or ſandy land, have reaped more profit than they could make of the ground by another crop, eſpecially in places where fuel is dear; where this *furze* is frequently uſed for heating ovens, drying malt, and burning lime and bricks. Miller.

The tops of *furze* bruiſed, in order to take off their ſharp points, have lately been found to be excellent fodder for cattle, particularly for horſes. Thoſe that have been lean and ſickly have often recovered, and plumped up in a ſhort time, by the uſe of this fodder. When *furze* is raiſed for this purpoſe, the ſeeds ſhould be ſown in February, March, or April, on ground previouſly prepared, as for barley, and afterwards barely covered over. Six pounds of ſeed will be ſufficient for an acre; the young plants muſt be preſerved from cattle during the firſt year, and in the next they will be fit for cutting; which may be begun in October. The plants will continue to ſhoot till Chriſtmas, and be fit for uſe till March. It is ſaid, that an acre of ground will produce fifteen tons of this fodder; and that it will anſwer the ſame purpoſe as an equal quantity of hay. In ſome places there are mills for bruiſing it; and it is mixed with chopped ſtraw in the proportion of an hundred of ſtraw to a ton of *furze*. It is ſaid, that the common Engliſh *furze* will grow upon the dry ſands, that are in the neighbourhood of the ſea, though ſubject to be waſhed ſometimes by the water; this is a thing extremely worth the trying, as it would then be of the greateſt advantage to thoſe who have walls or banks next the ſea, to plant it on them to preſerve them.

This being a very unprofitable plant in reſpect of many others, it is often neceſſary to deſtroy it. This may be done by plowing and burning the buſhes upon the land. Marling the land well in countries where marle is plentiful, is alſo a very good way; and there is yet another much better, which is to make wood-land, not arable, of the place; to this purpoſe it is only neceſſary to ſow or plant acorns at proper diſtances. The *furze* will ſhelter the acorns till the time of their growing up to two or three feet high, and then they will ſoon ſtarve and deſtroy all the *furze* and every other weed. Mortimer's Huſbandry, p. 308.

FUSA, in the *Italian Muſic*, the name of one of the muſical notes, frequently alſo called CHROMA, and by us QUAVER.

FUSANUS, in *Botany*, a name given by many authors to the ſhrub, more uſually called *euonymus*. See SPINDLE-*tree*. This was ſometimes called *attractylis* by the Greeks, and hath both this and its Roman name *fuſanus*, from its being of uſe for making the diſtaff, uſed by the women in ſpinning. Some have ſuppoſed that this was the ſame with the *euonymus*, ευωνυμος, of Theophraſtus and the Greek writers, but very erroneouſly. See TETRASTOECHON.

FUSAROLE, in *Architecture*, a moulding, or ornament, placed immediately under the echinus, in the Doric, Ionic, and Compoſite, capitals.

The Italians call it *fuſciolo*; and the French, from whom we borrow it, *fuſarole*.

The *fuſarole* is a round member, carved, in manner of a collar, or chaplet, with oval beads. The *fuſarole* ſhould always anſwer exactly under the eye of the volute, in the Ionic capital.

FUSEE, or FUSY, in *Watch-work*, is that conical part, drawn by the ſpring, and about which the chain, or ſtring, is wound.

The word is French; where it literally ſignifies a *ſpindle*. The ſpring of a watch is the firſt mover. It is rolled up in a cylindrical box, againſt which it acts, and which it turns round in unbending itſelf. The ſtring, or little chain, which at one end is wound about the *fuſee*, and at the other faſtened to the ſpring-box, diſengages itſelf from the *fuſee*, in proportion as the box is turned. And hence the motion of all the other parts of the ſpring-watch.

Now the effort, or action, of the ſpring, is continually diminiſhing from firſt to laſt; and, of conſequence, unleſs that inequality was rectified, it would draw the ſtring with more force, and wind a greater quantity of it upon the box at one time than another; ſo that the movement would never keep equal time.

To correct this irregularity of the ſpring, nothing could be more happily contrived than to have the ſpring applied to the arms of levers which are continually longer as the force of the ſpring is weaker. This foreign aſſiſtance, always increaſing as it is moſt needed, maintains the action and effect of the ſpring in an equality.

It is for this reaſon that the *fuſee* is made of a conical figure. Its axis, which is immovable, is the ſeries of the centers of all the unequal circumferences which compoſe the

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the ſurface of the *fuſee*: according as the part of a ſtring, which is untwiſting, is applied to a larger circumference, it is at a greater diſtance from the fixed point in the axis correſponding thereto; and, of conſequence, the power which draws by this ſtring, viz. the ſpring, acts with the more advantage; the ſpring begins to draw from the vertex of the cone, the moſt diſadvantageous part, becauſe its own force is then the greateſt.

If the action of the ſpring diminiſhed equally, as the parallel baſes of a triangle do; the cone, which is generated of a triangle, would be the preciſe figure required for the *fuſee*: but, it is certain, the weakening of the ſpring is not in that proportion; and, of conſequence, the *fuſee* ſhould not be conical.

In effect, experience ſhews, that it ſhould not be ſtrictly ſo; but that it be a little hollow toward the middle, i. e. the arm of the lever, muſt be there a little ſhortened; becauſe the action of the ſpring is not ſufficiently diminiſhed of itſelf.

It is a matter of enquiry, among geometricians, what the preciſe figure of the *fuſee* ſhould be; that is, what the curve is, by whoſe revolution round its axis, the ſolid, whoſe figure the *fuſee* is to have, ſhall be produced.

M. Varignon has determined this curve. The axis of the *fuſee* is alſo the axis of the curve, which is convex on the ſide toward the axis, and, of conſequence, concave all the way on the other, or outer-ſide; and the ordinates are the different diſtances at which the ſtring is to be, with regard to all the ſucceſſive fixed points of the axis.

The force of the ſpring multiplied by the arm of the lever it is applied to, each moment, being always to make an equal product; it follows, that when the ſolid of the curve ſhall be formed, an ordinate multiplied by the ſurface of the ſolid compriſed between that ordinate and the greateſt of all the ordinates, viz. that of the baſe, will always yield a product equal to that of any other ordinates multiplied in the ſame manner. For the ordinates are only arms of the lever; and the parts of the ſurface comprehended between them and the baſe are equal to the lengths of the ſtring which covers them, i. e. to the correſpondent forces of the ſpring; which is what conſtitutes the equation and the eſſence of the curve.

FUSEE, FUZE, or FUSE, in *War*, an appendage of a bomb, or granado-ſhell, by which the powder, or compoſition, in the ſhell, is ſet on fire, to do the deſigned execution.

The word is French, and literally denotes a *ſpindle*.

The *fuze* is a wooden pipe, or tap, commonly made of dry beech-wood, and ſometimes of horn-beam taken near the root, filled with wild-fire, or the like compoſition; and is deſigned to burn ſo long, and no longer, as is the time of the motion of the bomb or ſhell from the mouth of the mortar to the place where it is to fall, ſo that the *fuſee* muſt be contrived, either from the nature of the compoſition, or the length of the pipe which contains it, to burn juſt that time. *Fuzes* are turned rough and bored at firſt, and then kept for ſeveral years in a dry place; the diameter of the hole is about a quarter of an inch, which does not go quite through, but leaves about a quarter of an inch at the bottom, and the head is made hollow in the form of a bowl. The compoſition for *fuzes* is ſalt-petre three parts, ſulphur one, and mealed powder three, four, and ſometimes five, when it is required to burn quicker. This compoſition is drove in with an iron driver, whoſe ends are capped with copper to prevent it from taking fire, and as equally hard as poſſible; the laſt ſhovel-full being all mealed powder, and two ſtrands of quick-match laid acroſs each other are drove in with it, the ends of which are folded up into the bowl, and a cap of parchment is tied over it till it is uſed. When theſe *fuzes* are drove into the loaded ſhell, the lower end is cut off in a ſlope, ſo that the compoſition may ſet fire to the powder in the ſhell, and they muſt have ſuch a length as to burſt nearly as ſoon as the ſhell touches the ground. When the diſtance of the battery from the object is known, the time of the ſhell's flight may be computed nearly; which being known, the *fuze* may be cut accordingly, by burning two or three, and making uſe of a watch or a ſtring and weight for a pendulum, of ſuch a length as to vibrate ſeconds or any given parts of time. If the *fuzes* are to be kept for ſome time after they are drove, the top muſt be covered with a mixture of two parts of pitch, one of roſin, and three of bees wax, which will prevent any air from coming to the compoſition. Muller's Treat. of Artillery, p. 294, &c.

FUZEE or FUSEE, is alſo ſometimes uſed to denote a FIRE-*lock*.

FUSIBILITY, that quality in metals, and minerals, which diſpoſes them for FUSION.

Gold is more *fuſible* than iron, or copper; but leſs ſo than ſilver, tin, and lead.

Borax is frequently mixed with metals, to render them more *fuſible*.

FUSIL, in *Heraldry*, by the French called *fuſee*, q. d. ſpindle, is a bearing of a rhomboidal figure, more ſlender than the lozenge; its upper and lower angles being more acute than the two middle ones. See *Tab. Herald fig.* 42.

FUSIL, in the *Military Art*, ſee FIRE-*lock*.

FUSILE *column*, and *marble*; ſee the ſubſtantives.

FUSILIERS, or FUZILEERS, in the *Military Art*, are ſoldiers armed like the reſt of the infantry, but wearing caps like the grenadiers, though ſomewhat ſhorter. Of theſe there are three regiments in the Engliſh ſervice; the royal regiment of Scotch *fuſiliers* raiſed in 1678; the royal regiment of Engliſh *fuſiliers* raiſed in 1685; and the royal regiment of Welch *fuſiliers* raiſed in 1688-9.

The word is formed from the French *fuſil*, a *fuſee*, fire-lock.

FUSILUS, in *Botany*, a name given by ſome to the FUSANUS, a more common name for the *euonymus*.

FUSILY, or FUSILE, in *Heraldry*, is when a field, or ordinary, is entirely covered over, or divided into *fuſils*.

FUSION, the ſolution, or melting, of metals, minerals, &c. by means of fire; or the act of changing them from their ſolid ſtate to a fluor.

The word is derived from the Latin *fuſio*; of *fundo*, *I pour out*. Whence, alſo, *effuſion*, *infuſion*, *ſuffuſion*, and *tranſfuſion*; which ſee.

To give the ore its metallic form, they *fuſe* it: when it is in *fuſion*, the metalline ſubſtance, being the heavieſt, ſinks to the bottom of the furnace; the other terreſtrial matters riſing, in form of ſcoria, to the ſurface.

It is commonly imagined, that the *fuſion* and metalline form of ores is wholly the effect of fire; and we have theories of fuſibility founded on this principle; but it is a miſtaken one. Fire, no doubt, is the principal agent; but fire, alone, is not ſufficient. A mineral, or piece of metal not purified, being put alone in a crucible, melts with great difficulty, and never becomes a perfect metal: copper ore, for inſtance, being thus applied, its impure part forms a ſcoria, and vitrifies; the metalline part reſiding at bottom, under the appearance of a black regulus. To promote the *fuſion* and ſeparation, they mix coals, or ſtones, or cinders, or old ſcoriæ, along with the ore; the inflammable principle in which, by help of fire, fuſes them perfectly, ſets the heterogeneous part at liberty, and raiſes it to the top. See FLUX.

The general reaſon of *fuſion* is pretty eaſily aſſigned. The firmneſs or ſolidity of a body ariſes from the force wherewith its particles cohere. And the COHESION of all bodies is as the quantity of contact in the component particles.

Now, the corpuſcles of fire, entering with rapidity into the pores of the metal, agitate, and, by degrees, looſen, divide, and diminiſh their contact; till at length there is not enough to hinder their rolling over each other, and giving way upon the leaſt impulſe.

The dilatation obſervable in all *fuſion*, is a proof that the particles of the bodies are ſeparated, and ſet at a diſtance from each other; and, conſequently, their contacts and coheſions diminiſhed.

In effect, rarefaction and dilatation are the neceſſary conſequences of fire and heat.

From the difference of coheſion proceeds that variety we obſerve in the *fuſion* of bodies: for ſuch as have leaſt contact of parts, ſooneſt give way to the fire; and ſome will melt away by the warmth of a vapour only: thus air and mercury are ſo fuſible, that the heat of the atmoſphere is always ſufficient to keep them fluid; when others, which have a ſtronger contact, are not to be ſeparated without much difficulty. Upon this account, vegetables very eaſily diſunite, minerals flower, and metals floweſt of all; and of the laſt, thoſe wherein the contact of part is leaſt, as in lead and tin, moſt readily melt; but thoſe which are moſt compact, as gold and ſilver, are not to be managed but by a violent heat.

If now the force of coheſion were proportional to the quantity of matter, or to the weight of bodies, we might from ſtatics account for all the variety that occurs in *fuſion*: for by knowing the ſpecific gravity of a body, we ſhould then know what force is required to melt it; but becauſe the ſame quantity of matter may be ſo variouſly diſpoſed, that in one body there ſhall be a much greater contact than in another, though the gravity be equal, or even greater in the latter, therefore the force of the coheſion cannot be eſtimated by gravity; for lead, though more ponderous than all other metals except gold, yet in the fire is more eaſily melted than almoſt any other; ſo that it neceſſarily follows, that in this metal there muſt be a leſs coheſion, or contact of parts, how much ſoever it may exceed others in the quantity of its matter.

Bodies after *fuſion* return again into a ſolid maſs, upon removing them from the fire; becauſe their particles hereupon approach nearer to one another by their attractive force, and are compelled to unite.

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Such as conſiſt of homogeneous and unalterable parts, as wax, gums, and the purer metals, recover their ancient form: for when the ſame texture of parts remains in the whole body, it muſt of courſe reaſſume the ſame appearance, when the ſeparating power ceaſeth to act; but other bodies, whoſe parts with reſpect to denſity and ſurface are extremely different from one another, while ſome are carried off by the force of heat, and others are changed as to figure and poſition, muſt be forced to appear in another form: for they cannot recover their original phaſes, unleſs every particle could reinſtate itſelf in that very ſituation it had before, which may be hindered infinite ways; as may be experienced eaſily in heterogeneous bodies.

The difference, therefore, obſerved even in homogeneous bodies after liquefaction, is no ways to be accounted for but from the changeableneſs of ſurface in their parts: for thoſe bodies whoſe parts conſtantly retain the ſame ſurfaces, never loſe their form; but others, by having the ſurfaces of their parts altered, have a different texture, and put on another appearance.

It had been formerly an opinion, very generally received, that the ſolution of metals by lightning is effected by a kind of cold *fuſion*; and the inſtances that have been uſually alledged in ſupport of this opinion, are thoſe of a ſword being melted in its ſcabbard, and of money being melted in a bag, whilſt the ſcabbard and bag remained unhurt. But it appears, by a variety of experiments and obſervations, collected in the progreſs of ELECTRICITY to its preſent advanced ſtate, that this kind of *fuſion* is attended with heat and ignition, as in the caſe of common *fuſion*. Phil. Tranſ. vol. li. part i. art. 30 and 31.

FUST, in *Architecture*, the SHAFT of a column; or that part comprehended between the baſe and the capital; called alſo *the naked*.

The word is French, and literally ſignifies a *caſk*.

The *fuſt* is that cylindrical part, which makes, as it were, the body or trunk of the column, excluſive of the head and foot.

FUSTIAN, in *Commerce*, a kind of cotton ſtuff, which ſeems, as it were, quilted, or whaled on one ſide.

Manege derives the word from *fuſtanum*, which in the corrupt Latin writers is uſed in the ſame ſenſe, and is ſuppoſed to be formed from *fuſtis*, on account of the tree whereon the cotton grows. Bochart derives it from *fuſtat*, which, in Arabic, ſignifies the ancient city of Memphis, where cotton is produced in great abundance.

Right *fuſtians* ſhould be made altogether of cotton thread, both woof and warp.

There are *fuſtians* of divers kinds, wide, narrow, coarſe, fine, with ſhag or knap, and without it. There are alſo a great many made, whereof the warp is flax, or even hemp.

FUSTIAN, in *Criticiſm*, a word uſed to expreſs bombaſt.

FUSTICK, or FUSTOCK, a yellow wood uſed by the dyers.

The colour it yields is a fine golden yellow; but there ſhould be ſome other ingredients mixed with it, to make it laſting. The tree that yields it grows in all the Carribbee iſlands; particularly in Barbadoes and Tobago, where it riſes to a great height.

The dyers uſe it chiefly for BLACK: but ſome of the ableſt and honeſteſt among them, who would dye none but the beſt and moſt laſting colours, are of opinion it ſhould be abſolutely excluded out of all dying.

Beſide this, there is another kind of *fuſtick* or *fuſtel*, growing in Italy, Provence, &c. which is uſed to dye a coffee-colour.

FUSTIGATION, in the *Roman Cuſtoms*, a puniſhment inflicted by beating with a cudgel. This puniſhment was peculiar to freemen; for the ſlaves were ſcourged or laſhed with whips.

FUSTIGATION, *fuſtigatio*, is alſo a penance enjoined by the Roman inquiſition.

FUSTUARIUM, in *Antiquity*, a Roman puniſhment, the ſame with FUSTIGATION.

FUSTUC, in *Botany*, a name given by ſome of the old writers to the tree which produces the piſtachia-nuts. The word ſounds ſo like the name of a wood uſed in dying, and called at this time *fuſtick*, that it might be ſuppoſed to expreſs ſome tree of the ſame kind; but it is of a very different origin. The Jews and Arabians have called the piſtachia-tree *fiſtic* and *fuſtack*, and from thence ſome have written the name *fuſtuck* or *fuſtuc*, the Greeks have written it φυστικ, and the barbarous Latin writers *fiſticio*, which ſounds very like the name PISTACHIO.

FUT-FA, in *Muſic*. See F and CLEF.

FUTTOCKS, *in a ſhip*, the timbers raiſed over the keel, or the compaſſing timbers which make her breadth. Thoſe next the keel are called *ground-futtocks*, and the reſt *upper futtocks*.

FUTTOCK *ſhrouds*. See SHROUDS.

FUTURE, ſomething to come hereafter.

We ſay a *future* ſtate, a *future* contingency; there is none but God to whom *future* things are preſent.

FUTURE, or FUTURE *Tenſe*, in *Grammar*, denotes an inflexion of verbs, whereby they denote, that a thing will be in ſome time yet to come. As, the laſt day will come: I ſhall ſee an end.

The *future* time admits of two caſes: either we may intend to expreſs a thing that ſhall come to paſs in a ſhort time; or a thing that ſhall happen in any indefinite time. Thus the Greeks have their *paulo poſt futurum*, μετ' ολιγον μελλων, which marks a thing juſt going to be done; as ποιησομαι; beſide the common, indefinite *future*, ποιησω, *I will do it*; *ſcribam*, *I ſhall write*.

In Latin, Italian, French, and even in Engliſh, the *future* of the indicative expreſſes only the deſign or intention of doing a thing, or ſimply that the thing will be; as, I will praiſe, I will be approved: and the *future* of the ſubjunctive ſhews, that the thing will be done under certain circumſtances; when I ſhall have ſeen Verſailles, I will tell you. Sometimes the *future* is expreſſed in Engliſh by the preſent; if I meet your friend, I will ſend him to you; *ſi offendero*, *ſi incidero*, &c.

Mr. Harris, in his diſtribution of tenſes, reckons three definite *future* tenſes, beſides the common indefinite *future*, which he calls the aoriſt of the *future*, viz. the inceptive *future*, as *ſcripturus ero*, *I ſhall be beginning to write*; the middle or extended *future*, as *ſcribens ero*, *I ſhall be writing*; and the completive *future*, as *ſcripſero*, *I ſhall have done writing*. See TENSE.

FUZE, or FUZEE. See FUSEE.

FUZEE, in the *Manege*, two dangerous ſplents, joining from above downwards: commonly a *fuzee* riſes to the knee and lames the horſe.

Fuzees differ from ſcrews or thorough ſplents in this, that the latter are placed on the two oppoſite ſides of the leg. See SPLENT.

FUZILEERS. See FUSILIERS.

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G.

G, The ſeventh letter of our alphabet, and the fifth conſonant: though in the alphabets of all the oriental languages, the Hebrew, Phœnician, Chaldee, Syriac, Samaritan, Arabic, and even Greek, *G* is the third letter.

The Hebrews call it *ghimel*, or *gimel*, q. d. *camel*; becauſe it reſembles in its form the neck of that animal; and the ſame appellation it bears in the Samaritan, Phœnician, and Chaldee: in the Syriac it is called *gomel*, in Arabic *gilm*, and in Greek *gamma*.

The letter *G* is of the mute kind, and cannot be any way ſounded without the help of a vowel. It is formed by the reflection of the air againſt the palate, made by the tongue, as the air paſſes out of the throat; which Martianus Capella expreſſes thus, *G ſpiritus cum palato*; ſo that the *G* is a palatal letter.

G in Engliſh has two ſounds, one from the Greek Γ, and the Latin, which is called that of the hard *G*, becauſe it is formed by a preſſure ſomewhat hard of the fore-part of the tongue againſt the upper gum; which ſound it retains before *a*, *o*, *u*, *l*, *r*; as *gate*, *go*, *gull*. At the end of a word it is always hard, as *ring*, *ſing*, &c. The other ſound, called that of the ſoft *G*, reſembles that of *j*, and is commonly, though not always, found before *e* and *i*, as in *gem* and *gibbet*. To this rule, however, there are many exceptions; *G* is often hard before *i*, as *give*, &c. and ſometimes before *e*, as *get*, &c. It is alſo hard in derivatives from words ending in *g*, as *ſinging*, *ſtronger*, &c. and generally before *er*, at the end of words, as *finger*. *G* is mute before *n*, as *gnaſh*, *ſign*. *Gh* has the ſound of the hard *G* in the beginning of a word, as *ghoſtly*; in the middle, and ſometimes at the end, it is quite ſilent, as *right*, *though*. At the end of a word *Gh* has often the ſound of *f*, as *laugh*. Johnſon.

The Latins took the liberty to drop the letter *G* at the beginning of words, before an *n*; as in *gnatus*, *gnoſco*, *gnobilis*, *gnarrat*, &c. which they ordinarily wrote *natus*, *noſco*, *nobilis*, &c. They alſo frequently changed it into *c*; as *gamelus*, into *camelus*; *gragulus*, *graculus*; *quingentum*, *quincentum*, &c. Sometimes it was put inſtead of *n*, before a *c*, and for another *c*; as *Agchiſes*, *aggora*, *agguilla*, &c. for *Anchiſes*, *ancora*, *anguilla*, &c. And inſtead of *p*; as *magalia*, for *mapalia*, &c. *G* is alſo uſed inſtead of *q*, and *q* inſtead of *G*, as in *anquina*, *angina*, *anguina*, &c. inſtead of *r*, as in *aquagium*, for *aquarium*; *agger*, for *arger*, &c. And inſtead of *s*, as in *ſpargo*, *ſparſi*, *ſparſum*; or rather, it is retrenched from thoſe laſt words, to avoid the cacophony of *ſpargſi*, or *ſparcſi*. *G* is alſo put for *c*; as in *Cneius*, for *Gneius*; *Caius*, for *Gaius*; *Gaeta*, for *Caieta*; and for *v*; as in *figere*, for *fivere*. See N, P, &c.

The northern people frequently change the *G* into *u*, or *w*; as in *Gallus*, *Wallus*; *Gallia*, *Wallia*, *Vallia*, &c. For in this inſtance it muſt not be ſaid that the French have changed the *w* into *G*; becauſe they wrote *Gallus* long before *Wallus*, or *Wallia*, were known; as appears from all the ancient Roman and Greek writers.

And yet it is equally true, that the French change the *w* of the northern nations, and *v* conſonant, into *G*; as *Willielmus*, *William*, into *Guillaume*; *Wulphilas*, into *Gulphilas*; *Vaſco*, into *Gaſcon*, &c.

Diomed, lib. ii. cap. De Litera, calls *G* a new letter; his reaſon is, that the Romans had not introduced it before the firſt Punic war; as appears from the roſtral column, erected by C. Duilius, on which we every where find a *c* in lieu of *G*. It was Sp. Carvilius who firſt diſtinguiſhed between thoſe two letters, and invented the figure of the *G*; as we are aſſured by Terentius Scaurus. The *c* ſerved very well for *G*; it being the third letter of the Latin alphabet, as the *G* or γ was of the Greek.

The *G* is found inſtead of *c* on ſeveral medals: Vaillant, Num. Imperat. tom. i. p. 39. M. Beger produces a medal of the Familia Ogulnia, where GAR is read inſtead of CAR, which is on thoſe of M. Patin. But the *c* is more frequently ſeen on medals, in lieu of *G*; as AUCUSTALIS CALLAECIA CARTACINENSIS, &c. for AUGUSTALIS, &c. Not that the pronunciation of thoſe words was altered, but only that the *G* was unartfully or negligently cut by the workmen; as is the caſe in divers inſcriptions of the Eaſtern empire; where AUC, AUCC, AUCCC, are frequently found for AUG, &c.

The form of our *G* is taken from that of the Latins, who borrowed it from the Greeks; the Latin *G* being certainly a corruption of the Greek gamma, Γ, as might eaſily be ſhewn, had our printers all the characters and forms of this letter, which we meet with in the Greek and Latin MSS. through which the letter paſſed from Γ to *G*.

As to the gamma of the Greeks, it is manifeſtly the ג of the Hebrews or Samaritans. All the difference between the gamma and ghimel conſiſts in this, that the one is turned to the right, and the other to the left, according to the different manners of writing and reading, which obtained among thoſe different nations; ſo that all the pains Salmaſius has taken on Solinus, to prove that the *G* was derived from the Greek kappa, is loſt.

G, as a Roman abbreviature, has various ſignifications. It denotes *gratis*, *gens*, *gaudium*, &c. G. V. ſignifies *genio urbis*, and G. P. R. *gloria populi Romani*.

G has alſo been uſed as a numeral letter, ſignifying 400, according to the verſe,

G *quadringentos demonſtrativa tenebit.*

When a daſh was added at the top, $\overline{G}$, it ſignified forty thouſand.

G, in *Chronology*, is the ſeventh dominical letter.

G, on the French *Coins*, denotes the city of Poitiers.

G is alſo uſed, in *Muſic*, to ſignify one of the clefts; viz. that of the higheſt part, called the *treble*, or *alt*. See CLEF, and TREBLE.

GABALE, in *Mythology*, a deity worſhipped at Heliopolis under the figure of a lion, with a radiant head; and it is thus repreſented on many medals of Caracallus.

GABARDINE, from the Italian *gavardina*, has been ſometimes uſed to denote a coarſe frock, or mean dreſs. In this ſenſe it is uſed by Shakſpeare in his Tempeſt and Merchant of Venice, and by Butler in his Hudibras, book i.

GABBARA, a name which the Egyptians gave the dead bodies, which they kept by them, inſtead of burying them.

That people, out of a cuſtom which they had received from their anceſtors, and which aroſe in ſome meaſure from the poſition of their country, which is expoſed to the inundations of the Nile, uſed to wrap up the bodies of perſons of eminence, particularly thoſe of ſaints and martyrs, in a great number of linen cloths, with balms and ſpices; and inſtead of interring them, they preſerved them in their houſes: thinking, that thereby they did them much more honour. See EMBALMING, and MUMMY.

And theſe, St. Auguſtine tells us, were what they called *gabbaras*. Sermon cxx. *de diverſis*, cap. 12.

Pliny makes mention of the ſame thing, lib. vii. cap. 16. where he relates, that in the time of Claudius, a *gabbara* was brought from Arabia, almoſt ten feet long.

The word is Arabic, Syriac, and Hebrew, formed of גבר, *gaber*, a *man*, and denotes an embalmed body.

GABEL, or GABELLE, in the *French Cuſtoms*, a duty or impoſition on ſalt.

Etymologiſts are divided as to the origin of the word.

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Some derive it from the Hebrew *gab*, a *preſent*; others from קבל, *to deliver*; others from קבלה, *kabbalah*, *receipt*; others from *ghaucl*, or *gabe*, *unjuſt law*; and others from the corrupt Latin *gabella*, or *gablum*, *tribute*.

The *gabel* is let out to farm; and makes the ſecond article in the king's revenue.

There are three farms of *gabels*: the firſt comprehends the greateſt part of the kingdom; the ſecond is that of the Lyonnois, and Languedoc; and the third that of Dauphiné and Provence. There are ſeveral provinces exempt from the *gabel*, having purchaſed that privilege of Henry II.

This duty is ſaid to have had its riſe in France, in 1286, under Philip the Fair. Philip the Long took a double per livre on ſalt, by an edict in 1318, which he promiſed to remit when he was delivered from his enemies; which was renewed by Philip de Valois, in 1345; and the duty was raiſed to four deniers per livre; king John reſumed it in 1355, and it was granted to the dauphin in 1358, to ranſom king John. It was continued by Charles V. in 1366; after his deceaſe it was ſuppreſſed, but revived again by Charles VI. in 1381. Louis XI. raiſed it to twelve deniers per livre; and Francis I. in 1542, to twenty-four livres per muid; and it has been conſiderably augmented ſince that time; ſo that a minot of ſalt pays a duty of 52 livres, 8 ſols, and 6 den. Philip de Valois firſt eſtabliſhed granaries and officers of the *gabelles*, and prohibited any other perſons from ſelling ſalt: from which time the whole commerce of ſalt, for the inland conſumption, has lain wholly in the king's hands, who ſells and diſtributes every grain thereof by his farmers, and officers created for the purpoſe.

The produce of this impoſt is ſo conſiderable, that it is computed to make one-fourth of the whole revenue of the kingdom.

GABEL, or GABLE, is alſo uſed, in ſome of our *Ancient Writers*, for any ſort of tax, or impoſition: as *gabel* of wines, of ſilks, &c.

GABINIA *toga*. See TOGA.

GABIONS, in *Fortification*, &c. are large cylindric baſkets, open at both ends, made of ozier twigs, about three feet high, and as much in diameter; having nine or ten ſtakes, about an inch and a half in diameter, which exceed the baſket-work about five or ſix inches, and are pointed. Theſe ſerve in ſieges to carry on the approaches under cover, when they come pretty near the fortification. See *Tab.* VII. *Fortification*, *fig.* 39.

They are commonly uſed in BATTERIES, to ſcreen the engineers, &c. in order to which one is placed on either ſide each gun, only leaving room for the muzzle to appear through.

There are alſo a ſmaller ſort of *gabions*, about one foot high, twelve inches in diameter at the top, and from eight to ten at bottom, uſed on parapets, in trenches, &c. to cover the muſqueteers; being placed ſo cloſe as that a muſquet can but juſt peep through.

They alſo ſerve as a parapet on lines, lodgments, &c. where the ground proves too hard to dig into.

GABIONS, *ſtuffed*, are five or ſix feet long, and as much in diameter, filled with branches and ſmall wood, and ſerving to roll before the workmen in trenches, and to cover them in front againſt muſket-ſhot. See MANTLET.

To render the *gabions* uſeleſs, they endeavour to ſet them on fire, by throwing pitched faggots among them.

GABIREA, in the *Materia Medica*, a name given by ſome of the old writers to ſuch myrrh as was remarkably fatty.

GABLE, or GABLE-*end* of a houſe, is the upright triangular end; from the cornice, or eaves, to the top of its roof.

GABLE, *land*. See LAND-*gable*.

GABLOCKS, the artificial ſpurs of a *game*-COCK.

GABRES, or GAVRES, a religious ſect in Perſia and India; called alſo *Gebres*, *Gevres*, &c. See MAGI.

The Turks call the Chriſtians *Gabres*, q. d. infidels, or people of a falſe religion; or, rather, as Leunclavius obſerves, Heathens, or Gentiles: the word *Gabre*, among the Turks, having the ſame ſignification as Pagan, or Infidel, among the Chriſtians; and denoting any thing not Mahometan.

In Perſia, the word has a more peculiar ſignification; wherein it is applied to a ſect diſperſed through the country, and ſaid to be the remains of the ancient Perſians, or followers of Zoroaſter, being worſhippers of fire. See FIRE, *everlaſting*.

They entertain the moſt profound veneration for this ancient philoſopher, whom they conſider as the great prophet ſent by God to communicate his law, and to inſtruct them in his will.

They have a ſuburb at Iſpahan, which is called Gaurabad, or the town of the Gaurs, where they are employed in the meaneſt and vileſt drudgery: ſome of them are diſperſed through other parts of Perſia; but they principally abound in Kerman, the moſt barren province in the whole country, where the Mahometans allow them liberty, and the exerciſe of their religion. Several of them fled many ages ago into India, and ſettled about Surat, where their poſterity remain to this day. There is alſo a colony of them at Bombay. They are a poor, ignorant, inoffenſive people, extremely ſuperſtitious and zealous for their rites, rigorous in their morals, and honeſt in their dealings. They profeſs to believe a reſurrection and a future judgment, and to worſhip only one God. And though they perform their worſhip before fire, and direct their devotion towards the riſing ſun, for which they have an extraordinary veneration, yet they ſtrenuouſly maintain that they worſhip neither, but that theſe are the moſt expreſſive ſymbols of the Deity; and for this reaſon they turn towards them in their devotional ſervices. See Thevenot's and Tavernier's Voyages, and Hyde's Rel. Vet. Perſ. cap. xxiv.

However, ſome have ſuppoſed, that theſe are Perſians converted to Chriſtianity, who, being afterwards left to themſelves, mingled their ancient ſuperſtitions with the truths and practices of Chriſtianity, and ſo formed for themſelves a religion apart: and they alledge that, throughout the whole of their ſyſtem of doctrine and practice, we may diſcern the marks and traces of Chriſtianity, though grievouſly defaced; the annunciation, the magi, the maſſacre of the infants, our Saviour's miracles, his perſecutions, aſcenſion, &c.

GABRIELITES, in *Eccleſiaſtical Hiſtory*, a ſect of anabaptiſts, that appeared in Pomerania in 1530. They derive their name from Gabriel Scherling, who, after having been for ſome time tolerated in that country, was obliged to remove, and died in Poland.

GAD, in *Mining*, an inſtrument uſed to dig out the ore. It is a ſmall punch of iron with a long handle of wood. One of the miners holds this in his hand, directing the point to a proper place, while the others ſtriking it with a large ſledge hammer, drive it into the vein.

The working by this inſtrument is thence called *gading*.

GAD-*fly*, in *Natural Hiſtory*, a ſpecies of OESTRUS, with ſpotted wings, yellow breaſt and brown band, and yellow abdomen, terminating in a black point; the common name for a winged inſect, called alſo the dun-fly or ox-fly, a creature very troubleſome to cows, horſes, &c. This creature, examined by the microſcope, has ſeveral peculiarities worthy obſervation. It has, like the gnat, a long proboſcis, with a ſharp dart, and two darts ſheathed within it; the uſe of which is to penetrate the fleſh of animals, and feed on their blood; whereas the proboſcis ſerves to ſuck the juices, &c. from fruits, flowers, and leaves of plants.

The eggs of this fly are laid in the water, and there produce a remarkable maggot, of a brown colour and long flatted figure, with a pencil of fine downy hairs at its tail, which it ſpreads into a circular form on the ſurface of the water, whilſt its head is plunged under it in ſearch of food. In deſcending, theſe hairs are drawn together in an oval form, and made to incloſe a bubble of air, by means of which the maggot is able to riſe again; and if this bubble happens to eſcape, the creature ſqueezes another out of its body to ſupply its place. The ſnout of this maggot has three diviſions, whence are thruſt out three little pointed bodies, like ſerpents tongues. Theſe maggots are very common on the ſurface of ditch-water, and the motion of their inteſtines is very ſingular and obſervable. Baker's Microſ. p. 207.

GADING, among *Miners*. See GAD.

GADUS, in *Ichthyology*, the name of a genus of the malacopterygious, or ſoft-finned fiſhes, in the Artedian ſyſtem, the characters of which are theſe: the bronchioſtege membrane on each ſide contains ſeven bones of a ſomewhat cylindric form; the back in ſome ſpecies has three fins, and in others only two; the head in moſt ſpecies is compreſſed, but in ſome it is depreſſed.

Artedi enumerates the following diſtinctions, viz. thoſe which have three fins and no cirri, of which there are three ſpecies, the whiting, the cole-fiſh, and the whiting-pollack: thoſe which have three fins with cirri, to which belong the cod-fiſh, the haddock, the pouting, and the Corniſh poor: thoſe which have two fins in the back comprehend the hake, the ling, the eel-pout, and the bearded *gadus*, with a furrow at the firſt of the two back-fins, called in Cornwall the whiſtle-fiſh.

The *gadus*, in the Linnæan ſyſtem, is a genus of the JUGULARES: it has a ſmooth head, ſeven ſlender branchioſtegous rays, an oblong body with deciduous ſcales; all the fins are covered with a common ſkin, and the ventral fins are ſlender, and terminate in a point.

GADWALL, *anas ſtrepera*. See DUCK.

GÆELÆUM, *earth-oil*, in *Natural Hiſtory*, a name given by

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